Bibliographical Series No.36

Radioisotopes and Ionizing Radiations in Entomology

INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA, 1969
RADIOISOTOPES AND IONIZING RADIATIONS IN ENTOMOLOGY
Vol. IV
(1966-1987)
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INTERNATIONAL
RADIOISOTOPES AND IONIZING RADIATIONS IN ENTOMOLOGY
VOL. IV
(1966-1967)
The present bibliography on Entomology represents the:
which covers the years 1950-1967

1950-1960
1961-1963
1964-1965
1966-1967

The first three of these volumes Nos. 9, 15 and 24, respectively, dramatic and continuing increase why it is unlikely that the IAE
The bibliography is again included wherever possible.
as to permit several different the first place, the reference classification scheme of differ sub-section, they are listed detailed Subject Index which is in the particular study cited: arthropods; and special added with radiotracers, both by the with an indication of the system is an Author Index showing each.
The documentation will be a rapid survey of relevant pub in search of detailed document to the scientist in developing it might be somewhat limited.
The bibliography was compiled by Division of Scientific and Technical
Readers are invited to a spondence regarding the "Bio- Division of Scientific and Tech
Energy Agency, Kärntner Ring

BIBLIOGRAPHICAL SERIES, No. 36: RADIOISOTOPES AND IONIZING RADIATIONS IN ENTOMOLOGY (1960-1967)
IAEA, VIENNA, 1969
STI/PUB/21/36
FOREWORD

The present bibliography on Radiotopes and Ionizing Radiations in Entomology represents the fourth and probably final volume of a series which covers the years 1950 to 1967:

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<tr>
<th>Years</th>
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<tr>
<td>1950-1960</td>
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<td>1966-1967</td>
<td>2 years</td>
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The first three of these volumes were published as Bibliographical Series Nos 9, 15 and 24, respectively. The figures for references indicate the dramatic and continuing increase in published work in this field and explain why it is unlikely that the IAEA will continue this documentation service.

The bibliography is again fully annotated, and abstracts have been included wherever possible. The bibliography is organized in such a way as to permit several different approaches to the individual references. In the first place, the references are grouped together according to a broad classification scheme of different areas of work. Within each section or sub-section, they are listed in alphabetical order of authors. There is a detailed Subject Index which identifies the radiotopes or radiations used in the particular study cited; a taxonomic index for insects and related arthropods; and special additional tables to identify insecticides studied with radiotracers, both by their chemical and by their proprietary names, with an indication of the system (insect, plant, etc.) used. Finally, there is an Author Index showing each author’s affiliation (with date).

The documentation will be of practical use to the specialist requiring a rapid survey of relevant publications in related disciplines, to someone in search of detailed documentation on a particular aspect of the field, and to the scientist in developing countries whose access to the world literature might be somewhat limited.

The bibliography was compiled by Mrs. M. BINGGELI of the Agency’s Division of Scientific and Technical Information.

Readers are invited to address their suggestions and other correspondence regarding the "Bibliographical Series" to: The Director, Division of Scientific and Technical Information, International Atomic Energy Agency, Kärntner Ring 11, P.O. Box 590, A-1011 Vienna, Austria.
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COMPILATION OF BIBLIOGRAPHIES

SOURCES

The bibliography was compiled as a result of a routine search involving several
(a) Abstracting journals

- Biological Abstracts
- Bulletin Bibliographic
- Chemical Abstracts
- Dissertation Abstracts
- Nuclear Science Abstracts
- Review of Applied Science

(b) Title listings

- Atomindex
- Biological Abstracts
- Bulletin Bibliographic
- Chemical Abstracts
- Current Contents
- Life Sciences
- Pesticide Document

Subsequently, primary or secondary sources cited in original papers were
sought. Where necessary, otherwise not available, review proceedings, bibliographies
such as those of J. Rechcigl were consulted.

1. With the addition of some titles cited.
2. Includes keywords but no abstracts.
3. List of references to current literature from
  international Atomic Energy Agency.
4. Lists contents of a variety of journals.
5. Either because no abstract was available or information on the technical aspects
   were not available.
INTRODUCTION

COMPILATION OF BIBLIOGRAPHY AND GUIDE FOR ITS USE

SOURCES

The bibliography was compiled from the open literature. A first routine search involved scanning selected secondary sources:

(a) Abstracting journals

Biological Abstracts (BA)
Bulletin Bibliographique:
    Isotopes. Rayonnements. Agriculture, (BB)
Chemical Abstracts (CA)
Dissertation Abstracts (DA)
 Nuclear Science Abstracts (NSA)
Review of Applied Entomology
    series A: Agriculture (RAE-A)
    series B: Medicine (RAE-B)

(b) Title listings

Atomindex³ (STI/Doc/12, fortnightly) (LOR)
Bibliography of Agriculture (RAg)
Biological and Agricultural Index (AI)
Bulletin Signalétique Hebdomadaire (BS)
    - Périodique de Chimie³
Current Contents
    Chemical, Pharmacological &
    Life Sciences⁴ (CC)
Pesticide Documentation Bulletin (PDB)

Subsequently, primary sources were scanned, abstracts being prepared where necessary. Otherwise, sources of abstracts are indicated. References cited in original papers were followed up, this method of documentation search proving particularly productive. Numerous books, conference proceedings, bibliographies, and reports were also scanned, including such review series as A. Rev. Ent. 11 (1966) and 12 (1967) (Smith, R. F.,

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¹ With the addition of some title citations for reports.
² Includes keywords but no abstracts.
³ List of references to current literature, including numerous reports, received routinely by the International Atomic Energy Agency.
⁴ Lists contents of a variety of journals.
⁵ Either because no abstract was available or because the existing abstract proved not sufficiently informative on the technical aspects stressed by the bibliography.
Papers presented at meetings and published as abstracts only have been cited, usually in toto, since they often give enough information for the interested reader to decide whether he wishes to write to the author; in such cases, he can find the author's address in the Affiliation Index.

Among the selected journals scanned routinely are:

- Aus. Schädlingsk.
- Biochem. J.
- Biochim. Biophys. Acta
- Bull. ent. Soc. Am.
- Bull. ent. Res.
- Chromosome
- C.R. Acad. Sci. Acad. Sci. D
- Dakt. Acad. Nauk GDR - Biological Section
- Demogr. Inf. Serv.
- Ecology
- Entomologia exp. appl.
- Ent. Rev. (ABC-tr-Rumania)
- Experientia
- Fed. Irradi.
- Genetics
- Geology
- Hormones
- Int. J. Appl. Radiat. Isotopes
- Isopropenax
- Kaschke Zool. (Kaschke Zool.
- J. Genet. (Kaschke Zool.
- J. med. Chem.
- J. econ. Ent.
- J. exp. Biol.
- J. Hered.
- J. Insect Physiol.
- J. Invertebrate Path.
- J. med. Ent.
- J. molec. Biol.
- J. Sci. Ind. Agric.
- Kerenenergie
- Life Sci.
- Mosquito News
- Mutation Res.
- Naturewissenschaften
- Nucleonics
- Pesticide Prog.
- Proc. ent. Soc. Ont.
- Radiobiology (Radiobiology, ABC-tr-
- Science, N.Y.
- Z. industrielle Abstanze...-u. Verhalene

The omission of an abstract for a given reference may be due to one of the following reasons:

1. The reference had originally been obtained from a title listing or from a citation in another publication, and the compiler had not been able to obtain the original article;
2. The original article had appeared in interim form intended only for limited circulation, and permission could not be obtained for quoting details; or
3. The original articles were descriptions of projects or progress reports which would largely be outdated by the time the bibliography appears in print, much of the results having been published in the literature by then.

Such references have, nevertheless, been included as title citations and appropriately indexed since some readers might wish to follow them up by establishing direct contact with the scientists concerned; again the addresses of the authors can be obtained from the Author Index.

XII
Reports

Numerous reports have been abstracted, and may be considered valuable as indicative of trends in a particular field or institution. The user is thus enabled to contact a particular scientist, even if no conventional publication is (yet) available.

REFERENCES

References are arranged by subject matter as set out in the table of Contents. Articles reviewing the particular subject or of a general or introductory nature are placed at the beginning of a section. Such reviews are more specific than those reported in the Addendum (3.2. Bibliographies and General Surveys), where broad fields are surveyed.

Where new data (e.g. abstracts) have been obtained on references included in Vols I-III, their original number preceded by the volume number, are also indicated: an abstract may thus be added to a reference originally cited by title only, e.g. reference 1146 had been cited as reference 1038, without abstract, in Vol. III. This fact is indicated by 1146 = III/1038.

Cross-References

These are cited at the end of each section, giving the title (in English only), first author, year of publication, and the reference number. Despite the very detailed Subject Index, cross-referencing has been used extensively.

ADDENDUM

Techniques

Some selected papers representative of particular techniques (e.g. autoradiography, neutron activation analysis, etc.) have been grouped together.

TABLES

Three tables have been compiled.

Table 1. Systematic Listing of Insects and Related Arthropods

The insects and related arthropods cited in the bibliography are grouped together systematically by order, family, genus, and common name. Their place in this table is also indicated in the Subject Index where the systematic code appears next to the scientific name.

Table 2. Radiotracer Studies on Insecticides

This table gives a digest of radiotracer tracer studies on insecticides. Chemical names and other designations are indicated throughout. The parti-
cular radioisotope used in an analysis or synthesis as well as the animal, plant or particular substrate used in metabolic and residue studies are given. The insecticides have been grouped in certain broad categories, also used in the two Insecticide Indexes.

Table 3. Some Insect and Related Arthropod Pests:
Guide to Colonization and Mass Rearing

Various people had suggested to the compiler that, in view of the increasing importance of the sterile-male technique for insect control, it would be useful to list the laboratories with experience in the colonization and mass rearing of insects. Although it was not possible to carry out the survey that would be needed in order to produce a comprehensive list, a recently published book does, in fact, provide much useful information. The book is entitled "Insect Colonization and Mass Production" and is noted in the bibliography as reference APX, 11 in the Appendix. No attempt has been made to collect information beyond the period or areas covered there, but a table has been compiled as a guide to the rearing of various types of insect and related arthropod pests, with indications of their common and scientific names, taxonomic code, and some specialists in the particular field with affiliations.

INDEXES

Insecticide Indexes

To facilitate checking of an insecticide, e.g. where a synonym has been used, the following two indexes have been compiled:

(i) Common and Manufacturers' Names Index

(ii) Letter and Number Index

to be used in conjunction with Table 2.

Author Index

1. A Corporate Author Index has been compiled.

2. Personal Author and Affiliation Index.

As far as possible, up-to-date affiliations have been indicated for each author. Sole or first authors, in cases of joint authorship, have been indicated by underlining the pertinent reference number.

Subject Index

A detailed Subject Index is provided. The radioisotopes or radiations used are indicated for each reference. The following convention has been adopted concerning the position in which they are cited with regard to a particular study: When the radioisotopes or radiations represent the cause they precede the phenomenon reported; when used as a tool for analysing existing conditions they follow the phenomenon studied. Irradiation, when combined with other modifying treatments (gaseous environment or temperature at irradiation, etc.) is quoted as radiation/treatment. When a comparison

* Excluding chemical elements.
thesis as well as the animal and residue studies are given. Broad categories, also used in

Glossary

<table>
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<th>Symbol</th>
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<td>α</td>
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<td>(a)</td>
<td>adult</td>
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<td>AET</td>
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<tr>
<td>e</td>
<td>electrons</td>
</tr>
<tr>
<td>(e)</td>
<td>egg</td>
</tr>
<tr>
<td>EDTA</td>
<td>ethylenediamine tetraacetate</td>
</tr>
<tr>
<td>EM</td>
<td>electron microscop(ical) findings</td>
</tr>
<tr>
<td>(emb)</td>
<td>embryo</td>
</tr>
<tr>
<td>e.m.</td>
<td>electromagnetic fields</td>
</tr>
<tr>
<td>e.s.</td>
<td>electrostatic fields</td>
</tr>
<tr>
<td>(h)</td>
<td>hypoplastic stage (mites)</td>
</tr>
<tr>
<td>ir</td>
<td>infrared</td>
</tr>
<tr>
<td>i.v.</td>
<td>intravenous</td>
</tr>
<tr>
<td>(f)</td>
<td>larva</td>
</tr>
<tr>
<td>($)</td>
<td>5th larval instar</td>
</tr>
<tr>
<td>LD</td>
<td>lethal dose</td>
</tr>
<tr>
<td>(m)</td>
<td>metamorphosis</td>
</tr>
<tr>
<td>NA</td>
<td>nucleic acid(s)</td>
</tr>
<tr>
<td>n</td>
<td>neutrons</td>
</tr>
<tr>
<td>(n)</td>
<td>nymph</td>
</tr>
<tr>
<td>n&lt;sub&gt;f&lt;/sub&gt;</td>
<td>fast neutrons [when energy is specified suffix is dropped]</td>
</tr>
<tr>
<td>n&lt;sub&gt;1&lt;/sub&gt;</td>
<td>slow neutrons</td>
</tr>
<tr>
<td>NADPH&lt;sub&gt;2&lt;/sub&gt;</td>
<td>nicotinamide adenine dinucleotide phosphate</td>
</tr>
<tr>
<td>n.d.</td>
<td>non-dated</td>
</tr>
<tr>
<td>OP</td>
<td>organophosphorus (or) (ate)</td>
</tr>
<tr>
<td>P&lt;sub&gt;1&lt;/sub&gt;</td>
<td>inorganic phosphorus</td>
</tr>
<tr>
<td>p</td>
<td>protons</td>
</tr>
</tbody>
</table>

* Excluding chemical elements.
pupa
diapause
Dauer
pre
R-
Resistant (strain)
RF
Radio frequency
r.l.
Radiolotopes (non-specified)
RNA
Ribonucleic acid
mRNA
Messenger RNA
tRNA
Transfer RNA
RNase
Ribonuclease
S-
Susceptible (strain)
SMT
Sterile male technique
T
Temperature
TPN+n
Triphosphopyridine nucleotide (oxidized)
uv
Ultraviolet
1/120
Vol. I, reference 120
II/76
Vol. III, reference 76

Note: The following symbols may occur in the Subject Index:

IV
Roman numbers in connection with genetic effects indicate "chromosome, number IV".
QQ. 2
After scientific name of insect: systematic code, referring to appropriate position in Table 1.
[PA. 3]
After chemical compound: insecticide code, referring to appropriate position in Table 2.

ABBREVIATIONS

(Bibliographical Abbreviations for Abstract Sources)

AI
Biological and Agricultural Index
BA
Biological Abstracts
BAG
Bibliography of Agriculture
BB
Bulletin Bibliographique
BS
Bulletin Signalétique Hebdomadaire
CA
Chemical Abstracts
CC
Current Contents
DA
Dissertation Abstracts
LOR
Atomica
NSA
Nuclear Science Abstracts
NSA/J
Nuclear Science Abstracts Japan
PDB
Pesticide Documentation Bulletin
RAE
Review of Applied Entomology

ACKNOWLEDGEMENTS

The compiler (MB) is much indebted to Dr. D. L. Lindquist, of the Joint FAO/IAEA Division of Atomic Energy in Agriculture, for helpful discussions on insecticides.
1. RADIOISOTOPES

1.1. INSECT LABELLING

1.1.1. Methods


--- They are fed on young wheat containing $^{14}$C; the radioactivity taken up by the grasshoppers can then be observed by a portable scintillation counter. Laboratory tests have shown the biological period of the $^{14}$C to be $\pm 2$ days, and that $1 \mu$Ci/insect is needed to enable them to be traced during two months.


The effects of supplying adult $^{32}$P and radioactive phosphorus in their diet were described. Newly emerged individuals were given mashed bananas, renewed every 2 days, into which $^{32}$P had been incorporated at either 0.02 or 0.3 mCi per kg. The eggs laid were counted daily, and the larvae hatching from them were reared on mashed bananas. The $^{32}$P had no influence on the mortality of the flies but appeared to stimulate oviposition, especially at the lower rate, though this may have been due to the addition of phosphorus to the diet and not to the radioactivity. The percentages of the total radioactivity supplied to the adults that could be detected in the eggs were 2.3 and 1.05 for the two rates, respectively. Screening the pupae derived from the two groups of eggs showed that they contained 22.8 and 44.6%, respectively, of the radioactivity present in the eggs. The corresponding percentages in the adults were 42.6 and 34.2. Adults derived from eggs laid 9 or 10 days after the $^{32}$P had first been applied to the parent flies were paired with each other and with adults derived from material to which no $^{32}$P had been supplied, in all possible combinations, three males being confined with five females in each instance. Increased oviposition (as compared with the completely non-radioactive series) was observed when one sex (either male or female) was derived from the group supplied with the lower concentration and the other was from the untreated series, but when both sexes were of this group or one of both sexes was from the group supplied with the higher rate, there was a reduction in oviposition. Virtually no radioactivity was detectable in the eggs laid.

(From RAEM-55: 1961, ref. 22)


Larvae of Ceratitis capitata in order to obtain labelled adults for studies on dispersion. Eggs were placed on mashed bananas containing 0.2 mCi $^{32}$P per 15 g. The larvae hatched in 5-8 days, and nutritive solution was added daily from the 5th day, which somewhat reduced the radioactivity of the medium. The first pupae were formed on the seventh day. As a result of the progressive decrease in the radioactivity of the medium, the pupae formed on the 12th day were only half as radioactive as those formed on the 8th-9th. Adults were obtained from the 10th day and were supplied with food without $^{32}$P. Their radioactivity was measured on the 13th, 23rd, 33rd and 43rd days, and it is concluded from the results that by this technique adults can be obtained that are radioactive to a measurable
degree (in the order of 0.01 pmol per adult) more than three weeks after the eggs are placed on the radioactive medium. Over 60% of the pupae gave rise to adults. Labelled adults could be distinguished easily and rapidly from normal ones in cages in trap-jars containing 5% ammonium phosphatase and examined 6-9 days later, even when the contents of the traps had been filtered and stored for two days in a refrigerator and the "normal" adults had become very slightly radioactive as a result of contact with the labelled ones. When further tests were carried out with larvae using the same technique and rates of 0.4, 2 or 10 pmol per 15 g food, no pupae were obtained with the highest rate and adults were obtained only with the lowest. When these adults were paired each way with normal adults or with each other, the number of eggs laid was lower than that obtained from normal adults if at least one of the sexes was from the labelled group. At the increase in oviposition obtained by labelling adults (as noted in the first paper) does not appear to occur when the larvae have been supplied with 0.4 pmol. This is considered a safe rate for labelling material for field release. Although pupae were formed when rates of 0.6, 1, 1.2, and 10 pmol per 15 g were used, no adults were obtained. Interpretable results were given in a preliminary experiment to study the distances covered by individuals released in the field, but the radioactivity of the flies recaptured after 4 days was readily detected. (From AAF 9: 1967, ref. 225).
weeks after the eggs are placed on the
plants. Labelled adults could be
found in traps containing 5\% ammonium
for the traps had been filtered and
preserved very slightly radioactive as a
were carried out with larvae using the
compound, no papers were obtained with the
when these adults were paired each
second and was lower than that obtained
labelled group. As the increase in
people) does not appear to occur when
an safe rate for labelling material for
about 1, 3, 6, 1, 2, 7, 2, 7, and 0 g were
in a preliminary experiment to study
the radioactivity of the flies captured
by

**METHOD FOR THE RECOVERY**

Jod. 212 (1960) 503-506.

Dipemat, Simulidae (in the larval and
of adults, and an aerocephlographic
water of 1.2 \*C

Hg\textsubscript{2}Cl\textsubscript{2} water was used
was labeled. Two methods of
treated by Macomel scaler and
and could be detected.

The after treatment. The largest
were the tagging size, confirming

**PATO AGAINST THE COLORADO**

Pop. Zool. 17 (1963)

were released in the field
only 37\% were recovered


New York, N.Y.


Culex pipiens

500 \*C

PSEUDONEMAZENIAE.

Diptera of the ecology, systematics, and biology of Culex pipiens

Culex pipiens

The 6th instar

The 6th instar

Sadler (1969) 22-23.

Radiocative isotopes to specific larval stages of Drosophila melanogaster.


For a number of reasons, it has proved desirable to pulse label (3P) larvae during the first 24 h of the 3rd instar. The method is described in detail. Larvae are allowed to feed on labelled yeast for 24 h. Radioautographs of spines from females inseminated by males treated in the manner described in the paper with either \(^{32}P\) or \(^{35}S\)-thyminde showed heavy uniform labelling during the first 3 of mating yet the male germ cells had been subjected to radiation from radioactive media for only 1 d and during the relatively insensitive spermatogonial stage.

Citrus fruits infested with immature (white-cap stage only) Egyptian black scale, \textit{Chrysomphalus aonidum} (L.) (Diaspididae), were briefly dipped in a \textit{32P}-solution (as orthophosphate in an isotonic solution containing phosphate buffer with pH 7, and a phosphorus content of 1 mg/ml). Only in this initial stage of its development did the total scale, dorsal armour and all, be consumed in great quantities daily by the lady beetle, \textit{C. biguttatus} L. (Coccinellidae; Coccinellidae). The beetle is thus effectively marked. (A less permanent marking was achieved when radiophotographic material adhered to the beetle body.) The beetles were exposed to scale-infested fruit which had been dipped in \textit{32P}-solution, with a specific activity of 0.01 mCi/ml and 0.65 mCi/ml for 28 and 96 h. Feeding upon \textit{32P}-contaminated young scales did not affect beetle longevity, fecundity or egg viability. An effective half-life of 4.5 to 5.6 d was found in beetles fed on young scales treated with 0.01 mCi/ml, and 5.6 d when a 0.65 mCi/ml solution had been used. Most normal field studies could thus be carried out. With slight adaptations the method should prove suitable for labelling most scale insect predators.

14 Raimundo, A.C., Santos, J.L. COMBATE AOS INSETICOS. 1. A MARCAÇÃO DA MULHER DA FLOTA \textit{(Ceratitis capitata} Wied.) COM FEIROS FÓSFORES QUÍMICOS NO MÉTODO DOS MACHOS ESTÉRILES. (Insect control. 1. Tagging the fruit fly \textit{Ceratitis capitata} Wied. with radioactive phosphorus for the sterile male technique.) \textit{Estudos agron.} 6, 6 (1965) 103-112. (In Portuguese)

In a preliminary study concerned with population analysis prior to attempting eradication of the sterile male technique, tagging was effected by \textit{32P} mixed added to the larval medium. Four different concentrations (0.1, 0.3, 0.5 and 1.0 mCi/g) were used.


The germ line chromosomes of \textit{S. corophila} have been followed from the time of origin of the germ cells up to the time of maturity in the male and up to first larval molt in the female. The mechanism which prevents the accumulation of \textit{1}(-linear) chromosomes in the germ line is a unique process of chromosome elimination: it occurs in male and female embryos after the germ cells have migrated from the pole plasm to the definitive gonad site, and it involves the movement of whole \textit{1}(-linear) chromosomes through the nuclear membrane into the cytoplasm. The extra paternal \textit{X}-chromosome is eliminated from the germ cells as the same time and in the same manner. Following this elimination there is a cytological differentiation of the chromosomes remaining inside the nucleus. First, the four paternal homologues of the regular complement undergo a loosening of coiled and become light-staining whereas the maternal homologues remain condensed like the \textit{L}2. Next, the \textit{L}-chromosomes undergo a process of extreme condensation and disintegration following which they return to the condensed state. \textit{L}3-thymidine autoradiography on gonial and premeiotic cells in the testis reveals that the \textit{L}2-chromosomes undergo DNA replication at the end of the \textit{S} period, also that they are asymmetrical in DNA synthesis among the regular chromosomes. The phenomena of differential chromosome staining and asymmetrical DNA replication are considered in the light of current theory regarding heteroduplexisation and gene inactivation, also in relation to the phenomena of chromosome bipartition encountered in this genus.

\textsuperscript{1} In early experiments late 4th-instar larva or young prepuces were injected with a solution containing 50 mCi/ml \textit{32P}-thymidine (specific activity 1.80 Ci/mM), and kept until adult pupal stage when spermatogonia accumulated and the testes were dissected out. Because of high mortality following injection, later experiments used gondas given a 30 min exposure in a drop of tissue culture medium containing 10 mCi/ml \textit{32P}-thymidine (specific activity 5 Ci/mM).


A high level of labelling was achieved by modifying the standard medium and adding \textit{32P}-radiothymidine. Eggs were labelled. Final processing of pure ribosomal RNA had a specific activity ranging from 96,000 to 110,000 cpm/\mu g. All counting was done in a liquid scintillation counter on cellulose membrane, permitting assay of \textit{32P} and \textit{3H} in the same sample. The proportion of DNA complementary to ribosomal RNA was estimated by means of annealing experiments in four hybridized (3H) mutants of independent origin in \textit{D. melanogaster} together with other events, have led to the erroneous suggestion that the genetic I

17 Samorin, A.I. et al. \textit{Complisonopis anaphon T}

This can be labelled with for fifty months.

18 Talwar, L., Dhabhar, J. \textit{TEREND} (Application of Ochr. Res. 74) 1 (1968)

A method was developed feeding on radioactive \textit{pl} the larvae and their food, with an activity of 25-66 work. The biological la Larvae labelled in the first and locating leahters..


Young plants of beet, nks the stalk or stem, and far consisted in growing the \textit{32P} labelled solutions directly became radioactive them of 10 mCi \textit{32P} was suitable marking their aphid pop production of the aphids, labelled a soil transfer..

20 Trost, W.E., III. \textit{The melanogaster}. \textit{Dros. Ab}

Methods are described for spore labels. By feeding transferred to females, the larvae are also in a form of injection. Injected adult males delta unmated males, and is a feeding of the label to these experiments the firm to be like the same for males peals, one about 8-9 d of another peak 12-13 d after experiments offer stronger gradient in sperm and on process. The results from


Adult males injected with first 3 4. About 7% of the
origin in D. melanogaster. All were found to be partially deficient in this DNA. These experiments, together with other evidence concerning the localization of this DNA and the characteristics of the mutants, have led the author to offer the conclusion that the X loci in the nucleus organizer and that the typical genetic basis of X is partial deletion of the mitochondria.
at most, of the female label was received through mating. At least 59%, and probably all, of the remaining label was received through ingestion of label ejected by the males and as surface contamination of the females. Male larvae which had been fed b-hydroxylamine for several hours and allowed to mate 5-8 days later as adults also transferred label to females during the first 2-3 day of mating. Although some of this transferred label was taken up by the females through ingestion, there are indications that much of the radioactivity was transferred through matting as labelled sperm and seminal fluid.


The labelling of mosquitoes is a useful tool to estimate the size of populations, the daily survival, the dispersion rate and record travelling. It gives indications about the preference for shelters and a more accurate rate of human blood preferences. The results of the incidence of two character, i.e. human blood index and resistance to DDT are discussed. Detailed consideration is given to infections doses transmitted by mosquitoes and their change distribution. All data available are used to estimate the risk of contracting one infection dose. (NIA)


Stable meals such as europium, dysprosium and thorium were used to study the dispersal of certain pests. Labelling was carried out by spraying (field work), feeding or injection. Labelled insects were subsequently activated in a reactor. Rare earths can be detected with certainty with a gamma spectrometer down to 10^-6, europium even down to 10^-7.


Black fly adults, tagged with Sr^+ as larvae and pupae in aerated streamside tubs, have been recovered in significant numbers at distances of up to 5 miles by use of "sticky" traps and an autoradiographic technique. (Abstr.)

See also


26 Mutations produced by transmutation of phosphorus-32 to sulfur-32 within Drosophila DNA. (Lee, V.R. et al., 1967)

27 Early development in the use of radioisotopes in agriculture. (Cozar, D.J., 1965)

28 Atomic energy in life sciences. (Gupta-Aiyer, A.A., 1965)

29 Biological half-life of Ca^+ in all webworms. (Coleman, D.C. et al., 1967)

30 Distribution of Sr^+ in the male reproductive system of Culex pipiens squameolus Lusky. (Patterson, H. F. et al., 1967)

31 Study of the structure and function of the alimentary tract of Megoura viviae Rued. (Aphididae, Homoptera), with special reference to food uptake and hemocyanin excretion. (Ehrihri, P., 1965)

32 Some applications of radioactive isotopes in ecological research. (Nordlund, L.W., 1965)

33 Study of food uptake by Megoura viviae Rued., a phloem sucking aphid (Homoptera, Aphididae). (Ehrihri, P., 1965)

34 Labelling of aphid saliva with rubidium-86. (Gamb, K.F. et al., 1967)

35 Investigation of the hormone of periodic luteolus fate, tagged with H^+o. (Ngozere, W. et al., 1966)

36 Habitat selection by the queens of two field-dwelling species of ants. (Wissow, O.E. et al., 1968)

37 Study of nutritional interchanges in the ant Formica polyctena by means of radioisotopes. (Leconte, J., 1965)

38 Isotope to estimate colony size of Formica cincta Mayr (Hymenoptera,Furciferae) (Medier, J.T., 1964)

39 Note on the mean of dispersion of Rhodinum pyophilum Stoll. (D'Ascoli, A. et al., 1966)

40 Some results of studies. (Takah, 1966)

41 Study of the di., et al., 1966)

42 Flight range. (Monteau, J.)

43 Migration and

44 Radioisotopes. F. (Talota, L.)

45 Evaluation of. (1966)

46 Definition of by means of. (1966)

47 Radiophosphors. (1965)

48 Use of radic. (1966)

49 Basic fertilis. (1965)

50 Destruction of. (1965)

51 Interactions of. (1965)

52 Application of insect pests. I et al., 1965)

53 Study on mass. (A contributor)

54 Studies on the IV. (Mating by. (1965)

55 Plastic enclosure. (1965)

56 "Proceedings of. (1965)

I.1.2. Devi


In a study on the eff. of C. pipiens on a concentration of The period of larval c. occurred two weeks. It inhibited, larvae be. medium on the outer: this study, it is incor. concentration of H^+o radioactive to be tec.

Atal, Y.D. THE EF LARVAE. (1965)

Because the effect of is not the same, D. D. const and no cell 5 nutrient (50 mg mg, 24, or 46 lb, and then
Some results obtained with the application of the tracer method in insect migration and dispersion studies. (Dialoiba, I., et al., 1966)


Flight range, longevity of *^3H*-labelled Anopheles stephensii mosquitoes. (Guerin, L., 1966)

Migration and dispersal patterns of *^14C*-labelled luna star flies. (Simitsis, E. J., et al., 1967)

Radioisotopes as tracers used for migration studies of the leafhopper species *Cicadella viridis* F. (Talbert, L., et al., 1960)

Evaluation of activity of honeybee colonies moved to a hives seed field. (Olejnik, J., et al., 1960)

Definition of the range of host plants of the fruit fly (*Drosophila spp.* L.) by means of *^3H* in the seeds of the insects. (Talbert, L., et al., 1967)

Radioisotopes in labelling the desert locust for population estimation. (El-Mehalawi, S., et al., 1967)

Use of radioisotopes for studies on the ecology of tick vectors of disease. (Serbanescu, D., et al., 1968)

Basic fertilization phenomena and genetic lethality in *Drosophila*. (Michigan State Univ., East Lansing, 1963)

*Invertebrate cytology and genetics*. (Oak Ridge National Lab., Tenn., 1967)

Interactions of oxygen at high pressure and radiation in *Drosophila*. (Thomas, J. L., et al., 1966)


Study on mass breeding and sterilization of the Mediterranean fruit fly *Ceratitis capitata* Wied. (A contribution to the artificial technique.) (Schieman, E., et al., 1967)

Studies on the eradication of Anopheles pharaonis by the sterile-male technique using cobalt-59. IV, Mating behaviour and its frequency in the sterilized mosquitoes. (Takazono, A. O., 1967)


1.1.2. Developmental, physiological, and genetic effects of isotopic labels


In a study on the effect of different concentrations of *^32P* in the larval medium on the growth and development of *C. pipiens* molestus, *^32P* was found to have little noticeable effect on the growth of the larvae up to a concentration of 2.5 *μCi* *^32P*/ml but above this concentration larval growth was greatly retarded. The period of larval development was increased at concentrations > 1.0 *μCi* *^32P*/ml, and pupation occurred two weeks later than in the controls. In concentrations > 5.0 *μCi*/ml, pupation was completely inhibited, larvae became sluggish, stopped feeding and finally died. The effect of *^32P* in the larval medium on the emergence and radioactivity of the resulting adults was also studied. On the basis of this study, it is recommended that, for efficient utilization of *^32P* in large-scale field experiments, a concentration of *^32P* of 1.0 *μCi*/ml be employed so that emerging adult mosquitoes may be sufficiently radioactive to be readily detectable. (Auth. summary)


Because the effect of radiation on organisms of different ages and on different tissues of the same animal is not the same, *D. melanogaster* larvae were used, since the number of cells in different tissues seems to be constant and no cell division occurs in postembryonic stages. The larvae were transferred to hot nutrient (50 mg sugar, 50 mg yeast, 1 g banana and 60 *μCi* thymidine-^3H), maintained in it for 22, 24, or 46 hr, and then transferred to normal nutrient. The number of dead and living larvae were...
counted at intervals, it had a lethal effect on larvae; the longer the larvae were kept on 1-containing
medium, the greater was the mortality rate. A relation between the age of the larvae and the lethal
effect of 1 was found. The radiation from 1 had a greater effect on the cells which were of the beginning
differentiation than on the cells with already established differentiation. (CA 86 1966, 1465s)

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Le stastissement des cornes
lauens pour n recent de
sci. melanopast. A
L'embryo inutile n'a pas
témoin. (Agr.)

Hettasch, I.P.: TECHNI-
CATIONS IN INSECTS. 1
The use of u-decyl 1H
3 to 4-decyl larvae (1 μ
of time lag in the peak
alysis of u-decyl nec-
by the insect. The
one gives the prospects,
his risk of mechanical dam

Kaplan, W.D., Ongley,
DNA PRECURSORS IN D
Ser-injected treated lar-
larvae. The lethality
mine with 1H-thymine
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ally this and one of
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the distribution reflects
isomers produced by
cytidine content may ex

Lee, W.R., Oden, C.K.: CHROMOSOMES TO RA-
3 (1966) 807-822.

Transmission of 1P to-
and recall of the 1H ac-
by storage of 1H-la en-
the 1P 2-particle con-
that had been fed
agar plates at 22°C
on cinnamic red-
measure additional gene
There was no significant
by loss of the marker
be attributed to transmis-
been detected stably
less than one 1P hybrid.
(From auth., summary)

at the 1969 Meetings of

The effect of transmuta-
ing radiation in n μ up-
mg of unknown label-
8

Bogler, G.: EFFETI SONTAGENES DE LA LEUCINE, DE L'UMIDE ET DE LA THYMIDINE
(1966) 1179-1178.

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Lee, W.R., Oden, C.K.: CHROMOSOMES TO RA-
3 (1966) 807-822.
La substitution des composés triphosphate à la thymidine, l'adénosine ou la thymidine dans la nourriture des larves, permet d'augmenter l'incidence des tumeurs mélaniques chez les mouches d'une souche tumorigène de D. melanogaster. A cet égard la thymidine triphosphate est beaucoup moins active que l'adénosine ou la thymidine. L'utilisation triphosphate n'a pas permis d'induire la formation des tumeurs chez les larves d'une souche non tumorigène. (Auc.)


The use of 3-decyl 1-4C-acetate was investigated on Calliplora erythrocephala, applied topically to 3 to 4 day-old larvae (1 μl). No effects on mortality, pupation or emergence were observed. The lack of time lag in the production of ^14C-metabolites in the larvae was interpreted as a rapid hydrolysis of the decyl acetate, the free acid produced being further metabolized as soon as it is absorbed by the insect. The use of a stable precursor therefore permits to water soluble metabolite to be given to an insect, however small, in a dose smoothly applied over several hours without loss of blood, risk of mechanical damage or unnecessary metabolic disturbance.


Six-linked recessive lethals have been induced in male Drosophila by feeding 3H-deoxythymidine to 2-day-old larvae. The lethals have been localised and their distribution compared to the one previously obtained with 3H-thymidine. The two independently produced distributions differ from each other at the 5% level of significance. Two regional differences have been noted, one of high mutation after 3H-thymidine and one of high mortality after 3H-deoxythymidine. Data combined from the two treatments closely parallel the distribution of lethals induced by x-rays and y-rays, suggesting that the combined distribution reflects the regional content of DNA along the X-chromosome. The differences in lethal distributions produced by the two DNA precursors suggest that significant local variations in thymine and cytosine content may exist within the chromosomal DNA. (Auth.)


Transmission of 3H to H and the accompanying energy released by radioactive decay in the molecule and of the 3H nucleus have been separated from the mutagenic effect of accompanying 3H-deoxythymidine by storage of 3H-labelled spermatozoa in unlabelled Drosophila females. Because of the high energy of the 3H β-particle, only a negligible dose is observed by sperm from 3H-deoxythymidine 2-day-old males that had been 3H labelled in larvae. Females recently mated with 3H-labelled males were divided into two groups. One group was allowed to produce progeny immediately. The other was first stored on sugar agar media at 18°C for three weeks to inhibit oviposition, and then permitted to oviposit freely on communal media. The mutation rates of progeny in the two groups were compared to measure additional somatic damage, if any, caused by 3H decay in sperm during the storage period. There was no significant change during storage in the rates either of chromosome breakage (as measured by loss of the markers S^1 on the marked Y-chromosome) or of sex-linked recessive lethals that could be attributed to transmutation and recoll. By combining the data, increase in mutation rate that could have been detected statistically with the minimum estimate of 3H disintegrations, it was concluded that less than one 3H disintegration in 5000 in the X-chromosome will produce a complete recessive lethal. (From auth., summary.)


The effect of transmission of 3H to H in DNA separated from the mutagenic effect of accompanying 3H-deoxythymidine was measured in a previous experiment (Genetics 54, 1969, 921–824) by storage of 3H labelled spermatozoa in unlabelled females. The multipurpose breeding scheme used in this experiment was designed to detect (1) females with completely mutant germ lines by scoring for sex-linked recessive lethals in the 5° sex; (2) females with partially mutant germ lines by scoring for sex-linked recessive lethals in the 5° females. The results confirmed the earlier experiment in that there was no increase in the rate of either complete or partial...

To determine the proportion of P32 incorporated into DNA, sperm cells were double-labelled with P32 and 35S-thymidine. Evidence is presented that transmutation of P32 to 35S within the DNA molecules of Drosophila spermatogonia produces lethal mutations that are detected only in the F2. If the delay in expression of the lethal mutation due to P32 is caused, the mutant cells must average 25% or less of the F1, but less than 25% of the lethals will be detected in the F2. Most of the mutant cells cannot be detected until a mutation induced by transmutation of P32 to 35S. The implications for estimating genetic damage from radionuclides incorporated into DNA must be re-evaluated in view of these results. Furthermore, these results indicate the inadequacy of conventional P32 lethal tests for screening potential mutagenic agents.

37 Strayer, J.R. EFFECT OF RADIONUCLIDES (P32) ON LIGHT RESPONSE OF Aedes aegypti (L.) LARVAE. J. Insect Physiol. 25, 9 (1979) 81-84.

The normally negatively phototactic larvae of A. aegypti (L.) were exposed to varying levels of P32 in order to determine whether this would affect their light responses. Larvae were kept for 24 h at temperatures of 25 °C in a closed container containing 550 ml of water either alone or with the addition of 1 ml of a 0.05 N solution of orthophosphoric acid, or radioactive material giving 0.1 or 0.5 Ci P32/ml. The larvae were then transferred to fresh water and provided with food. For observations on light responses, which were carried out in a darkened room, a 18-in. cylinder was used, a trap funnel being fixed in an upright position about half-way up. The bottom of the funnel was closed or opened by a stopper operated by a string that passed through a drain plug at the base of the cylinder. The cylinder, which was lit initially from below, was filled with water and the funnel was closed. Larvae were placed in the top, and when they had settled, the funnel was opened and the bottom light was turned on. After a few seconds' pause, a top light was turned on for 20 sec, after which the funnel was immediately closed. The larvae in the top and bottom parts of the cylinder were counted separately, and their radioactivity was determined. No differences in the level of radioactivity were detected between these larvae in the top section and those in the bottom. However, the average percentage of larvae in the top were 24.9 and 26 for those that had been kept in water and in the non-radioactive orthophosphoric acid solution respectively, as compared with 43.6 and 61 for those exposed to 0.1 and 0.5 Ci P32/ml, indicating that these concentrations of radioactive phosphorus affected the light response of the Aedes larvae. (From Strayer et al., 1979, ref. 171)

See also

3 Application of radioactive isotopes to the investigation of methods for the biological control of pests. 31 Tests on marking larvae of C. capitata with P32. (Amos, M., 1986)
15 The elimination and differentiation of chromosomes in the germ line of Drosophila. (Biebel, S.M., et al., 1986)
74 A study of the retention and mutagenic mode of action of radioactive phosphorus in Drosophila melanogaster. (Coffman, F., 1980)
75 Some aspects of transition states in Drosophila. (Coffman, F., et al., 1987)
299 Genetic and radiocraphic evidence for a DNA-containing body in the cytoplasm of the adult tissues of Drosophila melanogaster. (Kaplan, W.D., et al., 1987)
533 Flights range, length of gonotrophic cycle, and longevity of P32-labelled Aedes aegypti, mysimonea. (Quinault, M.S., et al., 1986)
1.2. INSECT PHYSIOLOGY AND BIOCHEMISTRY

1.2.1. General Articles, Surveys


Numerous applications of radioisotopes in biological and medical problems of the tropics are reviewed. In tropical medicine four phenomena appear repeatedly in varied combinations: infection, diseases, nutrition and assimilation. Infection and malnutrition interact particularly closely. Radioisotope techniques have proved invaluable in studies of every aspect of water and electrolyte physiology, the most useful methods so far being based on the dilution principle. \(^{32}P, \^{14}C, \^{58}S\), and \(^{38}S\) (used as a chloride substitute) and dermoporphyrin \(^{58}S\) are the isotopes most often employed in such studies. Radioisotopes such as \(^{32}P, \^{58}S, \^{14}C, \^{14}N\), and vitamin \(^{38}S\), labelled with \(^{38}S\), have proved useful in the analysis and separation of conditions that exist in South-East Asia. These isotopes facilitate the study of haemolysis by providing estimates of the life span of red cells and the pattern and sites of their destruction. A table shows the various isotopes that have been incorporated into insects. These are most often used for ecological investigations are the \(\Phi\) and \(\Phi^\star\) forms. Tracer techniques and insect biochemistry are also discussed. Whereby the use of radioactively labelled insects enables their metabolic fate in insects to be followed with great sensitivity and specificity, and allowing much light on the mechanism of insect resistance. (NSA 149, 1369)
The use of labelling techniques to determine the relation between plant, plant pests, and environment to ensure a more effective use of pesticides is discussed. The use of heavy metals as a killing sterilizing plant pests is also discussed. Pest sterilization is considered in some detail with the discussion of the modification of the sterilization by endo- and exogenous factors, and a report of the results obtained in sterilization studies is given. The desirability of applying the method to some pests in Germany is pointed out.


This review article is broken down into sections on phosphate acceptor and substrate control of respiration in isolated mitochondria (dealing with succinates and their inhibition, energy requirements of insect flight, regulation of energy trapping pathways in flight muscles, oxidative phosphorylation and respiratory control, endogenous uncoupling or controlling agents, o-glycero phosphatase and respiratory control during flight, and biological factors influencing energetics of mitochondria); the regulation of enzyme levels (constitutive enzymes, oxidative enzymes in silkworm development, and enzymes of hatching reactions); control of the citric acid cycle (the biochemistry of insect hormones and of giant chromosomes, chromosomal puffing and its relation to development and to synthetic processes in the islet, endocrine and DNA synthesis, and chromosomal puff and transport); and the kinetics of protein synthesis and development (ion control during development, and protein synthesis regulated by ion concentrations). An extensive bibliography is attached. Radioisotopes were used in a large number of studies, particularly those dealing with puffing phenomena.


A review of the understanding of nutritional requirements, e.g., the chemical factors of ingested food essential for normal metabolism and development of the insect and the insight into insect metabolism arising from nutritional research. Trace elements are carried out in some of the studies reviewed, using 3H-labelled compounds. (8)

Kansa, A. RADIOISOTOPES IN ENTOMOLOGY, 1962. 4th Edn. Eng. (1964) 77-85. (In English)

This paper is mainly based on the author's lecture notes for the International Training Course in Radioisotopes in Agriculture, Jointly sponsored by the I.A.E.A. and the Atomic Energy Commission of the Republic of Turkey, Ankara, Oct. 2 - Nov. 25, 1962. (See also H/1975)


A review with 154 references.

See also

1538 Role of atomic energy in insect study and control. (Haque, H., 1982)

1.2.2. Elements, Ions. Inorganic Salts

Aldley, D.J. THE EFFECTS OF STRONTIUM AND OTHER DIVALENT CATIONS ON POTASSIUM CONTRACTION IN A LOCUST LEG MUSCLE. J. Physiol. Lond. 77 (1950) 108-111.

It was previously established that Ca ions are necessary for the production of K-induced contractions in the mesothoracic extensor tibiae muscle of the locust Schistocerca gregaria, and present experiments investigated whether other divalent cations would substitute for Ca in this reaction. Jorgensen's solutions containing these abnormal cations were made by substitution of the cations for Ca, and contractions were produced by perfusion of the muscle with a solution containing 164 mM KCl and 10 mM D-glucose. Addition of salts of Sr, Co, and Ni to Ca-depleted muscle in KCl solution caused a brief submaximal contraction. Salts of Mg, Ba, and Hg did not produce contraction under these conditions. After perfusion of a Ca-depleted muscle solution caused a phasic condition of Ca ions in the absence of a non-contracting muscle Ca from some site at a rate of 0.25 ml/ml in experiments-containing saline in their effects on a film between Ca and Sr than in normal saline, causing the contraction and interval of the salt between muscle of the 10 measurement Ca ions and the ab is far from being an a


A variety of studies in a 40's measure of mg of temperature on stimuli decreased by one-half in for leaf beetles (Chironomus).

Cavallaro, R. CHINO, U INSETTI FITOFOGLIOLO of phytophagous holome summary, Presented at 1985. A

The fate of fr, fr, fr, phagophagous insects Thaumetopoea (Thy insects) were labelled with 14C by followed by Ca and Sr, the radioisotopes. Upt. failed to be reached, with fr, fr, fr, fr, and Sr more at all life stages, a more n. concentration in the exists Biological half-life decay.


Insects were labelled at the feeding on labelled sprouts or Ca, and slowed for Sr, biological half-life of th compared with those reports was observed, fiti mobile. It was found in biological half-life value depending on the various
of a Ca-depleted muscle with a Ca-free Ringer's solution containing 4 mM CaCl₂. Perfusion with KCl solution causes a phase contraction which may reach 85% of the max, tension produced under normal conditions of Ca ion concentration. Successive responses to depolarization in the presence of Sr ions decline to the absence of Ca ions. It is concluded that Ca is prohibitively important in excitation-contraction coupling in this muscle, and that for other substrate solutions by displacing Ca from some site at which it is bound in the muscle. The comparative physiology of Sr ion action in excitation-contraction coupling is discussed. In the frog heart, Sr and Ba salts are similar to Ca salts in their effects on contractility, and S³⁺ can be used as a tracer for Ca. There is some competition between Ca and Sr ions, and higher tensions are produced in Ca-free Ringer containing Sr ion less than in normal Ringer solution. At low Ca²⁺ concentrations, the presence of Sr ions causes an increase in the contraction of cut papillary muscle which was associated with a lengthening of the R-T interval of the electrocardiogram. Sr and Ba ions can substitute for Ca to some extent in the uterine muscle of the rat, but the muscle appears to distinguish Ca from Sr in that after a brief exposure to Ca ions the ability to produce contracture persists for some time, whereas this does not occur after a similar exposure to Sr ions. There are many differences between the actions of Sr and Ca ions on vertebrate muscles, but these differences are fewer than are seen in locust muscles, where Sr is far from being an adequate substitute for Ca. (NSA 116 1985, 23783)


A variety of studies is discussed. The use of biological elimination of radioiodinated insecticides is an indirect measure of metabolism under field conditions was combined with estimates of the influence of temperature on consumption. In geometric patterns on the biological half-life of ¹³¹I was decreased by one-half for a 10°C rise in temperature. Similar temperature-related trends were found for leaf beetles (Chrysomela rastata) and meliphas (Aphidius graminis).


The fate of ⁶⁰⁹⁹Ca, ¹³¹I, ²⁴⁴c, and ³²P was studied in various stages of the life cycle of some species of phytophagous insects belonging to the families of Nectaridi (Gonia cupreus Schiff, and others), Thaumetopoeidae (Thaumetopoea pityocampa Schiff, and Scarabaeidae (Melolontha melolontha L.). Insects were labelled by feeding on labelled plants or solutions. Insects were transplanted most rapidly, followed by C₅ and C₆. Data are given on the accumulation, elimination, and biological half-life of the radioisotopes. Uptake was regular in Thaumetopoea and Scarabaeidae, although equilibrium was not reached, whereas it was very irregular in the Nectaridae. ¹³¹I accumulated more rapidly than ⁶⁰⁹⁹Ca, and ²⁴⁴c more rapidly than ³²P. Elimination curves were always regular and demonstrated, for all life stages, a more rapid loss of ⁶⁰⁹⁹Ca, followed by ³²P and then ²⁴⁴c. ¹³¹I was found in large concentrations in the exuviae which indicates preferential utilization of the element in the cuticle. Biological half-life data varied greatly with species and stage in the life cycle.


Insects were labelled either by ingestion of a sugar solution to which radioisotopes had been added or by feeding on labelled plants. Transection in the plant was found to be greatest for I, least for Ca, and lowest for Sr. A table was presented giving accumulation, elimination rates and the average biological half-life of the various isotopes in the insect species under consideration. The values were compared with those reported for other insect species. ¹³¹I accumulates faster than ⁶⁰⁹⁹Ca or ³²P. No equilibrium was observed. Elimination was more rapid for ³²P, followed by ⁶⁰⁹⁹Ca and ¹³¹I. Insects proved most mobile. It was found in large quantities in the exuviae. In its apparent utilization in the cuticle, ²⁴⁴c biological half-life values were found for the three radioisotopes 10 each for Sr and Ca and 4 for I, depending on the various stages of the life cycle.

Several species of Lepidoptera, Coleoptera, Hymenoptera, Orthoptera, and Hemiptera were examined. Included were adult and larval stages of various insects, including bees, ants, and wasps. The insects were labeled with radioactive isotopes and their accumulations were studied. The data were presented in a tabular form with the results showing the accumulation of radioactivity in different tissues of the insects. The conclusions drawn were that the accumulation of radioactivity varied with the species and the stage of development.


The movement of $^{60}$Co, $^{137}$Cs, and $^{144}$Ce has been studied in various species of insects, including the families of Lepidoptera, Coleoptera, Hymenoptera, Orthoptera, and Hemiptera. The results showed that the accumulation of radioactivity varied with the species and the stage of development. The elimination of radioactivity was also studied, and it was found that the rate of elimination was higher in adult insects than in the larval stages. The conclusions drawn were that the accumulation of radioactivity was influenced by the species and the stage of development.


The distribution of $^{85}$Sr, $^{137}$Cs, and $^{144}$Ce was investigated in larvae of 12 species of insects belonging to the following families: Lepidoptera, Coleoptera, Hymenoptera, Orthoptera, and Hemiptera. The results showed that the distribution of radioactivity varied with the species and the stage of development. The conclusions drawn were that the distribution of radioactivity was influenced by the species and the stage of development.


The distribution of $^{85}$Sr, $^{137}$Cs, and $^{144}$Ce was investigated in larvae of 12 species of insects belonging to the following families: Lepidoptera, Coleoptera, Hymenoptera, Orthoptera, and Hemiptera. The results showed that the distribution of radioactivity varied with the species and the stage of development. The conclusions drawn were that the distribution of radioactivity was influenced by the species and the stage of development.

55 Cavallero, R. DATA O AND $^{137}$Ce IN VARIOUS SPECIES OF INSECTS. (Sedimentary data on various species of insects.) Sedo 50 (1967) 387-390.

The distribution of $^{85}$Sr, $^{137}$Cs, and $^{144}$Ce was investigated in larvae of 12 species of insects belonging to the following families: Lepidoptera, Coleoptera, Hymenoptera, Orthoptera, and Hemiptera. The results showed that the distribution of radioactivity varied with the species and the stage of development. The conclusions drawn were that the distribution of radioactivity was influenced by the species and the stage of development.


The relationship between hydrolysis, FC 4, 1, 12, and the giant water bug Lethocerus and the bumble bee amount in the ratio of 5.5X $^{137}$Cs was investigated. The results showed that the bumble bee amount in the ratio of 5.5X $^{137}$Cs was present in the margin, which is the amount of radioactivity that is transferred to the material. The conclusions drawn were that the distribution of radioactivity was influenced by the species and the stage of development.

Tabulated data are presented on: (1) the biological half-life of the above isotopes in larvae and adults of various insect species, belonging to Leptopodidae (Notoctidae and Thematoepodidae) and Coleoptera (Scarabaeoidea); (2) the distribution of the radionuclides in last-instar larvae of Sesamia averina Schiff and Thematoepodinae Schuh following ingestion of labelled food; (3) the turnover of $^{60}$Sr in various last-instar larvae after ingestion of labelled food; (4) of $^{137}$Cs; and (5) of $^{134}$Cs, the distribution of $^{60}$Sr, $^{137}$Cs and $^{134}$Cs in adults of Hemimetopoda nithidulidae Scop. and Tephritidae procura L, following ingestion of labelled food; (6) distribution of $^{60}$Sr in various adult insects after ingestion of labelled food; (7) of $^{137}$Cs; (8) and of $^{134}$Cs. Graphs are given of: (1) the body burden of $^{60}$Sr and $^{137}$Cs in last-instar larvae of $S$. averina and $T$. procura, feeding on labelled plant leaves, as a function of time; (2) daily uptake of $^{60}$Sr and $^{137}$Cs by last-instar larvae feeding on labelled plant leaves. Daily uptake = rate increase in body activity + activity of liquid and solid excreta produced over 24h; (3) specific activity of $^{60}$Sr and $^{137}$Cs in solid excreta of last-instar larvae feeding on labelled food; and (4) loss curves of $^{60}$Sr, $^{137}$Cs and $^{134}$Cs in last-instar larvae and adults after ingestion of labelled food.


The relationship between fibre length and the Ca$^{++}$-activated ATPase (adenosine triphosphate phosphohydrolase, EC 3.6.1.3) of insect flight muscle was studied on the dorsal longitudinal muscles of the plant huts Lethocerus campestris and Helocerus campestris, the beetle Amphimallon solstitialis and the bumble bee, Bombus hortorum. Fibre bundles which had been stretched by the required amount in the relaxing solution were immediately transferred to an activating solution containing 3.5X 10$^{-5}$ M Ca$^{++}$, and allowed to equilibrate. Stabilized Ca$^{++}$ concentrations were obtained by adding CaCl$_2$ to the activating solution. The amount of bound Ca$^{++}$ was determined, special care being taken to exclude unlabelled Ca$^{++}$ present in the reagents used in the Ca$^{++}$-binding studies. Low levels of Ca$^{++}$ and small degrees of fibre extension have been found to increase the ATPase activity. Either factor influences the sensitivity of the material to the other factor. In insect fibrillar muscle, where the A filaments are continuous with the Z lines, it is possible to stain the A fibrillar directly in the absence of permanent A-fibrillar interactions. The higher ATPase activity as a result of fibre elongation is accompanied by an increase in Ca$^{++}$ binding. The relevance of the findings to the mechanism of muscular contraction and fibrillar muscle is discussed.


The uptake, assimilation and loss of Ca by Hyphantria cunea (Druy) was studied after allowing them to feed on poison haws which had been labelled by injecting 1 ml of 45Ca into the trunk. Values for biological half lives from last-instar larvae were determined under varying experimental conditions, and proved extremely variable. The assimilation rates were determined by micro-bomb calorimetry of leaves and faeces. It proved to be very low, with a fairly rapid flux of assimilated isotope (12% of for the fed larvae).


$^{35}$S was introduced as carrier free phosphorus in the chemical form of orthophosphoric acid. It was administered by trunk implantation, the immersion of roots and application to the soil. Radioactive assay showed that the distribution of activity in the trunk and branches was influenced by the location of the holes of implantation and of the roots engaged in absorbing the active material. There was
little lateral movement in the conducting vessels of the tree so that only those branches which originated near the path of translocation took up 3P. It would appear that the most uniform distribution of activity in the trees is obtained after application to the soil. The distributions and levels of activity in the branches are considered in relation to the suitability of these techniques for labelling the feeding vectors, Pseudococcus phylloxera L., of cacao vines at their feeding sites in the field. No activity could be detected in the immature stages. Considerably higher levels of activity than those employed in the present work are required in the branches before such insects can be used in ecological studies. Aphis, Cerastoderma striolata Bern. attending the mealybugs on these trees gave counts two or three times higher than those obtained from adult P. phylloxera. The results are of further interest in relation to other fields of cacao research, involving the application of systemic insecticides, the uptake of nutrients and the effect of shade.


66 Harvey, W.R., Hollow THE ISOLATED MEDI 75-765.

67 The lumen of an isolated contribut to but do not 30 times greater than 1 circuit current increases active K transport even with or without Na. (c)

68 Harvey, W.R., stacked CONSUMPTION IN CH 238-242.

Flux measurements will circuit current in current port is strongly depolarized potential on the human transport were to be an X would have to be & transport to G-particles. when the mucus is bat The ratio must be small. f max. value. (c) There is a close dependency tests with K-traspon K-transport does not, systems. (Author.)

69 Hskell, J.A., Clemens INHIBITORS, STIMULI

Harvey and Negev guard Cercopis silvina, with chemical potential with th carries 85% of the curre other data dominate midge equilibrium. R-chemical on this Na-


The lumen of an isolated larval midgut is 64 mV positive to the blood side. K diffusion potentials contribute to this but do not account for the trans-midgut potential. The K flux toward the lumen is 38 times greater than predicted from the electrochemical potential. At least 3% of the short-circuit current is carried by K moving towards the lumen. Apparently, Na plays no role in this active K transport since similar potential differences, short-circuit currents, and K fluxes are obtained with or without Na. (Auth., summary)


flux measurements with 4K reveal that in the isolated midgut of H. cecropia 90 to 100% of the short-circuit current is carried by the active transport of K from the blood side to the lumen, when K transport is strongly depressed, either by withholding K from the blood side or by imposing a large positive potential on the lumen, the O-uptake of the isolated gut remains virtually unchanged. If K transport were to be increased by the negligible increase in oxygen uptake about 40 g-equivalent of K would have to be transported for every g-equivalent of oxygen taken up. This ratio of K transport to O-uptake is thermodynamically impossible. The ratio of K-transport to total O consumed when the midgut is bathed with 30 mM K on both sides is about 1.3 at temperatures of 25 and 35°C. The ratio must be smaller at lower K concentrations and is 2.0 at 70.5 mM K, which may be approaching the max. value. Although the O-uptake is independent of the K-transport, the reverse is not true. There is a close dependency of K-transport on oxygen consumption. K-transport by the midgut contrasts with Na-transport by the fly skin because Na-transport stimulates oxidative metabolism whereas K-transport does not. Evidently the coupling of transport to energy supply is different in the two systems. (Auth.)


Harvey and Nedergaard (see ref. 64) have shown the midguts isolated from mature larvae of the Cecropia silkworm, when perfused in aerated, agitated physiological solution, exhibit a large electrical potential with the lumen-side positive to the blood-side. Isotope studies show that potassium carries 85% of the current generated by the midgut when the potential is short-circuited. These and other data demonstrate that potassium is actively transported from blood-side to lumen-side of the midgut epithelium. Neither the potential nor the current requires sodium. The effects of various chemicals on this Na-independent active transport of K were examined. The short-circuit current

**K**


Young Bacon, bactericidal females were fed a single meal from a mixture containing 100 µCi of carrier-free **90** and **0.1 µCi** of **24**. The radioactivity of each of a sample of 21 wasps was determined daily until death, using a conventional scintillation, well counter connected to an integrating decay scaler. The eggs deposited were collected daily and hatchability determined after 80 h. From other samples, the radioactivity for the whole body, for the anterior and posterior portions transsected at the pedicle, the gut, the fat body with statel, and the genital system obtained by dissection was determined (usually three counts/specimen). The average life span of wasps fed **24** compared well with controls (25, 25, 10, 10 against 25, 25, 10, 10). The effective half-life was attained by the 2nd-d following a **24**-meal. During this period most of **24** was abdominal, falling from 80% in the 1st d to 90% at the end of the 2nd-d. Even after 20 d, 80% of the **24**-curveted was abdominal. The level of the gut and its contents paralleled that of the abdomen. Neither ovaries nor eggs became appreciably radioactive. Hatchability was low only on the 1st-d (20%), rising to 90% on the 2nd-d. Investigations of the bioaccumulation of isotope of the transition elements appear essential for an understanding of potential environmental hazards.
was rapidly and reversibly inhibited by amoxicillin and 3,4-dimethoxyphenol. An irreversible inhibition was effected by salicylate. No observable change was produced by cholinesterase inhibitors, adrenalin, pituitary hormone or small changes in pH. Oxybenz, a cyclic glycoside which is thought to be a specific inhibitor of sodium transport, was without effect at concentrations as high as 10^{-4} M. Barley affected by 5% CO_{2}, the current was strongly and reversibly depressed by 2% CO_{2}. The carnitine anion was used as a blocking agent at 10^{-4} M was without effect, but the related sulfamide carbamide caused 50% inhibition at this concentration. The sulfanilamides are barely soluble in water and perhaps penetrate the mitochondrial cell wall with difficulty. Another type of carnitine anion was used as a blocking agent at 10^{-4} M and 87% at 10^{-3} M respectively. Clearly the K transporting system of Hydrilla was important from Na systems, and possibly employs a K, Na-linked pump. (Anh.)


In a preliminary study to investigate the pathways of insecticide (distribution, concentration, translocation) in the house beetle, _Phyllophaga_ was injected orally. After an (t) interval assumed sufficient for distribution -60% of the injected 181 was found in the thorax rather than in the abdomen as expected.


It was observed that 32 out of the 30 dissected males, _Lepisma saccharina_ (Maal), contained larval stages of Chironomus (Parachironomus) varius in the muscular cavity. The Ca concentration at the intersection of the union canal, where they were found was 56 ppm Ca and the pH was 7.4. The radioactivity was expressed as an Accumulation Factor (AF), based on the fresh weight of the organism.

\[
AF = \frac{\text{radioactive} - \text{in} \times \text{microcuries}}{\text{weight of insect} \times \text{volume of liquid taken}}
\]

The larvae concentrated ^3H(-^3H) and since these larvae form the diet of other aquatic organisms there is a possibility of further contamination in the food chain. Since ^3H has a half-life of 82 y it would have a long-term effect on other organisms, with possible genetic effects.


Beetles were fed labelled Na^4P and the thorax muscle examined for ^4P uptake. Approximately 70% of the activity was found in the A-band of the fiber, 7% in the Z-band, and the remainder in the I-band. (CA 1967, 67, 10289)


Adult cockroaches were selected with carrier-free NaCl, NaCl, NaCl, and NaCl in aqueous solutions and 18Cl in HCl between the 3rd and 4th-compartments of the abdomen. The radioactivity was measured at regular intervals in the hemolymph collected from the antennae and femora of each insect. In general, the femoral hemolymph was richer in inorganic cations and protein in solution than the antennal hemolymph. The concentrations of Na^14, Cl^14, Ca^14, and Mg^14 in the antennal and femoral hemolymph, while the concentration of K^14 was the same in the 2 hemolymphs. The antennal hemolymph had larger amounts of Na^14 and I^-14 and lower amounts of Ca^14, Mg^14, and K^14 than the femoral hemolymph. The internal radiation had no effect on the relative ion distribution in the antennal and femoral hemolymphs, even when heavy doses, i.e. up to 1000 uCi of the isotope was administered to each insect. (CA 1967, 67, 3194a)

71. Lenzl, M., Krueger, R. AUFNABME DER **Na** IN DIE ZELLEN DER SPEICHERBLÄTTER VON CHIRONOMUS THUMERI. **(1) Uptake of Na into cell nuclei of salivary glands of Chironomus thumeri;** Z. Naturf. 23B, 9 (1968), 776-81 (in German with English abstract).

The in vivo and in vitro uptake of Na from the hemolymph into cell nuclei of larval salivary glands was measured and compared. The uptake of Na in vivo follows approximately a saturation curve. The respective is followed by an interval the 5th-6th day increases nuclei in vivo at 60 min of puffs in polytene chromosomes.

82. Lenzl, M. SPEZIFISCHER ISOLETTEN ZELLEINNERN DER CHIRONOMUS THUMERI ZELLEINNERN DER CHIRONOMUS THUMERI (English abstract).

Na^23 reduces in isolated one half the ring, where enlargement is a sign of on the structure and from Mg-differentially taken.

73. Moser, E.C. EDETEAL at the "American Baltic" Measurements of radiocarbon as part of a radiostation lysotidae (Lysotidae canariensis and Planteliae virginianum) radioactivity turnover at half-rivers for 14C and 23Na. 23Na showed an increase in biological half-lives on bi-weekly collection stations in the crust and blanks in the field, resp. is to be calculated the

74. Oehdahl, P. A STUDY OF ACTIVE PHOSPHORUS I. The genetic effects of a standard medium when obtained on the gas pla mutagenesis: effective open

75. Oehdahl, P., Kaplan, I. Logical Effects of Decay

76. Patterson, R.S., Smith, E. SYSTEM OF CULES AND "New York Meeting of 1977". 4th-instar larval larva accumulate enough radionecrosis. The radi

77. Rhonwo, G., ROAC FIELMD. Final Rep. A 5 yr study of the acca ecosystems of the Geog was investigated by acca. Attempts were made to plants, water-flow three
irreversible inhibition
immediate inhibition, advanced, which is thought to be a
as high as 30 ^M. Baryly
145 CO_{2}. The carboxic an-
ionate sodium carbonate caused 39% color, sodium sulfite, caused
least the K transporting
and possibly employs

ine, N. SPECIFISCHES AKTIVITÄTS-ABERGANG DES BAHLSCHIMMELS DURCH Mg^{2+} IN ISOLIERTEN ZELLEN VON Chironomus. (Specific activity increase in a Bahlis ring in isolated cell nuclei of Chironomus by means of Mg^{2+}). *Chironomus* 21, 1 (1967) 109-122. (In German, with English abstract)


Measurements of radionuclide turnover and oxygen consumption were made on ^14CO_{2} tagged spiders as part of a radiotracer study to measure the energy balance of forest floor spider populations. Various lycomorphs (Lycomorpha pustulata, Pardosa sp., and Schistocampa sp.) and mites (Gamasus stamineus and Desmatoplectron americanum) were used in the experiment. A body size relationship occurred between radionuclide turnover and oxygen consumption, with larger individuals tending to have lower daily biological half-lives of ^14C and lower O_{2} consumption rates. Measurements made at three times (10, 20, and 30°C) showed an increase in metabolic activity with higher temperatures, reflected by shorter mean biological half-lives and higher mean respiratory rates. Number and biomass estimates, obtained by bi-weekly collections of 0.1 m_{2} and 0.25 m_{2} litter samples, indicate the importance of spiders as predators in the forest floor community. Data on radioactivity elimination rates and equilibrium values in the field, respiratory rates, number and biomass estimates, and caloric equivalents will be used to calculate the energy budget for this major group of forest floor predators. (Abstr.)


The genetic effects of ^32P on different strains of D. melanogaster were examined. ^32P was added to standard medium when raising males. Only few experiments were conducted with ^32P. Some data were obtained on the prior used by ^32P and ^32P in metabolism, their incorporation into sperm, and their mutagenic effects, especially in the rate of induction of lethals.


4th-instar male larvae of Coleoptrae sp. were exposed to ^32P at the rate of 0.95 cP/milliliter for 48 h. ^32P was administered in a total dose of ^32P to the flies to accumulate enough radioactivity to prove that they can transfer a detectable amount to females during insemination. The radioactivity is found in both the sperm and the accessory gland fluid. (Abstr.)


A 5 yr study of the accumulation of radionuclides by plants and animals inhabiting the granite outcrop ecosystems of the Georgia Piedmont was conducted beginning in 1961. Natural and fallout radionuclides were investigated by assaying the granitic, soils, plants, insects, and animals for quantities of radioisotopes. Attempts were made to explain actions and interactions between various radioisotopes, soils, plants, water flow through communities and concentrations within components of the respective
ecosystems, $^{137}$Cs, $^{55}$Fe, and $^{34}$Cl concentrations were of the greatest interest and data on their uptake by plants, insects, and deer are detailed. (NRA 912, 1977, 1976)


81 The uptake of $^{90}$Sr as a function of time per unit dry weight of A. vexans (Metz) larvae has been studied. There was a significant uptake of $^{90}$Sr by larval IV larvae up to 24 h, although the rate of uptake was very rapid during the first 24 h. There was little, but measurable, transfer of radioactivity from radioactive males during induced copulation. The radioactive females deposited appreciable radioactivity with the eggs. (Auth.)


83 The entire behaviour of Thorodes cynoscerciformis was employed as a model for the uptake and fate of $^{137}$Cs during transformation in insect populations feeding upon contaminated vegetation. Feeding larval females were killed and injected with artificial adults in natural nectar or sugar water containing $^{137}$Cs. The data suggested that in the larval stage, 97.8% of the total activity was transferred to eggs, with a 9.9% loss to the host and 6.2% remaining in the host and the host and 9.9% remaining in the host and the host.


85 Measurements of nutrient assimilation by animals from dietary inputs were often based on analyses of chemical contents of food and faeces. Assimilation measurements based upon faecal compositions, however, are biased by the organism's turnover of materials through normal excretory and secretory processes. Development of radiotrace methodology provides means for estimating nutrient absorption from food. Animals fed upon radiotrace tagged food acquire body burdens of isotopes (Q) which decrease at $0.01^{-1}$. For many organisms, the turnover rate of isotopes (Q) consists of two-component systems with two interacting rate constants ($k_1$ and $k_2$). The coefficient $k_2$ represents turnover of non-assimilated isotopes in food in the gut, and $k_1$ the turnover of assimilated isotopes in body tissues. Graphical analyses of retention curves and separation of rate coefficients, permit estimation of percent of whole-body radioactivity (Q) lost at each rate. For single feedings of isotopes, these parameters may be related to the rate of catabolism of Q. As the animal assimilates and $k_2$, under these conditions, are equivalent. (Abstr.)


88 Measurements of fluxes were carried out on chloride influx alone, chloride efflux alone, simultaneous measurement of sodium and chloride influx, and simultaneous efflux of sodium and chloride. Instead of the short-term $13$h, the isotopes $^{36}$Cl and $^{85}$Cl were used (see III/62 for details of method). The axial papillae of the aquatic larvae of A. aegypti are responsible for 99% of the steady-state exchange of chloride. The relationships between chloride influx and efflux and external chloride concentration are approximately described by the Michaelis equation. There is net uptake of chloride, independent of uptake of sodium, from $^{35}$Cl and $^{36}$Cl, probably in exchange for $^{35}$Cl or $^{36}$Cl, but the rate is much slower than from $^{36}$Cl. The following ions stimulate influx of chloride from 0.1 meq/l.

89 $^{35}$Cl $^{13}$HCO$_3$ $^{34}$Cl $^{34}$NO$_3$ $^{34}$SO$_4$ $^{34}$NO$_2$ $^{34}$S. The following ions inhibit influx: $^{35}$Cl $^{36}$Cl $^{36}$SO$_4$ $^{36}$NO$_3$ $^{36}$NO$_2$ $^{36}$S. Movements of sodium and chloride ions are explicable in terms of an anion and a cation carrier located in an osmotic barrier in the papillae, the carriers being functionally coupled to sodium and chloride ions located at the inner surface of the barrier. Studies of the papillae., Tirodrias dosensckiy COCCI SWEETWATER HYDRA

90 The effects of EDTA on $^{35}$Cl, $^{36}$Ca, and $^{34}$Co. Lemma minor: Claro et al. 5-left cages with radiocarbon in cocaine taken after 1, 2, 3, 4, 5, 6, 7, and 8 weeks (in plants, leeches, mosquitoes), decreased and Ga. All four kinds of results, with negligible d

91 Toprakci, A., Önis MAHJAN,トルテン. TO TÖ

92 A hodulipus was develop the willow aphid, Pissodes species with increasing lipophylic similar to that of valeric acid, into the American cockroaches lipophylic aphid. The index of $\beta$ smaller than index from the case of the cooing size, with respect to organic ions in the aphid alone and in the Zimmerman pathway into the apl compounds. These are especially of large, pol

93 Theodor, T.L. THE E OF TWO INSECT SPECIES 355-362.

94 The intracellular efflux medium. With Periplan 3.9x10$^{-6}$ see to 1.1 (uncoupling of the energy) the sodium efflux from of this cation is effective to maintain the insect two of a rather leaky part of the total flux, relatd to the combinined e membrane. (Auth.)

95 The effect of the ions of the incorporation of (Morrin, O.N.,

96 The effect of the ions of the incorporation of (Morrin, O.N.,
surface of the barrier. An attempt is made to relate these findings to recent electron microscopical studies of the papillae.


The effects of EDTA on the coefficients of accumulation of Fe, Cu, Zn, Mn, Zn, Cr, Sr, and Cs by the sweet-water plants, Elodea canadensis, Ceratophyllum demersum, Lemna minor, Chara fragilis, and leaves. Water samples were taken from 3-, 6-, and 16-hour water samples. The results showed that EDTA decreased the uptake of these elements by the plants.


A technique was developed to study the permeability of organic ions into the ganglia of the willow aphid. Uptake of 14C-labeled organic ions into the ganglia was studied, and it was found that uptake varied with the concentration of the ion.


The extracellular efflux of Na+ from the nerve cord is reduced by the presence of oxalate in the bathing medium. With Periplaneta 10^{-5} M oxalate caused a reduction in the rate constant for sodium efflux from 5.04 x 10^{-6} sec^{-1} to 1.50 x 10^{-7} sec^{-1} and in Carausius from 1.94 x 10^{-7} sec^{-1} to 3.48 x 10^{-8} sec^{-1}.

See also:

205 The effect of different ions on the incorporation of (1-14C) valine into fat body protein of the larva of the blowfly, Calliphora erythrocephala. (Price, O.M., 1956).

314 Incorporation of radioactive uridine into the RNA of the lepidopteran, Bupalus piniarius. (Morrison, O.H., 1960).
1.2.3. Carbohydrates.

Glucose 1-phosphate (G) was injected into 5th-instar silkworm (Bombyx mori) larvae, which were either well fed or poorly fed. Adipose tissue and hemolymph analysis 48 hr later showed that fat body glycogen (H) synthesis proceeded more rapidly in the poorly fed larvae. It was used principally for haemolymph trehalose (III) synthesis: the turnover of haemolymph was similar during both nutritional states. Adipose tissue II and III were poorly labelled with 6-2H, 6-2H2 and 6-2H3 incorporation respectively, compared with 22-15% radioactivity incorporation in haemolymph III. III could probably be synthesized from pyruvate in locations other than the fat body, and the biosynthetic III pathway does not necessarily pass through H. H and II synthesis, and II hydrolysis could be controlled, directly or indirectly, by the variation of the haemolymph III levels. When haemolymph III level was increased, as in well-fed larvae, II synthesis occurred, whereas during malnutrition, when III levels decreased, H was synthesized.
Three levels of mesquite forest systems of the Agaves and the forest arthropods. Biological investigations using d'insecte orthoptère.


This review is broken down into sections on the degradation of poly saccharides and oligosaccharides to monosaccharides (subdivided into carbohydrates, transfatty acids, and polyphosphates); the synthesis of poly saccharides and oligosaccharides from monosaccharides (particularly the synthesis of glycogen and trehalose); the fermentation and oxidation of carbohydrates (subdivided into glycolysis, the citric acid cycle, the electron transport system, oxidative phosphorylation, and the pentose phosphate cycle); the in vivo significance of metabolic routes in insects; and the regulation of metabolisms (in terms of enzyme and hormonal regulation). An extensive bibliography is attached containing numerous references to studies in which radiotracers had been used.


For Acetobacter subterraneus, fraction 1,6-diphosphate is hydrolyzed to fructose 6-phosphate in the presence of Mg$^{2+}$ and diphosphopyridine nucleotide (DPN). For chick, hog, or beef embryos, and also for successive developmental stages of Drosophila, the ratio of yields of $^{14}C_2$ from glucose-1-$^{14}C$ and from glucose-6-$^{14}C$ is initially high but decreases with increasing age. Control of pentose oxidation versus glycogen synthesis may lie in cell concentration of NADP or of 1 and Mg$^{2+}$.


D-glucose-$^{14}C$ (3.57 mCi/mmol) was used to prepare radioactive trehalose biologically. Cells of Lymantria monacha (Sphingidae: Saturniidae) in culture utilize trehalose at approximately the same rate as glucose. Sucrose uptake-$^{14}C$ was used at 22.8 mCi/mol and is not utilized during the first days of a new culture, and its subsequent utilization coincides with a fall in glucose concentration.


Les auteurs décrivent la purification de la trophalase extrait du muscle et étudient les propriétés de cette enzyme. En effectuant une hydrolyse de trehalose en présence de glucose marqué au $^{14}C$, les auteurs n'ont pu mettre en évidence aucune incorporation de glucose radiocétonique dans le trehalose. L'absence d'hydrolyse de dérivés substitués non-synthétiques du trehalose montre que les hydrolyses en position 3 et 6 des deux unités glucosyle du trehalose doivent être libres pour que l'action hydrolytique de l'enzyme se manifeste. De nombreux composés inhibiteurs du métabolisme glucidique sont dépourvus de pouvoir inhibiteur, et cette trophalase est dépourvue d'activité transférante.
EL HUFUDD, M., JAMIESON, C. METABOLISME DU TREDHARDE ET DU GLYCOGENE CHEZ LE VER 4 SOEUR, EN RELATION AVEC LA MORT, LE TRELAGE ET LES METAMORPHSES. BULL. ACAD. L. BAYON, CH. SCI., 83, 5 (1964) 541-556. (With English summary)

The principal circulating form of starchy cellular fuel in the silkworm is trehalose. The enzyme trehalase, in the haemolymph, is normally inhibited. Inhibition is only reversed during molting, causing a decrease in trehalose concentration and an increase in the amount of free glucose. The muscles and most other tissues, such as the digestive tract, are able to use blood trehalose, thanks to an intracellular trehalase. The epidermis and the silk glands are devoid of trehalase; they use the free glucose liberated by the hydrolysis of the haemolymph trehalose during the periods of molting and pupation. The role of the origin of the trehalase is discussed, in the light of recent experiments, in which the injection of radiocarbon from labelled precursor and glucose-1-phosphate into a fat body glycogen and haemolymph trehalose has been followed. The chain of events is synthesized at every molting process, partly at the expense of the glycogen liberated by the hydrolysis of the trehalose in the haemolymph. On the other hand, the old cuticle is destroyed by the proteolytic and chelatolytic enzymes of the exuvial fluid. The hydrolytic products, especially N-acetylglucosamine, are stored by the epidermis and can be used for the biosynthesis of the cuticle of the new cuticle. (Essentially auth. summary)

T-R-4-

FROSTON, J. M. DEVELOPMENTAL AND BIOCHEMICAL STUDIES ON THE MORPHOLOGICAL MUTANT CRYPTOCEPHAL OF Drosophila melanogaster. DIM. ABST. 81, 10 (1977) 3402-3 - 3403-b.

Studies have been conducted on the morphological mutant cryptoccephal of D. melanogaster in an attempt to elucidate the mechanism of action of the mutant gene and also to uncover possible mechanisms of repression of the cryptoccephal gene by other genes in the stock. The main developmental abnormality of the cryptoccephal mutant is that its head does not ossify at the time of pupation. It has been possible to demonstrate that the mutant has greater mechanical resistance to head emergence than the wild type. Experimental evidence indicates that the increased resistance to head emergence is produced by an increase in rigidity of the integument. It has been possible to show that the cryptoccephal mutant has more glucosamine (presumably chitin) in its integument at the time of pupation than the wild type. The increased content of glucosamine is presumed to be responsible for the increased rigidity of the integument. Biochemical evidence obtained from studies with glucose-1-C14 indicates that the rate of chitin synthesis is higher in the mutant than in the wild type. The synthesis of the cryptoccephal mutant produced by glucosamine was shown to have also an increased content of glucosamine in its integument at pupation and also has increased resistance to head emergence. The common feature found between the glucosamine-polymerization and the cryptoccephal mutant offer additional verification to the developmental model presented above for the action of the cryptoccephal gene. The modifiers in the cryptoccephal stock act by decreasing mechanical resistance to head emergence (and thus allow it) and by decreasing the excess content of glucosamine found in the cryptoccephal integument. Cryptoccephal stock
The octopry of the normal development stage is not followed by a follicle epibolism. During glycogen synthesis, amino acids decline. At the later development stage, glycogen synthesis is prominent. The glycogen granules are present in normal development.

COQUEL, CHEY LEVER.

Insecta, Acad. 7.

is trehalase. The only suppressed tissue is that of the amount of work, able to use the full glands are devoid of amyllophyll trehalase. The trehalase is disaccharide activity from amyllophyll trehalase forming process, partly at the amyllophyll. On the enzyme of the side resolved by the adenosine triphosphate. (Essentially, such an amino acid inotropic activity).

MORPHOLOGICAL

D. melanogaster is an to uncover possible methods. The main developments at the time of the structural resistance to head movement resistance to it has been possible to do its integrations at time it is presumed to be used obtained from the mutant than glycogenase was shown increment and also has been in the glucocerebrosidase. The developmental model of the cryptoplastic stem and by decreasing the stem to that of the cryptoplastic stem could be shown to exist the incorporation of free glucosamine. It is proposed that this resistance is one means by which the modifying genes decrease the content of glucosamine in the integument, and lower the mechanical resistance to head emergence. The relevance of the results to normal genetic activity during development and to the phenotype concept is discussed. (From DA)


The control of crop emptying in the blowfly, Phormia regina, was investigated by the technique of x-ray photography. Increasing the osmotic pressure of the solution in the crop shows crop emptying. This effect is independent of the nutritive value, stimulating power, and viscosity of the solution. Increasing the osmotic pressure of the blood also greatly slows crop emptying, but the osmotic pressure is the controlling factor. The effect of increased blood osmotic pressure in slowing crop emptying is independent of nervous or endocrine elements. The rate of absorption of sugar across the midgut wall was measured using HCl-labeled carbohydrates. Two in vitro midgut preparations were employed. No evidence for active transport was found.


The mucilaginous mass of various insects contains an enzyme capable of hydrolyzing trehalose. In several cockroaches and a grasshopper the enzyme activity of muscle homogenates is elevated several-fold repeated freezing and thawing, as previously shown for the Coccicola silkworm. With muscle of several flies, however, such treatment had no effect on trehalase activity. [1, 2, 3] Trehalase was prepared by injecting 50 μl of [14C] glucose (0.05 μCi/ml) into each of two mature larvae of Hyalophora cecropia and permitting incorporation for 6 h at 25°C. In the cockroach, B. discoidalis, trehalase activity is concentrated in a microsomal fraction prepared by centrifugation at 105,000 g. Glycoseidase activity is then specific for trehalose, it is inhibited strongly by sucrose and weakly by glucose and D-2-glucosamine. In Blabera muscle microsomal preparations, trehalase activity is enhanced as a result of treatment with several anionic, cationic, and non-ionic detergents, and by incubation with snake venom, as well as by freezing and thawing. Snake venom, either whole or briefly heated, gave the greatest activation (up to 10-fold). The activated enzyme exhibits maximal activity at pH 6.0; with untreated enzyme, this could not be determined precisely, but appears to be the same. The K_m for trehalose is 9.3 mM for untreated enzyme and 1.7 mM for activated enzyme. Of the detergents, only deoxycholate solubilizes the microsomal trehalase, and aggregation occurs on removal of the detergent. Snake venom yields trehalase in soluble form which gives single peaks on Sephadex G-75 columns and in sucrose gradient centrifugation. The apparent mol. wt from these methods is 50,000 and 63,000, respectively. It is suggested that this discrepancy may be due to bound lipid. B. discoidalis midgut tissue yields a distinct trehalase, which is entirely in the soluble fraction of homogenates and has pH optimum about 5.0 and K_m for trehalose 6.0 mM.


Horie, Y. PATHWAYS OF CARBOHYDRATE METABOLISM IN INSECTS AND ITS REGULATION. Scihiup Kaihoku 17, 2 (1950) 56-66.

A review. Radioisotopes were used in some of the studies cited. (4)

Original article not available.


The effect of ecdysone on the incorporation of 14C-glucose in house pupa (brain removed) of B. mori was examined. Incorporation was compared in pupa 12 h after injection of ecdysone or water. Cumulative recovery of 14CO2 from 14C-glucose was much the same in the ecdysone-injected pupa as in the control, and in both the recovery of 14CO2 from 14C-glucose was more than that from 14C-glucose. Labelled glucose was converted to blood trehalose after ecdysone
The mode of action of insect hormone and its related substance upon the metabolism of diapausing pupae was studied on the pupa of *S. cynthia reducta*. The brain was extirpated from each pupa at the diapause stage. The brainless pupae were kept at 26°C for five weeks prior to use. In some experiments, radioactive glucose (2.12 Ci/m mole) was injected into the pupae with estradiol, pregnant brain hormone or cholesterol. Brain hormone activity, respectively, 344h after injection, the incorporation of radioactive glucose into carbon dioxide, trehalose, glycogen, crude lipid, and crude protein was measured by several methods, obtaining the following results. All of the substances assayed on carbohydrate metabolism in the brainless pupae and probed the biosynthesis of trehalose. In control intact without hormone or cholesterol injection, however, radioactive glucose was incorporated into glycogen in the fly body and scarcely incorporated into blood trehalose. On the other hand, incorporation of radioactive glycogen in crude lipid and crude protein showed a low value, whether intact hormone or cholesterol was injected. It is concluded that insect hormone, estradiol and brain hormone, are concerned in the carbohydrate metabolism of *S. cynthia reducta.*

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The chief site of trehalose synthesis in insects is the fat body. There is evidence that the pathway is the same as that first described for yeast:

UDP glucose + glucose-6-P → UDP + trehalose-P

(Trehalose-P synthase)

Trehalose-P + H₂O → trehalose + P₃

(trehalose-β-phosphatase)

Fat body also synthesizes glycogen by a similar transphosphorylation:

UDP glucose + (glycogen)₆ → UDP + (glycogen)₅ + 1

(glycogen synthase)

These pathways have been verified in homogenates of fat body of *Hyalophora cecropia*. Trehalose-P synthase was detected by measuring incorporation from both glucose-1-4C and UDP glucose-1-4C into trehalose, and by measuring the release of UDP from UDP glucose. The glycogen synthase is activated by glucose-6-P, but not by glucose-1-P. The trehalose-P synthase is activated by Mg²⁺ and inhibited by trehalose. The physiological significance of trehalose inhibition was tested in experiments with intact larval fat body in a hemocoel-like medium. In absence of trehalose, the fat body incorporated glucose-1-4C into trehalose ten times faster than into glycogen. Addition of trehalose at levels approximating those in larval haemolymph (~60 ng) resulted in decreased incorporation into trehalose and increased incorporation into glycogen. Inhibition of trehalose-P synthase by trehalose would allow the level of UDP glucose to rise, thus increasing glycogen synthesis. Such a mechanism could explain the apparent regulation of blood trehalose level in insects. The conversion of carbohydrates which follows injury in some insect species may also be explained by these results together with the activation of glycogen phosphorylase.

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Enzymes which synthesize trehalose and glycogen from uridine diphosphate glucose are present in homogenates of fat body from larvae and pupae of the silkworm, *Hyalophora cecropia*. Glycogen synthase sediments in the 37,000 x g particulate glycogen fraction. It is activated by glucose 6-phosphate and has kinetic properties similar to those of mammalian glycogen synthase. Trehalose synthase sediments, which remains soluble at 125,000 x g, requires glucose 6-phosphate as a substrate and is inhibited by trehalose. Kinetic evidence indicates that trehalose binds to a site separate from the catalytic site, which can be functionally eliminated by treatments which cause mild protein denaturation. With intact fat body, trehalose in the medium inhibits incorpora-

The mutagenic effect of 3000 R acute X-irradiation on the spermatogenesis of adult D. melanogaster was studied by means of the band pattern technique. The irradiation brought about a period of low fertility on the 5th-6th day, almost complete sterility occurred on the 9th day. Interruption of fertility took place in two steps, with a secondary decline during the 11th-12th day. Control level was reached on the 15th-16th day. Recurrence of autosome chromosome length mutations in three lines and male sterility mutations (probably arising from damage to Y-chromosome) showed that the pattern was similar in the three successive S or D bivials, corresponding to progressively earlier postnatal germ-cell stages at the time of irradiation. (Author)

Enzymic Synthesis of the Glycoside of Protocatechuic Acid in the Cockroach, P. americana. (Isolated from T. americana, Tokyo, 1960.) (In English)

Labelled D-gluconolactone was formed during incubation of homogenates of testes from the female cockroach. P. americana, with 14C-labelled UDP-glucose and protocatechatic acid. (Cq 85: 1967, 687 v)


The mechanism for the greater resistance of T. intermed. 4th-instar larvae to DDT in comparison with 3rd-instar larvae was investigated. Both developmental stages rapidly incorporated 14C-labelled glucose into protein and several soluble intermediates, but the rate of incorporation was higher in 4th-instar larvae. DDT increased glucose incorporation into total protein, and this increase was paralleled by the amount of protein in 4th-instar larvae. However, this effect was less apparent in 3rd-instar larvae. DDT also significantly increased free protein in 4th-instar larvae. Chromatographic profiles of larval protein indicated the presence of an active Krebs cycle in these insects, which was apparently inhibited by DDT only in 3rd-instar larvae. (Cq 85: 1968, 537s)


Glycogen phosphorylase in cockroach and Cecropia fat body occurs in forms having differential sensitivity to 5'-AMP, bound to glycogen and is soluble. Phosphorylase activity in cockroach fat body is s and 30-fold greater, respectively, than adult and pupal fat body of Cecropia. Phosphorylase phosphorylase in adult moth fat body is responsible for the decrease in concentration of active phosphorylase, without a decrease in total phosphorylase. In vitro, the rate of decrease varies with the ionic nature of the medium. Phosphorylase kinase, requiring ATP and Mg2+ or Mn2+, mediates the conversion of active from inactive phosphorylase, and is highly active in adult cockroach fat body and only slightly active in adult flight muscle. Glycogen, D-glycerol-3-phosphate, and trehalose inhibit the active phosphorylase of adult male moth fat body in a cell-free system, while sucrose, ribose and mannose do not. Fat body active phosphorylase per animal increases 2-fold during adult development without a significant change in total phosphorylase. In vitro incubation of cockroach corpus cardiacum or the retrocerebral complex of Cecropia does not activate Cecropia fat body phosphorylase. Under identical conditions cockroach fat body is always activated by corpus cardiacum. The inability of Cecropia fat body to respond to hormones by activation of phosphorylase is not due to the lack of eucaryote systems capable of interconverting the inactive and active forms. Activation of phosphorylase in fat body of male L. madaroi in vitro is maximal 60 min after the addition of corpus cardiacum extract. As little as 5 X 10^-7 molar of cortisol per ml of incubation medium elicits an increase in active phosphorylase.
Female fat body, ovaries, and the developing embryos of *L. maderae* show marked changes in glycogen related to events in the reproductive cycle. The activation of phosphohydrolase by extracts of corpus cardiace from females at various stages suggests that the hormone content of the gland increases at times when the glycogen level in the fat body is decreasing and the converse. Trehalose release by the fat body of male *L. maderae* in *vivo* is stimulated by the hormone. The percent stimulation reaches a maximum after 30 min of incubation. Incubation of fat body with extracts of corpus cardiace stimulates O₂ consumption and decreases the respiratory quotient.

The rate of oxidation of glucose-6-C⁶ to CO₂ and its incorporation into glycogen is also reduced. The hormone stimulates the oxidation of acetate-1-C⁴ and palmitate-1-C⁴ in the degree that the metabolic rate is increased, possibly compensating for the decrease in carbohydrate oxidation. Trehalose is synthesized from glucose-6-P (G6P) and UDP glucose in a cell-free extract of tissue that had previously been incubated with corpus cardiace extract, suggesting an activation of trehalase-6-P synthetase. The data indicate that a corpus cardiace hormone regulates more than one site in the metabolism of glycogen. The hormone increases glycogen degradation by activation of phosphohydrolase and the phosphorylated hexoses are shunted into trehalose, rather than entering glycolysis at an accelerated rate. Consequently endogenous fat body metabolism shifts toward the increased utilization of lipid. Mechanisms that may be responsible for these effects are discussed. (From DA)


Changes in the fat body glycogen reserves of female *L. maderae* during the reproductive cycle follow a biphasic curve during oogenesis and a large single phase of synthesis and degradation during embryogenesis. Glucose-1-C⁶ and palmitate-1-C⁴ were used. Glycogen in the ovary and developing embryos increases slowly except for a short-term rapid build-up in the last half of embryogenesis, which is rapidly depleted just prior to and following parturition. Changes in these glycogen levels are related to several other physiological events in the reproductive cycle and suggest a basis for further studies of the control of carbohydrate metabolism by hormonal or metabolic mechanisms.


Hormonal control of the phosphohydrolase system, metabolism of radioactive substances, and trehalose synthesis were examined in the fat body. Fat body phosphohydrolase is maximally activated within 10 min after being exposed to corpus cardiace extract and is sensitive to very low concentrations of the extract. The concentration of phosphohydrolase-activating factor in the gland appears to be related to changes in glycogen content during oogenesis. The hormone elicits an accelerated rate of trehalose release, an increase in O₂ consumption, and a decrease in the respiratory quotient. The rate of oxidation of glucose to CO₂ is decreased, but that of acetate and palmitate are both increased in fat body incubated with corpus cardiace extract. A hypothesis considering the new metabolic effects of the hormone suggests that its regulatory action is effective at a number of different sites. The following radioactive compounds were used in the study glucose-6-phosphate, glucose-1-C⁶, acetate-1-C⁴, palmitate-1-C⁴ and trehalose-1-C⁴.

108 Williams, M.W., Benson, N.R. TRANSFER OF C⁴ COMPONENTS FROM *Pyilla pyricola* (Foor.) TO PEAR SEEDLINGS. J. Insect Physiol. 12, 2 (1966) 213-254.

Sedlak was found to be the major C⁴-containing compound transferred from the insect *P. pyricola* (Foor.) to pear seedlings. Other C⁴ compounds were also present in the seedlings but the amounts were too small to be identified. The *Pyilla* larvae transferred considerably more C⁴ to the seedlings than did the adults. Analysis of pyilla honeydew revealed that it contains 35% sedlak, 20% acetone, and 10% reducing sugars on a dry weight basis. (Auth.)


Comprehensive review. The article divided into sections on the occurrence of sugars in insects (glucose and reducing substances, trehalose, sugar content of insect hemolymph and of whole insects and insect tissues) intestinal absorption and the physiology of hemolymph sugar levels (absorption from the gut, use of monosaccharides — oral role of trehalose, accumulation and of glycogen). Hormonal proteins in insects, meta radioscintillation application: dense bibliography is a

1.2.4. Amino P

110 Agus, M., Arisena, L. TREATED WITH DDT. The effect of DDT and L. and adult specimen has 14-C protein of *L. maderae* is appreciably changed the rate of ATP, an ATP generation increases the rate of added DDT also is induced. The results obtained indicate is only evident in *Nymph DDT previously shown w

111 Agus, M., Fins, & C. INCORPORATION OF GLI STRAINS OF MAJUS DOMINUS, FLY STRAIN歐黃色 difference at levels of pathway in glucose utilize uniformly C-labelled, treatment stimulates the

NADP, oxidized nicotin adeaden dinucleotide phos
marked changes in phospholipase by extracts one corner of the gland and the converse. These changes in the hormone. This is demonstrated by the respiratory quotient, is glycogen and also normalize-1-I-C to the decrease in carbohydrate metabolism more rapidly in a calcium extract, suggesting a carcinogen hormone(s) increase glycogen secretion shown into trehalose, hepatic fat body metabolism may be responsible for the reproductive cycle and the degradation of glycogen in the ovary in the last half of vitellogenesis. These changes and suggest a basis for metabolic mechanisms. 

FORMATION AND UTILIZATION OF SUBSTRATES, and trehalose, rapidly activated within to very low concentrations the gland appears to be resistant an accelerated rate of respiratory quotient. The substrate rates are both for considering the new active at a number of glucose-6-de-¹⁴C. 

4 Phylla pyrgula (Four.) from the insect P. pyrgula seedlings but the amount more ¹⁴C to the seedling contained 69% seedlings. 


The presence of sugars in insects is polyphosphate and of whole synctial sugar levels (absorption from the gut, regulation of blood sugar), biosynthesis and utilization of sugars (glucose, use of monosaccharides such glucose, biosynthesis, cleavage with use of trehalose, physiological role of trehalose and trehalase, glucan and the properties of trehalose) glycogen (in insects, accumulation and conversion during growth and metamorphosis in insect flight, metabolism of glycogen: hormonal effects on carbohydrate metabolism: glycogenolysis and gluconeogenesis in insects, metabolism of chitin, and on glycogen and aryltid). Extensive reference to radioactive application (author's own among others) are made throughout the text. A comprehensive bibliography is appended. 

See also: 

40 Some biochemical aspects of insect metamorphosis. (Gilbert, L. et al., 1961) 
146 The course of protein and carbohydrate synthesis in decapods Apis mellifica L. (Engel, W., 1965) 
147 The time sequence in protein and carbohydrate synthesis in Apis mellifica. (Engel, W., 1969) 
176 Action of exocrine on some metabolism during larval-pupal transformation of the housefly, Musca domestica L. (Diptera: Muscidae) (Kobayashi, M., et al., 1987) 
178 Studies of the mode of action of royal jelly in honeybee development: the utilization of sugar uniformly labeled with ¹⁴C and of aspartic-¹⁴C acid. (Lue F.D. et al., 1967) 
179 Studies on the salivary physiology of planthoppers transport from hemolymph to saliva. (Miles, P.W., 1967) 
208 Radiosotope incorporation and nucleic acid synthesis in dipterous embryos. (Fady, W.W. et al., 1972) 
413 The deposition of endocrine in an insect, Callipodius asterias Stoll (Lepidoptera, Nymphidae). (Courten, W.V., et al., 1960) 


The effect of DDT and DDE, a DDT-like toxic analogue, on protein biosynthesis in T. infestans nymphs and adult specimens has been studied. DDT increases the in vitro rate of incorporation of DL-leucine-¹⁴C into total proteins, while a slight inhibitory effect is observed in adult males. DDE does not appreciably change the rate of protein biosynthesis in nymphs, although it appears to be inhibitory in males. Nymphal microsomes and sarcosomes show the highest specific activity after DL-leucine-¹⁴C injection. This activity is maximal increased by DDT, while DDE again is inhibitory. A cell-free system obtained from nymphal specimens incorporates DL-leucine-¹⁴C into proteins in the presence of ATP, an ATP-generating system, CTP, and Mg ions. In vivo pretreatment with DDT at low concentrations increases the rate of DL-leucine-¹⁴C incorporation into proteins by this system. In vitro added DDT also is stimulatory at very low concentrations, while higher ones are inhibitory. The results obtained indicate that protein biosynthesis is stimulated by DDT, but not DDE, an effect that is only evident in nymphal T. infestans. This appears to be consistent with the inductive effect of DDT previously shown with NAD-Kinase in this organism (Levy et al., 1964). (Auth.) 


Home fly strains showing various patterns of cross-resistance to insecticides have remarkable metabolic differences at lower of NADP, relative participation of glycolysis and the pentose phosphate pathway in glucose utilization, rates of protein synthesis and glucosamine turnover. Labeled glucose (uniformly ¹³C-labelled, glucose-1-¹³C, glucose-6-¹³C, and glucose-6-¹³C) was used, DDT treatment stimulates the pentose phosphate pathway, increasing the availability of NADPH, and 

NADP, oxidized nicotinamide adenine dinucleotide phosphate; NADPH, reduced nicotinamide adenine dinucleotide phosphate.
enhances the rates of protein synthesis and glutathione turnover in a pyrethrin-resistant strain, which is also cross-resistant to DDT. On the other hand, a susceptible strain did not evidence any of the above DDT effects. It is suggested that the metabolic changes observed are closely linked to the activity of detoxifying enzymes and constitute an expression of insecticide resistance.


The NAD kinase EC 2.7.1.29 from T. bientzusi was purified and a specific antisera against it prepared. Enzymochemical techniques showed that the increase in the levels of NAD kinase in adults of T. bientzusi was accompanied by an increase in the amount of enzyme protein. The enzyme is labelled after injection of 14C-labelled leucine in both induced and non-induced insects, but labelling is greater in the former, which further supports the concept that a de novo synthesis of enzyme protein occurs during induction by DDT. The enzyme is heterogenous by DEAE-cellulose and DEAE-Sephadex column chromatography but the antisera does not distinguish this heterogeneity.

NAD kinase induction may correspond to a protective mechanism of the insects by increasing the availability of coenzymes required for DDT detoxication. (CA 87 1987 10464g)


Amino acids were studied in the supernatant from fat bodies from the larval and pupal stages of the fly. The enzymes were examined by the pyrophosphate-phosphate ATP exchange method. The optimal pH for pyrophosphate-ATP exchange was 7.5 in the presence of 10 mM Mg. The exchange rate varied with the amino acid substrate, but the total activity decreased with age for the first 6 days of pupal life then increased to a max. 1-5 days before adulthood. Free amino acid concentration in the paper decreased during the period of amino acid activating activity. (CA 84 1984 13447f)


Fifty adult Cocconulina maculata (De Geer) were fed on 250 ml of an aqueous solution of sodium acetate at 14C which contained 600 µg of the salt. Total 14C was 26 µCi. After 4 h, the mollusks were homogenized, the amino acids were extracted and separated by thin-layer chromatography, and the activity was measured using a scintillation counter. Glycine, serine, aspartic acid, glutamic acid, proline, and tyrosine showed high activity, and are considered to have been synthesized in vivo. They are apparently essential, in contrast to threonine, phenylalanine, leucine, and valine, which are essential or derived exclusively from essential dietary constituents. The low activity shown by alanine, leucine, arginine, and histidine indicated a low level of 14C incorporation. These unknown amino-acid-positive compounds were isolated, in addition to the 10 amino acids that were identified. (Auth.)


The hormone ecdysone induces a large number of changes in the puffing pattern of midgut intercalary larvae of P. hydat. The pattern of changes occurring after experimental administration of the hormone are identical to those observed in normal development during a 6-h period before puparium formation. After administration of a considerable number of puffs reach a peak in activity within 15-20min. During this period, 8 puffs arise newly, 12 puffs show a strong increase in activity, 6 puffs show a lesser pronounced increase in activity and 12 puffs show a decrease in activity. At a period of 4-6h after administration of the hormone another 8 puffs arise newly. The effect of the hormone was identical in both in vivo and in vitro experiments. Diameter measurements on several puffs reaching within 30 min with an increase in diameter showed that these puffs reached simultaneously. Most of the puffs that showed a decrease in activity reached with some delay. - A study of the effect of different hormone concentrations revealed that the kinetics of 4 puffs with respect to the relationship between concentration and puff size was identical across a range of concentrations from 5,5 x 10^{-5} to 3 x 10^{-4} CIU/ml. Three of these puffs showed a reaction with even lower concentrations. Maximum puff size is attained by all puffs at a concentration of 3 x 10^{-4} CIU/ml.

Among the puffs studied of 8 puffs of the group retraction and desorganisation of the hormone as observed the larvae with 1 µl of activity 3 x 10^{-5} CIU/ml, labelling of the active with an endocrine assay revealed. All puffs active in both larvae and occur changes in gene activity.

116 Berends, H.D., AMINOREPROXING, End. Ser. 42 (Staining activity glial c puffs as well as those pro absent in the non-pulled larva to trace their un to the origin of puffs, N of endo-4-14C tryptophan) puffs cells the number of grain the cromosome. In the labelling, None of the N-puffation showed a uniform proliferation, histidine, leucine increase in protein cote presumably due to an act of 350 show amino a. After the same period of labelled. Therefore mi protein synthesis or occur.

117 Biepseweva, N.V., Sulli INTO TURBO IN T5 SER. Ser. Biol. 1 (1966) R. The sand eel carpenter was 0.1 x 0.134 M CIU and irradia eacrease formation in globular oo as well as accumulation; c. catoplasmas. (CA 67 1967 189)

118 Boyd, J. P. P. I.P. C. PART II: A NEW METI TO STUDIES OF Protophyl hydat. In part I, a method is de 14C or 3H following their incoculation.wit with a b histone-based fertilize in 9-18h depending upon radiometric measurement of P. hydat. accordingly, it is over of most of the lacun particular group of proteins Another group of proteins for protein turnover in the

30
Among the puffs studied there was no effect on their reaction thresholds was found. A study of the behavior of 6 puffs of the group reacting within 15-20 min and one of the group reacting after 4-6 h to midinstar and to the larval stages revealed that these puffs showed the same reaction after injection of the hormone as observed in the salivary glands. Chromosomal RNA synthesis was studied by injecting the larvae with 1 µl of an ethidium solution (30 µg/ml) containing 1 µC of uridine-3H (specific activity 15.6,000 µCi/mM). The salivary glands being prepared 30 min after injection. Specific labeling of the activated puffs was prepared by injecting uridine-3H into larvae that were injected with an ethidium solution 30 min earlier. The glands were prepared 30 min after injection of the uridine. All puffs activated by administration of the hormone showed particularly strong uptake of 3H uridine and accumulation of acidic proteins. Ethidium is concluded to induce a pattern of changes in the reaction thresholds that is far more complex in D. hydei than in Chromosoma tentans.


Staining salivary gland chromosomes with Fast green at pH 2.4 revealed that normally occurring puffs as well as those produced by a temperature shock exist at a high amount of proteins which are absent in the non-puffed condition of these regions. Various 1H amino acids were injected into larvae to trace their incorporation into the chromosomes and the possible relation of protein synthesis to the origin of puffs. No preferential labelling, after the injection of 150-h-old larvae with 1 µl of 1H-tryptophan (specific activity 9.6 µCi/mM), of the induced puffs was observed. In many cells the number of grans over the puffed regions was even lower than over the neighboring part of the chromosome. In many cases, however, certain bands showed a reproducible preferential labelling. None of the puffs specific for puparium formation which also during the period of incubation showed a preferential labeling of the puffed regions were observed. Similar results were obtained with proline, histidine, leucine and arginine. On account of these data it is clear that the regional increase in protein content during puffing is not caused by a synthesis in the puff itself, but is presumably due to accumulation of pre-existent proteins from someplace in the cell. Larvae of 150 h showed amino acid labelling in 10% of the salivary gland nuclei after 8 h of incubation. After the same period of incubation with 1H-tyrosine only 37-46% of the nuclei of similar glands were labelled. In vitro might thereby exist that there is no apparent correlation between chromosomal protein synthesis or accumulation and chromosomal replication. (From BES)


B. mori caterpillars were given glycine-14C, DL-alanine-14C, DL-lysine-14C, DL-methionine-14C, or 1 µc 0.14M NaCl in the final 2 h of the 3rd hour to the silk-secretion glands were removed, homogenized, and radioactivity measured. Fibrin synthesis reached its max, some days after complete RNA formation in glandular cells and increased incorporation of labeled amino acids into total protein as well as accumulation of the secretion occurred in the 2nd half of the 6th growth phase of the caterpillar. (CA 62: 14501b).


In part I, a method is described developed for measuring the radioidine proteins of proteins labelled with 3H following their separation by disc electrophoresis. The radioactivity is measured directly in acrylamide gel with scintillation techniques after the gel or the gel has been replaced with a homogenate-based scintillation solution. Gel slices can be prepared with a minimum of handling in 9-14 h depending upon the size of the slice. The technique has been used together with a sensitive measurement of separately labeled gel to study the turnover of the hexoplasm proteins of D. melanogaster. By labelling homologous proteins into the midgut of the adult, turnover of most of the hexoplasm proteins has been demonstrated in both larvae and pupae. The turnover of the hexoplasm proteins has been shown to be relatively inert in papa. A postulated mechanism for protein turnover in metamorphosing insects is discussed. No radioproteins were used in part II.
Tumors of the hemolymphe proteins of D. melanogaster was studied with the aid of disc electrophoresis. By injecting labelled hemolymphe proteins into unlabeled animals, active turnover of the major hemolymphe proteins was demonstrated in both larvae and pupae. Parallel experiments with a heterologous protein demonstrated that the observed turnover was specific for homologous proteins. One group of hemolymphe proteins turned over rapidly after puparium formation, with an average half-life of 12 h. Another group of proteins was relatively inert in pupae. (CA 19: 674.)

The study was aimed at determining whether the larval proteins are hydrolysed to free amino acids before being used for adult protein synthesis, or whether adult proteins are built up from larger units that might be carried by phagocytes which are known to destroy the larval tissues. The mean specific ratio of protein synthesis rate (rate of synthesis/amount of protein) from one free amino acid, glycine, in sphincter pupae, either in dissected or at the moment of the development of the adult organs, were compared. 115 μg of glycine-14C (300 μC/g) was injected into the body cavity of each of five pupae. The mean specific rate of non-labeled protein synthesis from free glycine proved much higher in the dissection pupae than in the dissecting animals. This seems to support the view of adult protein synthesis occurring directly from the free amino acid pool.

Thymidine and thymidylic acid were assayed by a chromatographic method (cf. J. Biol. Chem. 254:1691-1695) in terms of the disappearance of [3-4C]thymidine and the formation of phosphorylated products, dTMP, dTP, and dTPP. Thymidine kinase (ATP, thymidine-2'-phosphoehorolase), EC 2.7.1.85 and thymidylic acid were extracted from the wing epidermis of developing adults of Antheraea pernyi and partially characterized. Activity of both enzymes was low in dialyzed extracts unless Mg++ was added. Non-dialyzed extracts contained sufficient Mg++ for the full activation of thymidine kinase but not for full activation of thymidylic acid. High concentrations of Mg++ or of ATP inactivated thymidylate kinase but this inhibition disappeared when both reactants were added in equimolar concentrations. High concentrations of thymidine also inhibited thymidylate kinase; this inhibition was diminished by lowering the concentration of ATP. Thymidylate kinase was inhibited by about 50% when thymidine and dTPP were equimolar, dCTP also inhibited thymidylate kinase but to a lesser degree; i.e., by about 50% when the dCTP concentration was 30 times that of thymidine, dCTP and dTTP caused no detectable inhibition. However, to a certain extent, these factors were able to satisfy the requirements for ATP.

The thesis consists of two parts. The first concerns the development of a column-chromatographic method for fractionation of acid-soluble nucleotides of the silk gland of Bombyx mori. The second part is devoted to the study of these nucleotides. With the exception of CTP (cytidine triphosphate) and UTP (uridine triphosphate) all the other ribonucleotides have been identified; ATP, ADP, ATP (adenosine mono- and di- and triphosphate), GMP, GDP, GTP (guanosine mono- and di- and triphosphate); UMP (uridine monophosphate) and several UDP, CMP and GDP (cytidine mono- and di-phosphate). These results are compatible with those obtained for other animal tissues, and the order of elution of the nucleotides corresponds to that given by Huhbert et al. Possible explanations for the absence of CTP and UTP are put forward. Glutamic acid, a precursor of the pyridine base, was used in radioactive (14C) form but did not yield further information.

The content of cysteine rapidly from an underactive increase in cysteine synthase of the amino acid line of the 3rd amino acid of the protein. A total adult emergence. The quantitative results show that cysteine synthase activity is significantly increased.
SANS OF Drosophila melanogaster. Animals, active turnover of similar exoskeletal structures, result in the production of a large number of exoskeletal proteins. The synthesis of these proteins is enhanced by the presence of free amino acids in the diet. Free amino acids are incorporated into the protein pool at a rate proportional to the amount present in the diet. This suggests that the availability of amino acids in the diet is a limiting factor in the rate of protein synthesis.


Injection of 14C labelled amino acids and the tracing of the radioactivity in the tissues of the flies showed that the radioactivity was not found in the amino acids themselves, but rather in the metabolic intermediates derived from the amino acids. The presence of radioactivity in the tissues was not due to the direct incorporation of amino acids, but rather to the conversion of these amino acids to other compounds.


This review article is divided into two main parts: the formation and the excretion of nitrogenous end products. First deals with the ureolytic and the uricotelic pathways, the formation of urea and ammonia, and with amino acids and some other N-containing substances. The excretion of nitrogenous substances is exemplified in Coleoptera, Caprimulgidae, Dicentra, etc. The second part deals with the uricotelic pathway, the formation of uric acid, and the excretion of nitrogenous substances in the urinogenital tract. The excretion of nitrogenous substances is exemplified in Coleoptera, Caprimulgidae, Dicentra, etc.


A series of experiments was carried out to determine whether the pattern of incorporation of radioactive glutamate labelled with 14C into alanine would be conserved in thetse fly. The experiments showed that the conversion of glutamate to alanine occurs in the tsetse fly and that the conversion is not a random process. The conversion is mediated by the enzyme alanine transaminase.


The incorporation of base analogues into the female plasma of Microbacterium lacticum was studied. The incorporation was found to be dependent on the presence of the base analogues in the diet. The incorporation was increased by the presence of the base analogues in the diet, and decreased by the absence of the base analogues in the diet.


The biosynthesis of cytochrome c in the developing pupae of the silkworm moth, Samia cynthia, was studied. The biosynthesis was found to be dependent on the presence of the diet, and was increased by the presence of the diet, and decreased by the absence of the diet. The incorporation of radioactive precursors into the cytochrome c was found to be dependent on the presence of the diet, and was increased by the presence of the diet, and decreased by the absence of the diet.


The biosynthesis of cytochrome c in the developing pupae of the silkworm moth, Samia cynthia, was studied. The biosynthesis was found to be dependent on the presence of the diet, and was increased by the presence of the diet, and decreased by the absence of the diet. The incorporation of radioactive precursors into the cytochrome c was found to be dependent on the presence of the diet, and was increased by the presence of the diet, and decreased by the absence of the diet.

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cytochrome c and their characterization was studied and the results are tabulated. The increase in cytochrome c could be shown to result from de novo synthesis of the entire polypeptide chain.


Certain biochemical characteristics of monoaami oxidase (monoaami: O2 oxidoreductase (deaminating), EC 1.4.3.4) in T. confusum homogenate have been determined by using a radiometric method (14C-tryptamine). Like the mammalian enzyme, the insect monoaami oxidase shows maximum activity at pH 7.4. Besides, this enzyme possesses a very high affinity for trypanamine used as substrate (Km = 8.7 X 10^-4 M) and has an activation energy (Ea) of the order of 1044 cal/mol within the limits of optimum temperature (95°C). At a final concentration of 0.5 M, EDTA causes about 50% loss in the activity. Addition of Zn2+ and Cu2+ (molar concentration 10^-4 M each) in the presence of EDTA not only restores the lost activity but also activates the enzyme considerably, both paraoxon sulfate and harringtonin inhibit monoaami oxidase reversibly, their respective inhibition constants (Ki) being 6.26 X 10^-2 M and 1.4 X 10^-3 M. Monoaami oxidase activity is increased in the particular fraction of which the mollicoccus C, in terms of specific activity, contains about 5-7 times more activity than muscle. The enzyme is highly bound to mollicoccus C. During the life cycle of the insect, monoaami oxidase level follows a more or less inverse trend to that of acetylcholinesterase (acetylcholine acethyl-hydrolase, EC 3.1.1.7).


This review is divided into sections dealing with the breakdown of protein (subdivided into nucleic acids and nucleosomes); the transamination, deacetylation, and oxidation of amino acids (D- and L-essential amino acids); and the metabolism of amino acids (glutamic acid, glycine, serine, alanine, lysine, arginine, sulphur amino acids, tryptophan, and aromatic amino acids); and the metabolism of B metabolism; protein in insects: the synthesis of proteins in whole cells and cell-free systems, and the relation to amino acid incorporation and to nucleic acid metabolism; and finally lipid metabolism (oxidation and synthesis of fatty acids). The extensive bibliography contains numerous references to work utilizing radiotopes.


Comprehensive review article, dealing with embryonic development (changes in free amino acid pools, and enzyme patterns); larval development (amino acid peptides and other amino acid derivatives, and haemolymph proteins); pupal development (metabolism of amino acids and proteins, and changes in enzyme activities); and the adult, in terms of sex-specific differences in amino acids, peptides and proteins that persist. The enzyme is highly bound to mollicoccus C. During the life cycle of the insect, monoaami oxidase level follows a more or less inverse trend to that of acetylcholinesterase (acetylcholine acethyl-hydrolase, EC 3.1.1.7).


In order to examine the breakdown process more critically experiments were carried out entailing the injection of 14C-labelled larval haemolymph into various developmental stages of the blowfly Ph. regina. By following the formation of 14CO2 and the distribution of radioactivity in both the free


The breakdown of protein 14C-labelled haemolymph production and radioactive begins in the immature larval. However, the overall rate injected dose 10 h after before pattern showed that the basis of this finding is unchanged during metamorphosis is suggested incorporation of the main growth period of larval I decline during the course

134 Chitra, C., Shyamala, N. ANATOMY. Nature when glucose-14C was pointed into various tissues by the mid-gut. This so a facilitated diffusion in liver by accumulation in the silkworm (fat body gc accumulation and the 14C suspending 50 mg of fat activity 6, 1 mCi/10, 8 mCi/mg 14C in Comparison between rates in uptake even at the ca body cell discovered pre- microscopically in Philo

135 Chumaryska, W., Ziel, L. INNOCORZACI WEG HEMOLymph formation of oxidant I Acantholytica. Proc. Academica, 11

A solution of 14C labelled diet without. Peroxides were separated by peracids were measured by ir
The increase in poly polyphenolase gene expression in the blowfly, *D. melanogaster* (Diptera: Calliphoridae), during the larval to pupal transition was studied by immunohistochemistry. The increase in poly polyphenolase gene expression was associated with increased activity of the enzyme. This increase in enzyme activity was due to an increase in the number of enzyme molecules, rather than a change in the activity of individual molecules. The increase in enzyme activity was also associated with changes in the expression of other genes, including those involved in the defense response and development. These changes suggest that the increase in poly polyphenolase gene expression is part of a more general response to the transition from larva to pupa.
Incorporation of $^{14}$C into alanine, glycine, methionine and serine was established. The specific activity of the alanine and glycine was about 700 and 150 cpm/$\mu$g in these experiments, in which the similarity determined specific activity of serine and methionine reached 20,000 cpm/$\mu$g or even more. The high activity of the serine, also the high activity of the enzymatic systems bringing about synthesis and interconversion of the active monooxygen fragments (Gierzkowska, Ciecholska) give grounds for believing that the incorporation of $^{14}$C from alanine into serine occurs with the participation of the enzymatic systems in question. The high radioactivity of the methionine may indicate a considerable metabolic activity of this amino acid. (From translated abs.)


Flies were fed a solution of $5 \times 10^{-4}$ M $^3$H-leucine in 16% sucrose, with a specific activity of 0.5 nCi/ml. Label can be detected from within 5-10 min of the start of feeding. Flies were allowed to feed for 1 h. The mean survival time of even the most rapidly turning-over species of protein molecule must be at least 100 h, and may be much greater. The rate of protein synthesis is about twice as great in old as in young flies. Possible interpretations are discussed.


Studies were made on the 3rd, 4th, and 5th instar nymphs of L. migratoria L. from which the frontal ganglion had been removed, on control-operated, and on starved animals. The effects of this operation on protein metabolism were observed by study of electrophoresis of haemolymph proteins, chromatography of haemolymph amino acids, production of protein in the midgut, and the incorporation of $^{14}$C-glycine into protein by the body cells. Third instar locusts were injected with $^{14}$C-glycine (specific activity 8.0 mCi/mg), 106.7 mC/mg in distilled water (concentration 0.1 mCi/ml) either as a single volume (5 ml) or as a proportion of the body weight (1 ml/70 mg). The total protein concentration in the haemolymph of operated locusts did not increase with time. In control locusts, in which the increase of $^{14}$C level was almost entirely due to changes in the second of the three bands which normally separate out, the concentration of the free amino acids in the haemolymph fell to about 70% of that in operated controls. In operated locusts the proportions of the amino acids relative to one another changed. The incorporation of $^{14}$C-glycine into protein was slower and the equilibrium concentration less in operated than in control-operated animals. The time taken to reach equilibrium was the same in both cases, in both operated and control-operated animals the protein activity of the mid-gut wall was very low: no difference could be detected between them. The protein activity of the mid-gut contents expected per mid-gut was lower in operated than in control-operated animals. The protein activity expressed per mg was found to be the same in operated, control-operated and starved animals. The hypothesis that the effects of the removal of the frontal ganglion were mediated through changes in the secretion of hormones from the corpus cardiacum was tested by giving daily injections of freshly prepared corpus cardiacum extract to locusts from which the frontal ganglion had been removed and observing the growth in weight of these animals. A permanent increase in weight amounting to 100% of their initial weight was found. Animals injected with distilled water showed a temporary increase amounting to 30%. Uninjected animals maintained approximately constant weight. (Essentially auth. summary)


Insects treated and control flies were injected with $^{14}$C-labelled biochemicals, and 8 h later the soluble radiometabolites were extracted for identification and assay by paper chromatography and isotope techniques. Of the labeled compounds, DDT was found to interfere most with the metabolism of formate, glycine and proline. Thus after injection of $^{14}$C-formate, more uric acid and allantoin and less proline were recovered as radiometabolites from flies treated with DDT and related hydrocarbon insecticides than from flies untreated or treated with nonorganic analogues. However, insects of other types such as pyrethrum, organic phosphates, and phenoxyacetic and a carbamate, interestingly, failed to show a significant effect on formate metabolism, providing additional evidence for a different mode of action. (Auth.)


The cells that deposit test, this protein is formed by the plasmid with attached origin be cross-linked by the action of the epidermis of the epidermal - provascular are discussed. short time is required for of provascular and spongy by these cells are reported the synthesis of collars by


The fate body of metamorphosis the larva of Calopteryx eff 20 h before pupation. The source of the protein at-glycine and at-leucine level of incorporation into the si time during the instar, unlikely that fat-body hypothesis is that the protein increases steadily through females have a higher content in the fat body cells. 50% of protein formation in fat body protein to make the stimulus for sequestration is removed, although the tips of fat body cells during granule formation is not a protein in the animals. (Auth.)


The fat body of metamorphosis the larva of Calopteryx eff. After 18 h beginning 24 h after the appearance of a provascular protein de the time of granule formation from protein taken up from reserves in the blood then from the gut 4-4 h must be 60 h later. It increases by the phagocytic granules, for the action of the brain there is a sudden decrease granules. There is a sex difference in the fat body granules, 1 granules of the fat body at from the haemolymph into the gut. sequestration occurs.
COLEUS, G. C. STUDIES ON RESININ BIOSYNTHESIS. 1. Insect Physiol. 9 (1963) 679-681.

The cells that sequester resinin in Schizocerca gregaria have been studied to test the hypothesis that this protein is formed by the cross-linking of protein by a peroxidase enzyme. A peroxidase, resembling that from horse-radish, is present in these cells, and also in the gut, flight muscle, and cuticle with attached epidermal cells. There are proteins in the cells that sequester resinin that can be cross-linked by the peroxidase enzyme to form di- and tri-trinitro resistant. However, it cannot be concluded that the natural function of the peroxidase enzyme is to cross-link protein and similar cuticular proteins because it has not been possible to demonstrate its presence in the cuticle or at the surface of the epidermal cells. The difficulties of providing conclusive evidence for the existence of protein in these cells are discussed. Both in vivo and in vitro incorporation of H$_2$-tyrosine showed that only a short time is required for incorporation of free tyrosine into resinin cuticles, indicating a rapid turnover of protein and suggesting that only a small pool is present. Some observations on cuticle synthesis by these cells are reported. The incorporation of H$_2$O$_2$-tyrosine was used to investigate the synthesis of cutin by "resinin cells".


The fat body of hematophasic holometabolous insects stores protein from metabolism in the form of granules. In the larvae of Calpoda ciliata (Sull, Lepidoptera, Nymphidae), the granules begin to form about 30 h before pupation. Most of the protein in the granules is sequestered over a period of 14 h. The source of the protein sequestered has been demonstrated in two ways. The incorporation of $^35$S-tyrosine and $^35$S-leucine into the protein of the granules was observed electrophoretically. The level of incorporation into the fat body is no higher at the time of granule formation than at any other time during the stadium. In contrast, there is considerable incorporation into the epidermis. It is unlikely that the fat body synthesizes much of the protein in the granules at this time. An alternative hypothesis is that the protein is sequestered from the blood. The concentration of blood protein increases slowly throughout the stadium and decreases during the period of granule formation. Females have a higher concentration of blood protein than males, and a higher proportion of protein in the fat body cells. Horse-radish peroxidase injected into the hemolymph of the early stadium of granule formation is sequestered mainly into the granules. It is concluded that the fat body sequesters blood protein to make the protein granules. The high concentration of blood protein is not a sufficient stimulus for sequestration. The cells fail to form protein granules if the source of the stimulating hormone is removed, although the blood protein concentration may be at the same level. Electron micrographs of fat body cells during granule formation show that blood protein is sequestered in intracellular and intercellular channels, from which vesicles bud off into the cytoplasm. This mechanism differs from that involved in yolk protein uptake in oocytes. (Abs.)


The fat body of hematophasic holometabolous insects stores protein in the form of granules. In the larva of Calpoda ciliata (Sull, Lepidoptera, Nymphidae), the granules are formed over a period of 14 h beginning 30 h before pupation. Grain counts of autoradiographs show that although the fat body synthesizes protein during the intermoult, the rate of incorporation of $^35$S-tyrosine is lowest at the time of granule formation. The granules contain little newly synthesized protein and are formed from protein taken up from the blood. This conclusion is supported by the changes in amount of protein preserved in the blood throughout the stadium. The concentration of protein in the blood is constant from the 4th-5th moult until the critical period for the action of the brain on the prothoracic glands 60 h later. It then increases until the end of the intermoult at the time of the activation of the tissues by the prothoracic glands. This correlation between blood protein synthesis and the critical period for the action of the brain hormone has not been made in other insects. Following this critical period there is a sudden decrease in the concentration which exactly coincides with the formation of the protein granules. There is a sex difference in the amount of protein in the blood and in the amount stored in the fat body granules. Females have more protein in their blood and also store more protein in the granules of the fat body at pupation. The intermoult fat body also sequesters horse-radish peroxidase from the hemolymph into granules. These granules are much smaller than those formed at pupation. This sequestration occurs during the period when the blood protein is increasing. The protein sequestered
at this stage is not stored in large granules but is partitioned and must therefore be degraded by the cells. This suggests that the fat body is engaged in the turnover of blood proteins. The uptake of the blood proteins by the immature is not dependent on the presence of hormones from the head and thorax.

"Dauer" larvae, produced by thymic ligation to prevent pupating, continue to sequester porphyrines from the blood. The cells that have an intrinsically controlled ability to take up proteins. In contrast, ligation experiments show that the formation of the large granules at pupation occurs only after the action of the maturing hormone. The maturing hormone may influence both the rate of sequestration and the rate of destruction of the protein. Protein uptake is a two stage process. The first step is the concentration of the blood proteins in the intercellular spaces between the fat body cells. These spaces are continuous with intercellular channels formed by the extensive invagination of the plasma membrane. The concentrated protein is then ingested in vacuoles which pinch off from the tips of the intercalating channels. The vacuoles fuse to form granules in which the protein is either lyzed or stored, depending on the stage in the maturing cycle. Not all the granules are formed from sequestered blood proteins. There is a phase of autodigestion before protein sequestration during which mitochondria and a small amount of the endoplasmic reticulum are isolated and lysed. After the sequestration of blood proteins to form the major portion of the granules, a second phase of autodigestion occurs. This involves the isolation and partial autolytic of the endoplasmic reticulum. The residual bodies from the two autolytic phases are stored along with the granules of sequestered protein and are probably used by the pupa to provide precursors for adult development. (From DA)


1- alanine-14C (225 mCl/mMg) and L-lysine-14C (225 mCl/mMg) were used. Bioassays at the desired experimental stage were injected quantitatively with 1.0 mCi of isotope, the adults into the theaux, the pupae after piercing of the external puparium in the abdominal region lateral to the heart. The extent of alanine and lysine oxidation by various developmental stages of the blowfly is stage specific. Both amino acids are most slowly oxidized at about half way along adult development, but alanine is more rapidly oxidized by the adult fly, and lysine by the white pupa at the commencement of puparium. The rate of utilization (K) for free pool alanine is at all corresponding stages higher than for lysine. Variations in K of alanine during metamorphosis are far more pronounced than for K-lysine. K- alanine being particularly high in the white pupa. Alanine and lysine were incorporated into total protein at identical rates (K2) during metamorphosis except in the mature fly, where K-lysine was higher than K alanine. The K2 values, at all times low, decreased markedly during adult development. It is suggested that protein synthesis during blowfly metamorphosis is less extensive than had previously been assumed.


Preparations of ribosomes from D. virilis yield populations of mainly 205 or 505 particles depending on the composition of the isolating media. It has been suggested that the largely protein 205 particles are the structural units of 105 ribosomes with which they are antigenically identical. It has now been possible to quantitatively convert 205 particles to 805 ones in vitro (but not vice versa). The in vitro relationship has been pursued by studies of the formation of proteins in the EEP fraction, using sucrose density gradient analyses of 14C-inacssing incorporation with an isotopic buffer that produces some polyribosomes, some 805, and mainly 205. Long-term incorporation (2-6 h) results in an almost equal excess of label in both the 205 and polytene regions when the radioactive peak is normalized to the 805 peak. Other experiments on cold media after the long-term incorporation show the excess label of the polypeptides but not that of the 205, indicating that the incorporation at the polytene area was transient while that at the 205 was not. Populations were also sampled at various times after exposure to radioactive food. After 2 h, both 205 and polypeptides were hot but the 805 area was cold. After 6 h, an 805 radioactive peak appeared. At 10 h, the 805 peak can be normalized to the 805 OD peak; the polypeptides still have a moderate excess of label and the 205 a large excess. This suggests that synthesis is initiated less 205 and on polypeptides, with the 805 labelled secondarily. The constancy of the polypeptide excess is consistent with a flow of material such as is expected in the site of general protein synthesis. To follow 805 synthesis, a 2 h label was followed by an 8 h chase. The radioactivity showed equal amounts of label in the 205 and 805 regions, approximating the straight


Beta alanine incorporated by Drosophila melanogaster

Following request for metabolism in yeast

"Beta alanine DC is metabolized to four diL alanine, C and leucine in radioactive" topography of the supernatant with some residual radio label detected.

tumors and label in labeled molecules in the nuclei is considered from the point of view of the regulation of nuclear function.


The sequence and polymerization of the precursor was investigated by using tryptic digestion with a tRNA or mRNA to assess the role of these in the reaction. The results indicate that the reaction is enzymatically dependent on the presence of radioactive polypeptide. They are described to represent newly synthesized protein synthesis appears to occur during the first 24 h after the radioactive label was introduced. An experiment in which an activity 1.7 Ci/mMg, with 1.0 Ci/mMg, was measured at times of up to 38.
be degraded by the cells. In vivo, the uptake of the blood sugar from the head and thorax, intestine to sequester carbohydrates to take up proteins. In contrast, assimilation occurs only after the fat body has been digested by the fat body cells. The digestive process is the first step in the fat body cells. These then reaggregate in the plasma, which is removed from the tips of the pieces of fat tissue and are formed from the fat body tissue. The reaggregated mass is then subjected to morphological studies. The residual fragments of sequestered proteins are then (From DA)

**BETA ALANINE INCORPORATION INTO PROTEIN BY PHORMIA REGINA (Metcalf)**

used. Movements at the isotope, the adults in the adult region lateral to the heart, stage of the fly is stage lateral to adult development, but the pupa at the commencement of the stage is a stage higher than the larval stage. For K+ and lactic acid were incorporated into the fly, where K+ decreased markedly during adult metamorphosis is less extensive than in flies of the species. The 16 h labelling results. This suggests that the labeling of the 80S ribosomes comes from the host 20S particles, as if 20S units were the precursors of 80S ribosomes. (Abstr.)


Beta alanine incorporation into TCA precipitated proteins of whole body homogenates of *T. molitor* and *Drosophila melanogaster*. (Abstr.)

* Following request (44b) for further information, the author sent the abstract below, on beta alanine metabolism in *Tenebrio molitor*.

"Beta alanine incorporation into TCA precipitated proteins of whole body homogenates of *T. molitor*." (Abst.)


Chromosomal puffing, generally believed to represent gene activation in Drosophila, was induced in the presence of sodium acetate and 8-H (50 mCi/ml of saline). There is no preferential uptake of these labelled molecules in regions of gene activation. Uridine-8-H (25 mCi/ml of saline) was also used. The results from autoradiography that the activation of histone does not play a general role in the regulation of RNA synthesis in *D. melanogaster.*

**Engels, W. DER ZEITLICHE AUSLAUF VON PROTEIN- UND KOMPLEXHYDRATSYNTHEN IN DER OOGENESIS BIS APTIS FELIX L. (The course of protein and carbohydrate synthesis during oogenesis in *Apis mellifica* L.) p. 243–251 of "Verhandlungen der Deutschen Zoologischen Gesellschaft, Jena, 1964." (In German).**

The sequence and mutual interaction of protein and carbohydrate synthesis during oogenesis in the honey bee was investigated autoradiographically. A mixture of 14C-D-glucose and 14C-L-histidine was used. By using enzymes to break down polysaccharides and checking against controls it was possible to assess the role played by proteins alone. Protein and glycogen synthesis could therefore be followed in one ovary. Laying 1 yr-old queens were used, and the labelled substances injected abdominally (including a mixture of equal parts of an aqueous solution of 14C-D-glucose (specific activity 0.65 Ci/mM) and 14C-L-histidine (specific activity 1.7 Ci/mM), with 1 µCi/ml total activity). Injection periods of 6, 10, 20, and 40 min were allowed. Five functional phases could be distinguished, with some overlap in their sequence. The sequence was described in detail. RNA is transported into the ovum, whereas glycogen can no longer receive newly synthesized RNA. The reduced RNA supply to the cytoplasm, followed by marked protein synthesis appears to be a first step in certain cytoplasmic maturation processes. Maximal protein synthesis and carbohydrate deposition appear to be mutually exclusive. Sources of carbohydrates are stored during the final phase.


An aqueous mixture of 14C-D-glucose (specific activity 0.45 Ci/mM) and 14C-L-histidine (specific activity 1.7 Ci/mM), with a total activity each of 1 mCi/ml was injected abdominally into the hemocoel of ovipositing 1 yr-old queens. Brief mention is also made of results obtained from using
1H-thymidine and 1H-thymidine. Details of the autoradiographic techniques are given. Five functional phases may be distinguished. The 1st, during which there is very limited protein synthesis, is followed by the exoplasmatic growth phase which involves prolonged, slowly increasing protein synthesis; the deoxyplasmatic growth phase; the 4th phase of coagulation when carbohydrates are stored in the egg plasma in the form of glycogen, and the 5th and last phase in which the egg is surrounded by the chorion. The hypothesis that the maximal protein synthesis and glycogen storage are mutually exclusive appears to fit the anti-coagulation data. Their results and their significance are discussed.


Review article drawing on data obtained from work on insects and spiders. A very detailed study has been made of the molecular aspects of the differentiation involved in cocoon spinning in the silkworm. The physical properties of fibroin on which the protective function of the cocoon is based depend on the characteristics of the protein synthesis in the posterior part of the silk gland. The structure of fibroin seems to be explained by the special nature of the messenger RNA liberated at the cellular level in the posterior part of the gland. Detailed analysis has shown, however, that if the nature of the cocoon depends on a specific gene, the formation of the cocoon is the result of several other factors: the type of nutriment available to the silkworm, the behaviour pattern which attracts the silkworm to a specific nutriment, making it obey and finally swallow it, and which leads to the outstanding appetite characteristic of the middle of the 5th stage; the way in which amino acids are removed from the haemolymph by the gland; pupal weight control, etc. Differentiation evidently has a closely polygenic basis which can only be elucidated by a molecular approach. - Radiolabelling was used in the majority of the studies cited.


A quantitative re-examination of the peridines in Oncopeltus has given results at variance with those published previously. The precursors of the red peridine, erythrophorin, are xanthopterin, probably, and xanthopterin acid. The conversion of xanthopterin-6α,6βH into erythrophorin was studied in 3-5 d old eggs. Xanthopterin is not present in such in Oncopeltus but exists as the β-8-dihydroxyanthopterin. Pyridine acid-2,4-C, on the other hand, proved not to be a precursor of erythrophorin, Chlorophyll and photosynthesis have also been isolated and identified from later growth stages of the bag, 180 Fon, A.S., Kan, L., Kang, S.H., Wallis, B. PROTEIN SYNTHESIS IN CELL-FREE PREPARATIONS FROM Locustella migratoria. J. Biol. Chem. 245, 2 (1965) 5305-5308.

Uniformly labelled L-leucine-14C, and in some cases L-leucine-1,14C or L-leucine-3H were used. A cell-free system was developed capable of incorporating 14C-labelled amino acids into proteins. The system includes microsomes or ribosomes, soluble RNA (sRNA) or pR 5 fraction, the 20 standard amino acids, ATP and an ATP-generating system, and GTP. Mg ion concentration is optimal at 10-25 M. Microsomes and ribosomes exhibit a significant level of endogenous incorporation in the absence of sRNA and the pH 5 fraction. SRNA stimulates incorporation more effectively than pH 5 fraction. The requirements for amino acids, ATP, and GTP are not absolute. In the absence of sRNA, the incorporation of 3.20 mg of L-leucine/mg of microsomal protein/10 min of L-leucine in an incubation mixture has been observed. This yields an estimate of 5 mg of protein synthesized/mg of microsomal protein. For ribosomes, the corresponding value is 5.30, or an estimate of 6.5 mg of protein synthesized/mg of ribosomal protein. Ribosomes in 15-25 M MgCl2 exhibit a single peak in the ultra-centrifuge with a sedimentation coefficient of 70$S$. In 10-17 M MgCl2, two peaks are observed at 57$S$ and 44$S$, respectively. Amino acid-activation enzymes are bound to microsomes and ribosomes; no activity has been observed in the soluble fraction, the pH 5 fraction, or the pH 5 supernatant.


1H-1L-leucine (4.1, 1.0 mmol/L), 3H-4, 5L-leucine (6.0 mmol/L), 14C-1-glutamin (6.4 0.4 mmol/L), 1H-2-glutamin (5.0 mmol/L), and 1H-thymidine (5.0 mmol/L) were used in protein determinations. Compounds were made of protein synthesis in imaginal discs of different developmental stages using acetylamine gel electrophores detected between middle last 3rd instar discs and early 5th imaginal discs has been inhibited, so that no larval discs should be expected to form. A secondary, "hormone", a black pigment is shown as primary pigmentation in an area within 5-10 d. Protein tyrosine has been shown that tyrosine is the primary pigment; the secondary pigmentation is deposited after the uncovering of the secondary pigment (Aug.)

152 Fesseau-Brezacz, S. ETU. migratoria, J. Insect Physiol. Secondary of "hormone", a black background: the secondary pigmentation is shown as primary pigmentation in the area within 5-10 d. Protein tyrosine has been shown that tyrosine is the primary pigment; the secondary pigmentation is deposited after the uncovering of the secondary pigment (Aug.)

153 Glass, D., Forrest, H.S. IN Locustella migratoria. H-labelled reduced activity has been detected experimentally, lacks this activity life cycle, of the fly, being laid down. At in it "inertool fraction", proposed, involving the aq.

154 Gruszka, M. N. AUTORA OCIEKTEJ O Pajomek em. Autoradiographic technique and phytolacca-14C, th ones, (polyol type), molecules was twice as high: a manifest a specific capacity as the in the karyopetal role in the protein metabolism.


The specific activity of L-200 mg/g. There was no ribosomes of the dark gland system, whereas glycine in each case the ribosome see the classic systems of anin.
acrylamide gel electrophoresis of *H*- and *C*-labelled protein. No qualitative differences were found between middle 3rd-instar discs and late 3rd-instar discs, and small differences were between late 3rd-instar discs and early prepupal discs. Using actinomycin D, the functional half-life of mRNA of imaginal discs has been minimally estimated to be ~2 h long. It is proposed, on the basis of this finding, that no large differences in the pattern of protein synthesis in late larval and prepupal discs should be expected because the existing mRNA would buffer the system against changes.


Secondary of "homeochronic" pigmentation can be induced in adult scutellids by rearing the adults on a black background; this occurs in the field when locusts and grasshoppers live on black, burnt land. The secondary pigmentation is achieved in two ways: an additional chromatophore appears in certain localized areas within 6-10 d, partially covered by a cuticular pigment. Experiments using *H*-labelled tyrosine show that tyrosinase incorporates into the new cuticle before the blastoderm is not a pigment precursor, whereas the tyrosinase is taken up after scutellation and during the sclerotization of the cuticle is used for primary pigmentation; the pigments are referred to as "primary melanin". The pigment associated with secondary pigmentation appears to have the same nature and origin as the primary pigment, but since it is deposited after the cuticle is sclerotized, it is referred to as "secondary melanin". The significance of the secondary melanization is discussed, as well as the possibility of the hormonal control.


*H*-labelled reduced nicotinamide adenine dinucleotide phosphate was used. Kynurenine hydroxylase activity has been detected in a-tetra-type P. melanogaster for the first time. The circadian mutant, as expected, lacks this activity, and the white mutant has about one half the wild-type activity. During the life cycle of the fly, there is a peak of enzyme activity around the time the brown pigments are being laid down. As in the mammalian system, the enzyme seems to be associated with the "enolchelasmatic fraction." A theory as to the nature of the biochemical lesion in white mutants is proposed, involving the suggestion that kynurenine hydroxylase has a prosthetic cofactor.


 Autoradiographic experiments showed that 15 and 30 min after an intravenous injection of leucine-2H and phenylalanine-14C, these amino acids are incorporated mainly into the cytoplasm of *P. commutata* oocytes (polytrophic type) and only slightly into the nucleus. After 24 h the incorporation into the nucleus was twice as high as the incorporation into the cytoplasm. The karyosphere does not demonstrate a specific capacity for selectively binding amino acids, the degree of incorporation is the same as in the rest of the karyosphere. However, it can be assumed that the karyosphere plays a definite role in the protein metabolism of the nucleus.


 The specific activity of 1-C4-glycine was 90-100 mCi/g and that of the labelled C4-leucine was 200 mCi/g. There were no impurities of other C4-amino acids. The fractions of both free and bound ribosomes of the silk gland were shown to be able to include C4-amino acids in the proteins of the celluar system, whereas glycine can be included only by the bound ribosome fraction (30 000 g-precipitate). In each case the ribosome cellular system from the silk gland of Bombyx mori L. did not differ from the classic systems of animals and bacteria.


 Melanins are dark pigments usually bound to proteins. A culture of the fly was used which is homozygous for three recessive mutants carrying yellow eyes, nutty body and a black papilla (in contrast to the brown papilla of the normal wild strain). When empty papilla, from which papilla cuticles, other residuals and lips have been removed, are hydrolyzed then insoluble melanins
remain "ghosts" of the original pappe, which are outlined in the normal white stria but intensely black and thicker in the mutant. The black pigment in the pappes showed the physical properties of melanin, with degradation products characteristic of melanins of animal origin. The pigment was therefore classified as an isolate melanin. Experiments with radioactive tyrosine show it to be formed from tyrosine, confirmed by the nature of the degradation products.


In developing C. pappes eggs, in which ribosomal RNA is the major type of RNA synthesized, the rate of synthesis, when it is at its max., can be affected by incubating partially dehydrated eggs with either of two naturally occurring pteridines, balanochroin, or zanthochroin. Balanochroin and zanthochroin at 10^{-4}M inhibited by 80 to 90%, resp., the incorporation of uridine-3H into ribosomal RNA. RNA synthesis was also affected by the same two compounds. At later stages of development these inhibitory effects disappeared, and indeed, with respect to ribosomal RNA synthesis, pteridines stimulated incorporation of precursor. (CA 67:1967, 73131 b)


The posterior wings of Schistocerca gregaria age visibly as the animal gets older (see also ref. 108), becoming brittle and breaking away at the ends, although an active circulation of blood is maintained. The turnover of [H]valine into wing protein 2 h after injection of 0.68 mCi/g live wt. (0.6 mCi/g mg) has been measured. At adult emergence the wings weigh 70 mg/g live wt. falling quickly to 50 mg/g at 60 h as the wings dry out and tan, and then more slowly to 16 mg/g at 24 weeks old. The wing protein is 0.9 mg/g at emergence, 6.8 mg/g at 36 h and 0.5 mg/g at 24 weeks so there is no net synthesis of protein by the wings during adult life. 2 h after injection the wings of newly-hatched adults contained 120 mCi/g of wing falling linearly to 0.8 mCi/g in wings of 24-week-old insects. The rate of incorporation of valine into wing protein was almost linear over the first 4 h after injection. The specific activity of wing protein 2 h after injection was measured in batches of different ages. The age given is half way through the incubation period. 3.74 ± 0.17 mCi/g, 3.86 ± 0.28, 5.3 ± 0.38, 7.5 ± 0.69, 9.7 ± 0.61, 15.4 ± 0.82, 15.2 ± 1.0, 26 ± 0.95, 51.2 ± 1.5, 55 ± 1.77, 72 ± 0.15, 370 ± 0.67, 336 ± 0.81, 336 ± 0.81, 2150 ± 0.36, 5340 ± 0.29 mCi/g. There was no indication of an increase of protein synthesis in the wings of older insects.


In part I, xanthine dehydrogenase, one of the enzymes of purine catabolism in D. melanogaster, has been extensively studied and is known to be affected by three separate loci. To date little evidence has been presented concerning the substances of the pathway. In vivo studies were made of a Pacific strain and other strains carrying these mutant genes: xdh-1, xdh-2, xdh-3 (3-648), xdh-1, xdh-2, xdh-3 (3-858), xdh-1, xdh-2, xdh-3 (3-858), and xdh-1, xdh-2, xdh-3 (3-845). These enzymes of xanthine dehydrogenase were observed:

\[
\begin{align*}
\text{adenine} & \rightarrow \text{adenosine (deoxyadenosine)} \rightarrow \text{hypoxanthine} \\
\text{hypoxanthine} & \rightarrow \text{inosine (deoxyinosine)} \rightarrow \text{xanthine} \rightarrow \text{guanine} \\
\text{(AMP, IMP)} & \rightarrow \text{urate acid}
\end{align*}
\]

Two mutants of XDH, xdh-1 and xdh-2, converted some [14C]xanthine to uric acid. No evidence for xanthine deaminase activity or urate oxidase activity was noted. There was no significant evidence in enzyme level of xanthine deaminase, xanthine oxidase or uric acid deaminase in any of the strains. The possibility of pathway control by the genes involved in xanthine dehydrogenase activity: xdh-1 (3-845), xdh-1, xdh-2, xdh-3 (3-858) and xdh-1, xdh-2, xdh-3 (3-858) was ruled out.


The pathway of purine catabolism in larval extracts of D. melanogaster was investigated. The enzymes prior to xanthine dehydrogenase in the pathway appear to be adenosine deaminase, inosine phosphorylase, and guanine deaminase.


Some major biochemical changes in the three stages of the life cycle of the yolk were investigated. The total amino acid composition of the yolk was characterized. The yolk was collected from eggs laid by females maintained on a diet of 0.25% NaCl, 0.25% MgCl₂, 0.5% P₂O₅, and 0.025% potassium chloride. The yolk was collected from eggs laid by females maintained on a diet of 0.25% NaCl, 0.25% MgCl₂, 0.5% P₂O₅, and 0.025% potassium chloride. The yolk was collected from eggs laid by females maintained on a diet of 0.25% NaCl, 0.25% MgCl₂, 0.5% P₂O₅, and 0.025% potassium chloride. The yolk was collected from eggs laid by females maintained on a diet of 0.25% NaCl, 0.25% MgCl₂, 0.5% P₂O₅, and 0.025% potassium chloride.


A technique has been described for the isolation of the yolk from the ovary of the female. The yolk was collected from eggs laid by females maintained on a diet of 0.25% NaCl, 0.25% MgCl₂, 0.5% P₂O₅, and 0.025% potassium chloride. The yolk was collected from eggs laid by females maintained on a diet of 0.25% NaCl, 0.25% MgCl₂, 0.5% P₂O₅, and 0.025% potassium chloride. The yolk was collected from eggs laid by females maintained on a diet of 0.25% NaCl, 0.25% MgCl₂, 0.5% P₂O₅, and 0.025% potassium chloride. The yolk was collected from eggs laid by females maintained on a diet of 0.25% NaCl, 0.25% MgCl₂, 0.5% P₂O₅, and 0.025% potassium chloride.


In plants, the biosynthesis of chlorophyll is carried out by a series of enzymatic reactions involving precursor molecules. The reaction is catalyzed by a series of chlorophyll biosynthesis enzymes, which are located in the chloroplast. The reaction is catalyzed by a series of chlorophyll biosynthesis enzymes, which are located in the chloroplast. The reaction is catalyzed by a series of chlorophyll biosynthesis enzymes, which are located in the chloroplast. The reaction is catalyzed by a series of chlorophyll biosynthesis enzymes, which are located in the chloroplast.


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and guanine deaminases. Adenine deaminase and urate oxidase are not present in extracts of larvae. A Canton-S wild-type stock strain did not metabolize guanine-14C, suggesting a possible mutation affecting guanine deaminase. Some conversion of xanthine-14C to uric acid was noted in extracts of the xanthine dehydrogenase mutants, mx2 and py. (CA 68: 1668, 37150 q)

Some biochemical changes during the metamorphosis of the fly L. cuprina were studied and the amounts of free amino acids, soluble protein and DNA per organism have been estimated at different stages of the life cycle. The effect of variations in the concentrations of ATP, pyrophosphate and Mg2+ on the total rate of amino acid-dependent ATP-pyrophosphate exchange by soluble fractions were investigated and a suitably sensitive method of assay has been derived. Radioactive phosphate, H3PO4, in HCl, was converted into pyrophosphate by pyrophosphatase at 40°C for 1 h. Ammonia-dependent pyrophosphate exchange was determined by two methods, both of which NaH10PO4 was used.

A technique has been developed for preparing from the soluble fraction of L. cuprina, an enzyme system containing about 90% of the RNA and 90% of the total ATP-pyrophosphate exchange activity of the soluble fraction. 16 different amino acids were added to stimulate exchange with this system. Using this technique, enzymes were prepared from tissues at different stages of the life cycle and the variations during the life cycle in the total ATP-pyrophosphate exchange and in the exchanges with 21 single amino acids were measured. The variations were similar to those obtained with the original exchange. The enzyme system incorporates [14C]-amino acids into a form insoluble to perchloric acid, in a reaction which was dependent on ATP and RNA. Evidence suggested that this reaction included an exchange between amino acids attached to RNA and [14C]-amino acids in the incubation medium. The incorporation of aspartic acid, glutamic acid, and leucine were highly specific; amino acids with similar chemical structures did not compete effectively. Variations during the life cycle in the extent of incorporation of nucleotide and amino acids were investigated. The variations in the mixture of amino acids whether expressed per organism, per mg protein, or RNA were similar to those observed in the total rates of amino acid activation. These results are discussed in relation to likely changes in the rate of protein synthesis during the life cycle. Variations in the extent of incorporation for single amino acids, expressed relative to that obtained with the mixture, occur during the life cycle. Most pronounced were the decreases for glutamic acid and serine and the increases for alanine, aspartic, and tyrosine associated with the transition from larval to pupal life and the changes for leucine, proline, and threonine during the development of the pupal and adult stages. (Auth.)

210 Huviler, J., Agar, M. GLUTATHIONE TURNOVER IN Triquea (mammal) TREATED WITH
2, 2'-BIS (p-chlorophenyl)-1,1'-TRICHLOROETHANE. Exp. Parasit. 20, 3 (1967) 345-356.
The effect of 2, 2'-bis (p-chlorophenyl)-1,1'-trichloroethane (DDT) and 2, 2'-bis (p-chlorophenyl)-1,1'-dichloroethane (DDDE) on 14C-labelled glycine incorporation into glutathione (GSH) was studied in T. pyrnmarus. The levels of glutathione (oxidized) and glutathione (reduced) were similar in nymphs and male species. DDT increased total [14C]-levels in nymphs, but in males this effect was negligible. DDDE was without significant effect in nymphs, but markedly decreased total [14C]-levels in males. [14C]-levels were decreased by DDT in nymphs, whereas the opposite effect occurred in males. DDDE markedly increased [14C]-incorporation into [14C]-nymphs within the 1st hour of intoxication, but the turnover time was unaffected. These results were attributed to the increased levels of enzymes involved in the synthesis and degradation of H2S. (CA 67: 1617, 111212d)

Simple and inexpensive methods of determining chlorinase activity are useful in many phases of research dealing with organophosphates and carbamate insecticides. Such a method, based on the same principle utilized in manometric techniques has been developed successfully. Sodium bicarbonate-14C is used to react with acetic acid liberated from the enzymatic hydrolytic acetylcholine. The resulting CO2 is trapped and quantitatively measured by liquid scintillation counting. The
method is rapid and inexpensive; although so far limited to gross determinations it could be made into a useful tool for more precise studies by additional refinement.

165 Jacobs, M. E. DEPOSITION OF LABELLED ETA-ALANINE IN EMBRY AND NON-ETAB DOMTHACIDS WITH NOTEED ON OTHER AMINO ACIDS. Genetics 23 (1968) T78-786.


167 Referred.


Four active substances have been isolated from the central nervous system of insects and crustaceans: acetylcholine, serotonin, and neurohumors C and D. Studies on S metabolism using W compounds in Periplaneta americana indicated that neurotransmitters C and D were of a peptide nature with S-containing amino acids. The neurotransmitters increased the heart beating frequency in Periplaneta until the heart stopped either due to suicide (with serotonin C) or diastole (neurohumor D). The heart inhibition could be removed by diluting the neurotransmitter with insectinger solution. Neurohumor D increased uptake of neutral red dye by Malpighian tubules and intestine of Drosophila melanogaster, whereas neurohormone C had an inhibitory action. (From CA 68: 1967, 10554v)

169 Karsten, P. BIOCHEMISCHE VORKAMENDE DER HORMONE. (Biochemical mechanisms of hormone action.) J. int. Med. 4 (1964) 689-696. (In German)

The effect of hormones on certain enzyme systems in terms of inhibition and activation, the effect on membranes by affecting permeability, and the effect on gene substance by activation or inactivation are discussed critically on the basis of various examples. The effect of enzymes is discussed in connection with the index Chlamydomonas reinhardtii.

170 Karsten, P. BIOCHEMISTRY OF ENZYMES. Biochimica et Biophysica Acta 27 (1965) 1-4.

Cholesterol-4-C was demonstrated to induce C in mRNA carrying the 100 kDa histones and the histone.


Review article. After a review of the physiology of action, radiospectroscopy, and the test.

172 Karsten, P., Seebach, C. F. ACTION. Recent Found. The chemical, physiological, and immunological aspects of messenger RNA splicing of many studies cited in this and future papers are incorporated into the fundamental mechanisms of the system and are essential for its proper functioning.
connection with the induction of the pulling phenomenon; investigated autoradiographically in Chromatium leucane.


Cholesterol-\( ^{14}C \) had been shown by the author to be a precursor of ecdysone. Ecdysone has been demonstrated to induce molting and processes preparatory to molting, and to induce the synthesis of mRNA carrying the information for ecdysone biosynthesis. The induction of pulling in salivary gland chromosomes and the biochemical events leading to the structuring of the laminar cuticle are discussed.

171 Karlson, P. ECIDYSONE, DAS HAUTUNGSCHEROMON DER INSEKTE. (Ecdysone, the molting hormone of insects.) Naturwissenschaften 53, 18 (1966) 446-453. (In German)

Recent article. After a historical survey, the author discusses the concentration and isolation of ecdysone, the elucidation of its structure, its biological and biochemical effects, and its mechanism of action. Radioisotopes, although used in many studies cited are not mentioned specifically in the text.


The chemical, physiological, and chemical effects and the mechanism of action of ecdysone are reviewed. It was first isolated and found to be a pure, crystalline form, and the first to have its structure elucidated. Its mechanism of action, influence on genetic material and induction of messenger RNA synthesis are well documented. The use of radioisotopes formed an essential part of many studies cited. (e.g., tracer studies with labelled compounds that showed that tyrosine, dopa, and tryptamine are incorporated into the cuticle, the stimulation of RNA synthesis, etc.). There are many indications that the same mechanism of action may also be valid for other steroid hormones in manipulating target tissues. (An active discussion on the paper is repeated fully; see p. 494-502.)


A review with conclusions. Ecdysone, the molting hormone of insects, exerts its action at the level of the chromosome and induces messenger-RNA and in turn enzyme synthesis. In this respect hormones appear as general inducers and may be, in higher organisms, of far greater importance than substrates, which are of primary importance to bacteria. (CA 67:1967, 1645w)


Labelled glucose was injected into 3rd-instar larvae of H. bovis, the northern cattle grub, and the concentrations of some of the amino acids in the tissues of the grubs were determined. Alanine, proline, aspartic acid, and glutamic acid were readily synthesized and appeared to be nutritionally non-essential. The absence of radioactivity in phenylalanine, tyrosine, leucine, histidine, lysine, isoleucine, valine, threonine, and methionine showed that they were not synthesized by the cattle grub and were probably essential. Limited syntheses of glycine, serine, and arginine by this insect suggested that it would benefit from a dietary supply of these compounds. (GA: 66:1967, 16377w)


An induced radioactivity method for determining nutrient requirements is described. It depends on the presence of a readily metabolized compound normally available in food and labelled with \( ^{14}C \). Nutrients of interest such as amino acids are subsequently isolated from the organism: after purification, the radioactivity is determined. Substances that contain \( ^{14}C \) are considered to be nutritionally non-essential since they were synthesised by the organism. In contrast, those substances that contain no \( ^{14}C \) are considered nutritionally essential since they were not synthesised. The validity of the method was established by comparing results with those of the classical depletion procedure. Apparent discrepancies can be explained. The radioactivity method has already been applied to several organisms that cannot be reared on chemically-defined diets. In particular, it has been widely used for determining the amino
acid needs of phytophagous and other insects. Conditions used in determining amino acid requirements of different organisms by the indirect radioactivity method are tabulated and include the black blowfly, Phormia regina, the pine sawfly, Neodiprion sertifer, the wheat stem sawfly, Cnudus cinereus, the wheatworm Chilo suppressalis, the cutworm Agrotis orthogona Mon., the waxy grub Hypoderma lineatella, and the green peach aphid Myzus persicae. The dietary need of the hive bee, Bombus vulpinus, for cholesterol (and the lack of a dietary requirement for carotenoids by the rat) were confirmed by the radioactivity method. The amino acid requirements have been examined for a number of other species including Periplaneta americana and Blattella germanica. Factors that must be considered in the interpretation of results from the radioactivity method are (a) purity of isolated compound, (b) size and source of isolated compound, (c) radioactivity substrate, (d) metabolic period, and (e) administration of radioactive substrate. Radioisotope procedures have also been used to demonstrate utilization of protein and cellulose by insects. In addition, radioisotope may be used to measure the amount of food consumed and digestibility of dietary components by small organisms.


The effect of ecdysone on DNA and RNA synthesis, and on lecithin and glucose metabolism was investigated. 5 ml water (a 2 μg ecdysone) were injected into the posterior half of house fly larvae, together with 0.5 μg of 91-thymidine, uridine, -lecithin or -glucose. Most DNA synthesis appears to have been completed 24 h prior to pupation, whereas ecdysone appeared to accelerate RNA synthesis in the tissues examined (epidermis, fat body, muscles) by stimulating RNA-polymers. Although ecdysone-injected larvae showed some slight incorporation of lecithin into the epidermis, muscle, and intestine there was no increase with time, and the incorporation of lecithin is not considered to be closely correlated with the presence of the hormone. It appears that injected glucose is converted to polyamidines or related compounds and stored in the tissues. Ecdysone probably acts on glucose degradation in M. domestica larvae in the way it acts on Bombyx mori. (See 90)


Incorporation of L-tyrosine, generally labelled with 3H and given as a single injection into the haemolymph of the desert locust, Schistocerca gregaria Forsh., is shown to take less than 6 h, and the lag- phase is less than 1-2 h. The bright yellow fluorescent bands in resilin are synthesized during the 24 h period, whereas the faintly fluorescent bands are synthesized during the 9 h period. It is shown that the part of the peptider alan where two chlorine ions are missing is synthesized soon after emergence. (Essentially auth.)


The cell-free centrifugates prepared from crushed pupae 1-2 d of age were examined to their ability to take up 91-Ca bound amino acids into their proteins, with tagged alanine, glycine, threonine, -leucine, and tyrosine being used. Such incorporation was indeed found. Radiocarbon isolated during max. level of histamine had low activity; ribosomes from 7-d pupae had high activity. Amino acid incorporation was impossible in the presence of active tyrosinase. Amino acid incorporation in the cell-free system requires the presence of ATP and is sensitive to RNase and penicillin. (CA 64:1968, 29056g)

Deleed.


The primary function of the salivary gland in Chironomus thummi and C. tentans is to produce a secretion, puffing of the Balbiani rings on salivary gland chromatin, which represents sites of heightened RNA synthesis, has often been correlated with the production of secretion (Bockemeyer, E., Kriz, M., Lauffer). The pattern of Balbiani ring puffing is time and stage specific, as is the production of the secretion. Quantitative biochemical and immunological analyses of the salivary secretion revealed the presence of a number of enzymes (Lauffer). The enzymes included proteinase, trypsin, and chymotrypsin, which are also present in the gut. The salivary gland is the only known site in the body where proteinase is actively synthesized and secreted.


Most proteins found in extracts with this extractable salivary gland components are identical with those extracted from labelled 91 and 92 from the haemolymph of adult cockroaches. Labelled protein appears of saliva from the adult was not dispersed into a saliva gland other than the gland, being components of the secretion also synthesised in vitro by the peripheral component of the gland. This suggests the possibility that the photogenic chromosome.

182 Lauffer, W. DEUTSCHE Z. Zellul. REGEN. (Contribution to H. (Mochum Trav., West Germany).

The structural composition of the Balbiani ring was followed by hematoxylin counter staining. The particular a seriation, attention dels to the cuticle during secretion. The secretion of chironomus into the tyrosine, -100-110°C-DPA, - dopamine, -serotonin - dopamine were injected into lateral coelom and papa danicin Drosophila rather than chimio
of a number of enzymes (Lauder and antigens. Recently we found that all the major secretions antigens and enzymes occurred in other tissues as well as in the blood. Thus, an apparent paradox arose: tissue- and stage-specific parts appeared to be related to the secretion of proteins (representing more than 50% of the secretory mass), yet those proteins were not tissue specific. The following experiments appear to resolve this paradox. They indicate that salivary glands function predominantly to select, concentrate, and particularly to transport the proteins of the secretion. Furthermore, present evidence indicates that the gland does not synthesize any of the major secretory proteins. In late-stage Chironomus blood proteins were injected into larvae. Radioactive proteins promptly appeared in the secretion. Radioautographs of tissue sections showed that the radioactivity was located in cytoplasmic granules; these granules seemed to be formed at the ends of canals connected to the basal surface of the gland. Use of protease therefore appears to occur from the haemolymph by a process akin to pinocytosis. After the injection of radioactive human serum albumin into larvae, this heterogeneous protein was also recovered in the secretion, retaining its antigenic properties. We concluded that the major proteins and antigens of the secretion normally are derived from the blood. Since the presence of the haemolymph's sugars in salivary chromosomes is correlated with the secretory process, we suggest that the haemolymph's sugars in salivary chromosomes are correlated with the secretory process. These substances would not appear to be major constituents of the secretion itself. Thus, the specific secretion even of heterologous protein can be, and indeed seems to be, mediated by tissue-specific puffs. (Abstr.)


Most proteins found in extracts of isolated salivary glands were also present in the haemolymph, according to results with the electron microscope in acetylated gels. Certain blood proteins were labelled in the absence of salivary glands when 3H-aminoc acids were injected into the body cavity. These blood constituents are identical with proteins of the salivary secretion, since the same number of counts were precipitated from labelled blood by antibodies to either secretion or blood. The transport of proteins from the haemolymph to secretion can be demonstrated by 125I-labeled albumin injection into the haemocoel. Labelled proteins appeared in the secretion as demonstrated by the recovery of substantial quantities of albumin from the secretion and by high resolution radioautographs of sectioned glands. Albumin transfer was not diminished by consistent injection of saline or tyramine. These observations are consistent with a salivary gland transport function and suggest that blood components are synthesized at sites other than the gland, being subsequently transferred by the gland to the secretion. In addition to these components of the secretion which are concentrated by the gland, some fraction of the secretion is also synthesized in situ by the salivary glands. This was revealed by radioautographic analysis of glands cultured in vivo with a pulse of 3H-tyrosine followed by a chase with the unlabelled amino acid. Labelled protein studies indicate that phosphoproteins have a function in the nucleus. The fact that purified nuclear phosphoproteins form complexes with histones which are less inhibitory to DNA-dependent RNA synthesis than free histones (Lauder, in Symposium on "Regulatory Mechanisms in Nucleic Acid Protein Synthesis", Cold Spring Harbor Laboratory, Cold Spring Harbor, 1965, in press) suggests the possibility that phosphoproteins may be involved in the regulation of RNA synthesis in eukaryotic chromosomes. (From abstr.)


The structural composition and histological differentiation of Diploidea cuticles before and after pupation, followed by hormonal control, and change in tanning under the action of phenol caustic systems are discussed. The particular aspects studied were the changes in the chemical structure of cuticular sclerotin, attention being paid to the fat, distribution and compound formation of tanning metabolites in the cuticle during different developmental stages, and the incorporation of various labelled precursors into the cuticles. Labelled amino acids (generally labelled N-lysine, 125I-DL-lysine, 1-14C-DL-DOPA, 2,3,4,5-4H-hydroxyphenylalanine, 1-14C-tyrosine, 1-14C-DOPA, acetyl dopamine, acetyl DOPA, and glycerol) were injected into larvae 3 days before pupation, and the distribution of radioactivity between cocoon and pupa determined. Tyrosine incorporation did not involve protein synthesis. Phenol rather than choral substance appeared responsible for cuticle tanning. Tyrosine
incorporated primarily during the first 24 h of pupation, at a percentage considerably above that of dopamine. During pupation the water content of the cuticle dropped from 68% to 7%. The increase in dry weight by 31% is caused by the accumulating substance acetyl dopamine, by an unidentified carbohydrate, and a further protein. The cuticle content remains unchanged. Experiments with U-14C-tyrosine have shown that tyramine metabolites are firmly incorporated into the cuticles in the course of cuticulation. Apart from tyramine, N-acetyl-tyramine, a direct precursor of sclerotizing chitin, was found in the cuticles of pupae. In 12-h-old, just coloured puparia no N-acetyl-dopamine or radioactive tyramine can be traced even after extraction and hydrolysis. The presence of phenolic and phenolic carboxylic acids has, in part, been confirmed in Calliphora. They are not, however, formed from tyramine immediately before pupation. Para-diphenyl-acetone do not play any part in cuticulation. Fractionated chemical extraction of puparia gave fractions particularly enriched in labelled tyramine metabolites, the fractions containing only 1% protein. The major component consists of what is presumably a carbohydrate with markedly high O-content. The protein which lacks arginine, aspartic, and threonine can be separated completely by hydrolysis. Radioactivity remains in the carbohydrate fraction. When extracts are hydrolyzed before hydrolysis, 4 amino-acid-negative degradation products are obtained. The radioactive C4-chain proves that a chitin metabolite is involved in sclerotization. From the various data obtained the author concludes that the chitin tyrosine metabolite is responsible for the reddish brown colour, the incorporation of the cuticle components as a network within the complex sclerotin structure, and probably also for linking them to the chitin skeleton.


The title synthesis in the mutual glg was determined by chromatography and autoradiography. A purine base was utilized, in this case, adenine. (CA 64:1966, 1644g)


Using a specific quantitative method, 3-hydroxykynurenine was determined through a number of larval, pupal and imaginal stages of the D. melanogaster. There was a steady increase in the amount of hydroxykynurenine from the spinning larva to the middle of the pupal stage, reaching 1 mg/animal. During the same period the pattern of fluorescent compounds showed significant changes. After injection of [7H]-hydroxykynurenine several fluorescent compounds are labelled. The U-2-glucoside of 3-hydroxykynurenine was confirmed by synthesis. (CA 64:1966, 18771e)


The existence of oxomochromes in grasshopper was investigated. The brick-red pigment was isolated from the eyes. Compared with the usual oxomochromes the isolated pigment showed different characteristics as analyzed by paper chromatography and spectrophotometry. It could, nevertheless, be identified as an oxomochrome by means of experiments involving the injection of [14C]-tryptophan into larvae.

186 Lisanz, B. ZUR BIOCHEMIE DER OXMOCHROMATE. UNTERSTELLUNG, VORRUMMEN, BIOSYNTHSE UND PHYSIOLOGISCHE ZUSAMMENHÄNGE. (The biochemistry of oxomochromes. Their substitution, occurrence, biosynthesis, and physiological significance.) Naturwissenschaften 53, 11 (1967) 239-267. (In German)

Work on the dark eye pigments of insects is reviewed. Some radioligand studies are cited. Thus the red pigmentation in the eye of certain grasshoppers (variously called acridochromes, acridochromate and insectochrome) could be proved, by means of its incorporation of radioactive 3-hydroxykynurenine, to be of oxomochrome, rather than of oxomochrome. The term oxomochrome was subsequently used for it. The incorporation of labelled precursors into oxomochromes was demonstrated by means of methylene blue, U-14C and 3-hydroxykynurenine-4H into Cybus humoratus. It could thus be shown that the oxomochromes are not synthesized continuously but only for a short period at the end of each molt.


Two hours after the injection of the labelled protein, autoradiographs at the time of protein is considerably incorporated was being recorded, but than did the rest of the e. larvae with a foreign resorbing demonstrated, i may have realized from the blood to form:
considerably above that of the untreated larvae. The increase in weight was greatest among the larvae that had been fed a diet containing acetil-1-14C-leucine. Experiments with larvae that had been fed a diet containing acetil-1-14C-leucine showed that the increase in weight was primarily due to an increase in the content of protein, particularly in the midgut and the fat bodies.

The increase in weight of the larvae that had been fed a diet containing acetil-1-14C-leucine was also observed when the diet was supplemented with acetil-1-14C-leucine. The increase in weight was greatest among the larvae that had been fed a diet containing acetil-1-14C-leucine. Experiments with larvae that had been fed a diet containing acetil-1-14C-leucine showed that the increase in weight was primarily due to an increase in the content of protein, particularly in the midgut and the fat bodies.

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Genetic moth oocytes selectively remove proteins from the blood during the period of yolk formation; the blood proteins reach the surface of the oocyte by an intercellular route, enter the oocyte by phago-
cytosis, and become a component of the protein yolk spheres. The extent to which a particular protein enters the oocyte may be determined by its relative affinity for the surface of the oocyte; these base-
ment lamellae that form continuous boundaries between the oocytes and the haemocoel are also candidate
ates for the site of a selective mechanism. The primary objective of the work described in this contribution
was to obtain experimental evidence concerning the relative contributions of the basement lamellae and the oocyte itself to the selectivity of blood protein uptake. An autoradiographic analysis of the uptake of 3H-protein injected into the haemocoel indicated that selective transmission through the basement lamellae and active adsorption onto the oocyte surface both contribute to the selectivity of blood protein uptake. Evidence is presented, too, from studies of the incorporation of 3H-leucine into blood proteins and yolk, that the ovary itself synthesizes some of the protein deposited in the yolk spheres. Information concerning the relative rates of yolk formation by various regions of the oocyte cortex was also obtained: the rate of yolk formation by a particular area of the oocyte surface appears to be correlated with the ease with which material derived from the blood can reach it. (IA)


The insects used in Australia were 5th-instar larvae of *Ancepsus pterygorhynchus* (Ski) (Pentatomidae) collected from under the bark of sugar gums (*Eucalyptus cladocalyx* P. Macl. & A.) and adults of the pea-
let litter bug, *Pentatomodes sp. (Ski)* (Pentatomidae); from a laboratory culture maintained on peanuts,When injected into the haemolymph, D-glucose (unlabelled), fructose 1,6-diphosphate (labeled), and amino acids [DL-phenylalanine (labeled), DL-tryptophan (methylene-14C), and D-tryptophan (methylene-14C)], rapidly appear in the haemolymph of *Pentatomodes* and glucose, glycerol, and some amino acids are also incorporated into the precursor of the component of the saliva that solidifies to form the 'spatula svg'. Injection of a large amount of an amino acid into the haemolymph also causes the compound to appear in usual concentration in the haemolymph apparently due to ex-
cretory activity by the accessory gland of the salivary apparatus. Autoradiographic and chromatographic evidence is given for the occurrence in the various salivary secretions of carbohydrates and amino- and phospholipid.


A number of experiments were carried out to test the possible synthesis of salivary D-tryptophan (IAA) in Hemiptera, using *Ancepsus pterygorhynchus* (Ski) (Pentatomidae) and *Pentatomodes sp. (Ski)* (Pentatomidae). Injection of 1 µg D-tryptophan (labeled) in 2 ml of Millonig's and Scalling's saline solution into the haemolymph of larvae of *Ancepsus* of the 5th instar resulted in the appearance in the salivary glands, 1-1½ h later, of reduced quantities of labelled phenylalanine and other radioactive compounds with the same Rf as dihydroxyphenylalanine (DOPA). Results support an earlier suggestion that DOPA is the substrate for the salivary tryptophan synthesis, and indicate that phenylalanine is a precursor. Further experiments were done with much smaller *Pentatomodes*. In another experiment, D-tryptophan (methylene-14C) in 5 µl of saline solution containing 2 µg 1-phenyl-
alanine (methylene-14C) was injected. Autoradiography showed that in the homogenate of the salivary glands (including the accessory gland and ducts), a small amount of the tryptophan had been converted to a labelled compound with the same Rf as IAA. Chromatography of the haemolymph of injected insects showed that free tryptophan and phenylalanine are normal constituents; IAA synthesis is considered to occur naturally during salivation of these insects.


An extensive report is given of the biochemistry of juvenile hormone action in the adult *L. migratoria*, including respiratory experiments, experiments with radioactive compounds, arghosterol ethers of proteins, and electron microscopy. The role of juvenile hormones in respiratory metabolism is discussed, and a comparative study of the effects of starvation and some other operations is presented. The results are in accord with the concept that the fat body produces a considerable fraction of the proteins required for oogenesis, and with the ideas of R.G. Highman et al. (J. Insect Physiol., 13 (1967) 307) that the reno-
mitary cells activate protein synthesis in the fat body. However, a more independent role is suggested

195 Minnott, M., Odom, FORMATION OF GLYCINE OXIDASE. Seikagaku 20, 30-1 (1968).

38C-labelled glycocolate in amounts of escaped and alani-
ate of sitosterol, fat body, and amino acid, enzyme activity. The e-relevant data and gly-
phosphate (5 x 10^{-4} M NiSO_{4} to H_{2} (CA 65, 1869, 1968).

196 Nakazawa, T. FIBROIN IN THE FIFTH INSTAR L. FROM posterior silk glands was isolated, but the amount that DNA inhibited the synthesis of feto protein using the tape (CA 66, 1966, 1966).

197 Nishimura, C. QUANTITATIVE GRASS-COMMER (Chela). The distribution of sulphe in the development of its development cellular activities. gage 120 cm, at 120 cm/s for 45 years of analysis of inactivated eggs (without prediapause to the 8th prediapause eggs. The y number of titratable sulphur compounds treated with pulp 10-15, the 10-15, and even negative mesosoma groups in the y groups in prediapause, a diapause period parallel and the development of a direct relationship between embryo. The excrative, morphogenetic growth as possible for the breakdown the embryonic cells, new cell metabolism, Cycle hist in the reduced state. The histochemical demer-
tive data indicates postdiapause embryo.

198 Ocalda, T., Gotto, M. AMINO-4-DYTROK Seikagaku 20, 2 (1968).
for the corpora allata in this process. The data are more in accord with the idea that juvenile hormone exerts its activities in the presence of active protein synthesis and induces the formation of specific vitellogenic proteins. The change of lipid and glycolytic metabolism in the fat body may be explained in the same way. (CA 68 1968 1156a)


\(^{14}\)C-labelled glycolate was converted to labelled glycine in the silkworm in vivo. Less, but significant amounts of arginine and alanine were also formed. Glycylate oxidase activity was found in the homogenate of silkworm fat body. Other thiones, such as sildiglione and digestive tracts, showed no detectable enzyme activity. An enzyme system from the fat body also catalysed the conversion of glycylate to cysteine and glutathione. Glycylate oxidase activity was stimulated about 2-fold by the addition of 5 X 10^{-7} M \(	ext{NH}_4\)Cl to the system, while the formation of \(\alpha\)-ketoglutarate was significantly inhibited. (CA 68 1966 1005a)


From posterior silk glands of silkworm (Bombbyx mori) at the 5th-instar larval stage, fibrous nucleic acid preparation was isolated, consisting mostly of RNA and a slight amount of DNA. It was speculated from analytical data that DNA and RNA make up a complex in this nucleic acid preparation. Actinomyces inhibited the synthesis of this specific nucleic acid, which stimulated the incorporation of glycine-\(^{14}\)C into protein using the supernatant fraction obtained by centrifugation at 108,000 g for 60 min. (CA 68 1966 9466a)

197 Norman, G. QUANTITATIVE STUDY OF DISTRIBUTION OF SULPHHYDRYL GROUPS IN THE DEVELOPING GRASSHOPPER (Melanoplus differentialis) EMBRYO. Physiol. Zool. 27 (1954) 141-156.

The distribution of sulphhydril groups was studied quantitatively in the grasshopper egg which, during the course of its development, goes into a histologically blocked or diapause state in which metabolic and other cellular activities are greatly diminished. In one series of experiments, 4- and 8-cell embryos were irradiated at 150 kV, at 25 kR/min for 15 min (total dose 750 R), incubated in 50°C and subsequently lots were removed for amperometric analyses. The dose prevents embryo development. The curve representing the yield of sulphhydryl groups (without embryos) maintains a fairly constant level of -SH content from the 10th day of pre-diapause to the 8th day of diapause. This level of -SH is comparable to that found in normal zero-day pre-diapause eggs. The egg -SH curve for the controls (with embryos) shows a progressive decrease in the number of titratable sulphhydryl groups. Nonprotein alkali extracts of irradiated as well as control eggs, when treated with 10-15 mg of sodium borohydride for 30 min at room temperature, and titrated amperometrically, gave negative results. This indicates the absence of oxidized as well as reduced soluble free mercapto groups in the egg. Summarizing it may be concluded that the increase of titratable -SH groups in pre-diapause, a levelling-off during diapause, and the resumption of a rapid rise in the post-diapause period parallel the metabolic, mitotic, and morphogenetic activity of the embryo during these phases of development. The increase of embryo -SH occurs at the expense of the egg -SH. There is no direct relationship between the sulphhydryl content and the "blocked" or diapause state in the grasshopper embryo. The increase, abrupt rise in the level of -SH groups during postdiapause is associated with morphogenetic growth and differentiation. The embryo is probably the site of enzyme synthesis which is responsible for the breakdown of protein -SH in the egg. The nonprotein -SH (probably glutathione) enters the embryonic cells, serving as a substrate for protein -SH synthesis, as well as serving as a regulator of cell metabolism. Cytoplasmic -SH consists of protein and nonprotein thiol, with all the non-protein -SH in the reduced state. The yolk and nuclei do not contain oxidized or reduced soluble free thiol groups. The histochemical demonstration of protein-bound -SH in the embryo qualitatively confirms the quantitative data and indicates the localization of protein-bound mercaptans in nerve and muscle tissue of post-diapause embryos.

198 Okada, T., Goto, M. SYNTHESIS OF 3-AMINO-4-HYDROXY-8-HYDROXYMETHYLPREDNERONE-10,11-C9 AND 3-AMINO-4-HYDROXY-3-METHYLPREDNISONE-10,11-C9 AND THEIR METABOLISM IN ECHINOCOCCUS GRANULOMATOSUS. Sekigaku Zasshi 6 (1965) 440-446.
The biosynthesis of cephalin by D. melanoogaster, insect species, was investigated with 2-amino-4-hydroxy-5-hydroxymethylpyridine-10-\(^\text{14C}\) and reduced 2-amino-4-hydroxypyridine-10-\(^\text{14C}\). It was found that after growth with both labelled compounds, radioactive lysophosphatidylinositol and cephalin could be isolated by paper chromatography from the adult flies. The incorporation hypothesis concerning the biosynthesis of Drosophila phosvitin was thus proved to be correct. (From auth. summa.)


Glycocoll-1,2-\(^\text{14C}\), dissolved in Ringer solution, was injected into the 4th abdominal ring of 24 h old 4th instar larvae, respectively, larvae were killed in dry ice; green pigments were extracted with water and the latter were prepared after lyophilization of these extracts. Chromatographic study shows that the injected glycocoll-1,2-\(^\text{14C}\) is incorporated in the biliverdin, which is the hypoperoxidase and blood pigment of these two species. (CA 66 (51), 17350d)


The role of protein synthesis in the structure of giant chromosomes was followed by feeding \(^3H\)-labelled histidine to larvae for a 48h period 24 - 48 h before puparium formation. The pattern of incorporation into chromosome "puffs" was followed by incubation of expanded Drosophila salivary glands in a Ringer's solution containing the \(^3H\)-labelled amino acid. Following a short exposure to the isotope, one lobe of the gland was fixed immediately, as a control, while the other lobe was incubated in "cold" medium for periods up to 6 h. The "developmental stage" of the larva was determined by the number of hours that had elapsed from the beginning of the exposure to the time of incubation. The incorporated isotopes was visualized by the application of autoradiographic stripping film to chromosome smear. The autoradiographic patterns of incorporation will be presented and discussed. (Abstr.)


An autoradiographic study of \(^3H\)-histidine incorporation into non-histone proteins of expanded larval salivary gland chromosomes of D. virilis showed patterns of incorporation that were dependent upon the stage of larval development. The sequence of change in the development of several puffs in a specific chromosomal region was followed using the appearance of pigment in the anterior spiracles as a means of larval staging. \(^3H\)-histidine incorporation into these puffs in prepupae occurred as the puffs were regressing in size and protein staining. Acid extraction of histone and nucleic acid failed to alter the character of the autoradiogram; presumably non-histone protein is involved in the \(^3H\)-histidine incorporation. Other puff sites in the same prepupal chromosomes showed various patterns of incorporation. Incorporation patterns were reported for a specific region may not be true for all puff sites. (Abstr.)


An attempt was made to ascertain whether crovate can serve as precursor for synthesis of pyridoxamine derivatives in those uricotrophic insects in which the presence of amino crovate has not been demonstrated. After injection of radioactive crovate to C. euphalaica, active UMP and CMP were found in RNA isolated from the fat body and muscles. In RNA from H. pomatia hepatoamnion, radioactive UMP and CMP were found after administration of labelled crovate, aspartate, or bicarbonate. The presence of a dcrasamine and dcrasamine transferase in small hepatoamnion was demonstrated. In the two invertebrates studied, the biosynthesis of the pyridoxine ring probably follows the same pathway as in vertebrates. (CA 62 (3), 11018b)

* methyl monophosphate.
** cytosine monophosphate.

Price, G.M. THE LARVA OF THE BLO

The incorporation of uracil into the body of insects, by feeding \(^3H\)-labelled uracil, has been shown to be important for the biosynthesis of uracil nucleotides. During the interval studied no new \(^3H\) was found. (CA 66 (1), 17350c)

Price, G.M., FORM THE LARVA OF THE

The proteins in the Ithaca, in addition to being identified as being affected by changes in the medium, are a marked increase in the activity of the enzymes. (CA 66 (1), 17350d)


Fat body from blow-Ringer's solution, the presence of \(\text{Ca}^{++}\) affected by changes in the medium, there was a significant increase in the activity of the enzymes. (CA 66 (1), 17350d)

Reese, D.M., LUMINSKI, J. AND L-CYSTATHIO

L-Cystathionine and cystine of Bombyx mori is \(\text{L}-\text{Cys}\) for compounds have been carried out and cooperation of isotonically various tissues other than the body in particular.

Röll, E., BURGER, J. AND L-CYSTATHIO

L-Cystathionin and cystine of Bombyx mori is \(\text{L}-\text{Cys}\) for compounds have been carried out and cooperation of isotonically various tissues other than the body in particular.

Ray, J.W. THE Fibrillar NERVOUS SYSTEM. Brainst. J.W., 8

Reibel, E. END PRO 49-52.

A review of the origin of the nervous system, and its function in the honey bee. (CA 66 (1), 17350d)

Rembold, H. ZUM

in the honey bee. (CA 66 (1), 17350d)

The incorporation of \(^{14}C\) L-valine into fat body isolated from the larvae of the blowfly, C. erythrocephala, has been studied in vitro. The effect of various concentrations of L-valine and of a mixture of amino acids was studied at pH 6.5. The highest incorporation rates were obtained with fat body isolated from 4- to 6-old larvae, the rate falling off rapidly as the larvae became older. It was found that the fat body synthesized protein which was then released into the surrounding incubation medium. During the course of incubation the specific activity of this released protein increased rapidly until its level was many times that of the structural protein of the fat body. (Auth.)


The proteins in the haemolymph isolated from blowfly larvae of different ages were separated by electrophoresis on acrylamide gel. Their pattern was compared with that of proteins released in vitro by blowfly fat body and found to be almost identical. Fat body was also incubated in the presence of \(^{14}C\) valine, and the distribution of \(^{14}C\)-activity among the labelled protein was measured. (Auth.)


Fat body from blowfly larvae was incubated with a mixture of amino acids, \(^{14}C\) valine and various Ringer's solutions. The metabolism of phenylalanine was further examined by incubating fat bodies in the presence of \(^{14}C\) phenylalanine. Incorporation of \(^{14}C\) valine into protein was considerably affected by changes in the level of Ca, Mg, X, and Na in the incubation medium. During 60 min incubation there was a fall in the levels of alanine, aspartate, glutamate, and phenylalanine in the medium and a rise in glutamine and taurine. An examination of the in vivo distribution of free amino acids between various tissues of the larva showed that aspartate and glutamate were concentrated in tissues other than the haemolymph and that phenylalanine and taurine were concentrated in the fat body in particular.


Lanthionine and cystathionine have been isolated in crystalline form from the deproteinized haemolymph of Bombyx mori (silkworm) and Drosophila melanogaster (Japanese oak moth) by ion-exchange chromatography. Both compounds have been characterized as the L-carboxylthornin by enzymatic and physical methods. A preliminary survey of the distribution of lanthionine and cystathionine throughout a number of flya has been carried out and the results of this, together with some preliminary experiments on the in vivo incorporation of isotopically labelled materials, is reported. The presence of free L-lanthionine in insect tissue is invariably associated with a complete absence or, at the best, barely detectable traces of cysteine, cystine, and methionine. (Auth.)


A review of the origin and fate of urea acid, degradation of nucleic acids, ornithic acid II, excretion of ura, ammonia, amino acids, creatine, creatinine, and phospholipids.


58
Biopterin metabolism was studied in workers and queens, using $^{14}C$-biopterin. One quarter of the radioactivity was found to remain in the pupa and the imago. The rest was eliminated as faces prior to pupation. Biopterin scarcely metabolizes into other fluorescent compounds.


Biopterin is a characteristic component of royal jelly. Its metabolism was studied by following the development of queen larvae. Synthesis, separation, and characterization of the $\delta$ and $\gamma$-erythro-1,2-dihydroxypropyl-derivatives of $\delta$-amino-4-hydroxyphephrine are described. $\delta$ C$_4$-1-purified chromatographically via phosphonium cellulose was obtained as analogues. Its metabolism was investigated in rat, housefly, and bee. These insects metabolize it only slightly. In rats, the bulk of the injected $\delta$ is eliminated within a few days, having undergone only slight degradation. A test in Crithidia fasciculata, a markedly lower activity than in was observed in various phlebodines and pyrimidines. $\delta$-polypyrrole-vinyl-pteridines which have an O atom in the 3-position of the side chain in the L-erythro component are an exception. The possible application of polarographic methods for determining the structure of phlebodines is demonstrated by various examples.


Mulberry leaves with $^{14}$C-labelled isingalese were fed to silkworms (Bombyx mori). Silkworms obtained contained $^{14}$C-labelled isingalese. The isingalese was treated with K$_2$Cr$_2$O$_7$, acid hydrolysis, and crystallization. The spectra of specific activity, $6.6 \times 10^{-4}$ mU/g, and oxidized with performic acid to give cytochrome c having a specific activity of $6.8 \times 10^{-4}$mU/m. The findings indicate that $<10$% of the lysisomal (lysosomal) residue is formed.

\[
\begin{align*}
&\text{NH}_2 \\
&\text{CH}_2\text{N} (\text{CH}_3) \text{CH} (\text{OH}) \\
&\text{CO} \\
\text{CH}_3\text{NH} \end{align*}
\]

has its origin in cytochrome c. (CA 67,1967, 51552)


Larvae of the insect Argyresthia velutinana were reared aerobically on a synthetic medium containing glucose-$\delta$-$\text{C}^4$. Specific activity measurements of the amino acids indicated that the insect was capable of synthesizing certain amino acids from glucose. These results agree with those obtained by the amino acid deletion technique. (Abstr.)


Amino acids were determined by the indirect method in young adult T. urticae females. The mites were maintained on bean plants in the greenhouse, starved overnight, then fed for $24 \text{ h}$ on a chemically defined diet containing glucose-$\delta$-$\text{C}^4$. During the starvation period the concentrations of the amino acids dropped to about $15$% of those in mites taken directly off bean plants and analyzed. All protein amino acids and some non-protein amino acids were detected. The relatively high labelling found in alanine, aspartic acid, cysteic acid, cystine, glutamic acid, glycine, proline, serine, and threonine indicated that the mite is capable of synthesizing these amino acids from glucose; therefore these are classified as nutritionally non-essential. Arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, tyrosine, and tryptophan were also determined. (Abstr.)

214 Rogers, J.I., Jr.notin:A TENTED LITTLE attention has been given to the role of the Arctium lappa in the production of ethylene. This herbaceous plant produces a significant amount of ethylene when grown under controlled conditions. (Abstr.)

215 Schenk, C.E. SCLE $\beta$-amylase. A study of the molecular basis for the activity of the enzyme. (Abstr.)

216 Schnek, C.E., Harris, W.T. THE SYNTHESIS OF PROTEINS AND AMINO ACIDS. The lysosomal metabolism of the eukaryote. (Abstr.)

217 Schenk, C.E., Harris, W.T. SCLE $\beta$-amylase. A study of the molecular basis for the activity of the enzyme. (Abstr.)

218 Tschirn, C., and KUROSAKI, T. KINEMATIK DES BAUMER. Kinetics of the biological carbon cycle. (Abstr.)

54
555 Salorio, C.E. SCIENTIFIC In the BLOWFLY IMAGO. Science, N.Y. 144 (1964) 419-420.


In Tenodera and Drosophila, as in Calliphora, there are two main pathways of tyrosine metabolism. Firstly, the hydroxylation of Tyrosine and the synthesis of \( \text{N}-\text{acetyl-tyrosine} \) and secondly the degradation to phenylacetic acids. The analogy with tyrosine metabolism in Calliphora and the appearance of \( \text{N}-\text{acetyl-tyrosine} \) at the time of takedown suggests a mechanism similar to that found in the tubule of Calliphora. Maximal activities of Dopa decarboxylase in Tenodera are also found before pupation and at the beginning of the imaginal stage. The course of transaminase activity follows the opposite course. In Drosophila, the decarboxylase activity can be shown in vitro too. These findings are discussed in relation to results with other insects, - (U-\( ^{14} \)) -tyrosine, \( \text{N}-\text{acetyl-tyrosine} \), \( \text{N}-\text{acetyl-Dopa} \), and \( \text{N}-\text{acetyl-Dopa} \) decarboxylase were labelled compounds and injected, in aqueous solution, either intravenously or subcutaneously into the larvae.

Enzyme induction by ecdyson (1), the effects of 1 on RNA metabolism in the insect epidermis, and the action of 1 on isolated epidermal nuclei are reviewed. 1 initiates sclerotization by producing the sclerotizing agent N-acetyl-D-glucosamine indirectly through stimulation of mRNA synthesis and by induced enzyme formation. The primary site of action of 1 is on the nuclear epidermal cells. (CA 68:1588, 19680222).


After injection of glycine-2-lC and alanoinoalactosecarboxylate-4-14C into the butterfly Pieris brassicae in the chrysalid stage, the rate of incorporation into leucopim (2) and, guanine, and adenine was detected. Stimulation activities were observed after alanoino-2-lC, showing that the biogenesis of 1 was not independent from purine (1) biogenesis, and that 1 was converted to 1-glucosamine and that it was converted to 1-glucosamine, or 1, respectively, of structural changes. (CA 64:10562b).


The H4-RNA in the posterior silk gland of Bombyx mori was analysed by MAK column chromatography. The chromatographic patterns obtained were essentially the same as those from Philosamia蚕 body RNA (CA 64:254).

Shigematsu, H., Takahashi, H., Ooda, S. EFFECT OF ACTINOMYCIN AND MITOMYCIN ON FIBROIN SYNTHESIS IN THE POSTERIOR SILKGLAND OF Bombyx mori. Seikagaku Zasshi (J. Biochem., Tokyo) 55, 6 (1963) 604-606. (J English)

The posterior silk glands of 3, 5, 7, and 9 day-old larvae were removed after a single injection of actinomycin or mitomycin in various concentrations, and the incorporation of glycine-14C into 1 fibroin was measured. Inhibition of fibroin synthesis was observed between 1 and 2 days after actinomycin, while mitomycin was apparently not an active inhibitor. The DNA-directed synthesis of a specific RNA appears to be an obligatory 3rd step in fibroin synthesis. (CA 64:11062).


Posterior silk glands of the silkworm were collected from larvae on the 4th to 6th day of the 4th instar and after incubation at 35°C in glucose-14C, incorporation of radioactivity into fibroin in subcellular fractions was studied. The greatest and most rapid incorporation was observed in the supernatant (18000 rpm for 30 min). After deoxycholate (DOC) treatment, the soluble part of the fraction (M) (precipitate after centrifugation at 105,000 g for 60 min) showed an incorporation curve similar to that of 14C, but the incorporation to the DOC-insoluble part of the fraction (LM-5) (precipitate after centrifugation at 105,000 g for 60 min) was less and similar to that of the DOC-insoluble part of the fraction (LM-8) (large sediment) of fraction LM (precipitate after centrifugation at 20,000 g for 60 min). The rate of labelling of fibroin in the insoluble fraction (LM-8) after treatment of fraction LM with DOC was, as it was also the case with fraction CD, almost linear during the reaction period. After 10 min incubation, the specific radioactivity of fibroin in fraction R (particulate) was much higher than that in fraction F, which was obtained by further centrifugation of fraction 105,000 g for 10 min at 105,000 g.

Stadham, J.B., THE FATE OF CARBON-14 LAM MONQUITO, Aedes aegypti. The free amino acids of t. maintained on two different
METABOLISM IN INSECTS.


In a continuation of our experiments to elucidate the biogenesis of leukopterin, glycine-$^{14}$C and $^{14}$C-labelled amino acids were injected at the initial and nearly final stages of development of the cabbage butterfly pupae. The incorporation in leukopterin, glycine, and adenosine and the ratios of the specific radioactivities of these substances were determined. These ratios in the wings of the butterflies always approximate to one independent of the time of application. The amount of precursors incorporated in the pupae and the leukopterin increases steadily, reaching a max. at the 8th day of development.

The application of xanthine-$^{14}$C, glycine, adenosine and leukopterin show very similar specific activities. From these results we conclude that the biogenesis of leukopterin is not independent from that of purine biogenesis and that the conversion purine-$^{14}$C to leukopterin goes via a minimum of structural changes.

The results obtained so far fit into the general biogenesis scheme which was previously proposed by this laboratory. (Aud.)


The results obtained so far fit into the general biogenesis scheme which was previously proposed by this laboratory. (Aud.)

LYCINE-$^{14}$C INTO LEUKOPTERIN IN CABBAGE BUTTERFLY, Rombiya mont L.

The in vivo incorporation of valine-$^{14}$C into the proteins of various tissues of the Cabbage silkworm during its life cycle and under various physiological conditions was investigated. Tissues were dissected and their incorporation of the radioactive precursors was determined. The results obtained so far fit into the general biogenesis scheme which was previously proposed by this laboratory. (Aud.)


The results obtained so far fit into the general biogenesis scheme which was previously proposed by this laboratory. (Aud.)


The free amino acids of the adult female were investigated at seven different ages in mosquitoes maintained on two different dietary regimens (succrose, and sucrose and blood). In addition, certain
aspects of the metabolic fate of 14C-labelled α-alanine and aspartic acid were studied (0.1 μCi per 1.0 ml of 0.01 N HCl). Three tissue fractions (amino acid extract, lipoid fraction, and protein fraction) were analysed for radioactivity. Sixteen free amino acids were found to be consistently present in mosquitoes from the two dietary regimens; these sixteen amino acids included α-alanine, aspartic acid, glutamic acid, glycine, serine, threonine, proline, valine, methionine, histidine, leucine, tyrosine, phenylalanine, lysine, histidine, and arginine. Four other amino acids found but in rather low concentrations included β-alanine, taurine, cysteic acid, and methionine sulfide. Statistical procedures applied to the data on free amino acids indicated that diet alone had less effect on individual amino acids than did time or age. When time (age) was considered, diet was not particularly significant when time was included. Throughout the 46 d experimental period the concentrations of free amino acids in those mosquitoes given sucrose and blood were consistently higher than the concentrations in those mosquitoes given only sucrose as adults. The amino acid found to be present in the highest concentration in both sucrose-fed and sucrose and blood-fed mosquitoes over the 46 d period was α-alanine, comprising from 34-62% of the total amino acid concentration. The total amino acid concentration in both sucrose-fed and sucrose and blood-fed mosquitoes was found to range from 36-37 μg/g dry weight. The amino acid concentration in both sucrose-fed and sucrose and blood-fed mosquitoes was found to be highest at 36 d. Mosquitoes fed sucrose and blood were found to be slightly heavier per individual mosquito than those mosquitoes maintained on sucrose alone but mosquitoes from both groups reached their heaviest weight at 46 d. Analysis of tissue fractions from mosquitoes fed 14C-labelled α-alanine and aspartic acid revealed radioactivity in the amino acid extract, lipoid fraction, and protein fraction. For mosquitoes fed 14C-labelled α-alanine and aspartic acid were found to expire 14C-CO₂ at a rate in the range of 0.5 μg/g dry weight. The significance of free amino acids and the percentage of alanine and the radioactivity of the tissue fractions were discussed.


The biosynthesis of pteridines was studied in D. melanogaster. The 2-amino-4-hydroxy-6-(CD)-erythro-1',2',3',4',5'-tetrahydroxypyrrolopteridine was a bioprecursor. 2-Amino-4-hydroxypteridine (reduced) was also incorporated into biotin. A possible metabolic pathway of pteridines was discussed.


Review article divided into sections dealing with extracellular contributions to vitellogenesis (evidence for the uptake of blood protein by the oocytes, protein yolk deposition as blood protein, the role of entry, formation of yolk spheres from blood protein), ovarian contributions to yolk formation (the role of the follicular cells of the oocytes and trophectoderm tissues, and of the oocyte), and the control of yolk formation. Numerous studies are cited in which vitellogenesis had been used in the study.


The relation between corpora allata and protein synthesis during ovarian development in D. americana was studied. In all female locusts, allatectomized within 48 h after metamorphic adults, the ovaries remained small, and the oocytes neither grew nor deposited yolk. The haemolymph protein concentration of allatectomized locusts was low (1.06 g/100 ml) 95 h after allatectomy compared with the controls (1.72 g/100 ml). Electrophoretic study of the haemolymph protein revealed a gradual decrease and final disappearance of one of the five fractions in the experimental insects. In males, the concentration of this fraction was low compared with the females, suggesting that the formation of this fraction of proteins is sex-linked. Allatectomized insects showed a lower rate of incorporation of 14C-labelled amino acids into haemolymph protein (2400 cpm/mg protein) compared with the controls (3236 cpm/mg protein). In ovariatectomized locusts, the haemolymph protein concentration increased (1.08 g/100 ml) 14 d after ovariatectomy compared with the controls (1.85 g/100 ml). The concentration of the sex-linked fraction increased after ovariatectomy.

230 Traversfield, J.J., Shulock SECRETING CELL In American Society for Ge...

Electron microscope observations fixed in O₂-excluding picric acid, large Golgi complex, as marker. The role of the membrane between the two was recognized in large vacuoles aggregates of particles (differ from the usual "c" often the particles are in the arrangement of RNP crystal membrane. It contains material with an an intense annulus, particles and progresses but can be constructed in the particles of the form these particles, without typical light microscopy shows the structure that they were a material that includes.

231 Travis, J., McKay, W. AT THE ACTIVE SITE (C.

The reaction of the blood has been reported to take the titer of all of these to determine the amino acid, the essential subunit, and the isolation of a single results molecular weight and tryptic peptides pattern is composed of two like.


Investigations of protein sequence, new tool that different proteins may be used in the study.

233 Watanabe, H. PROTEIN WITH NUCLEAR-POLYH.

HI-hydroxylic was used as a polyelectrolyte. The virus in this work showed a high body weight, with more appreciably enhanced in active protein synthesis a polyelectrolyte growth.


Quantitative data are prepared.

Keatinge microscope observations on the amorphous and amphilactic stalks of the spider (Tegenaria domestica) fixed in 3% glutaraldehyde and 2% OsO₄ show that cells of this tissue, like cells of the exocrine pancreas, plasma cells, and osteocytes, have well defined arrays of granular reticulum, a large Golgi complex, and mitochondria. The nucleus, nucleolus, and nuclear envelope are not remarkable. The stalk, which has a stippled or reticulate appearance in the lumens of the glands, can be recognized in large vacuoles of the cytoplasm of these cells. In addition to these structures there are aggregates of particles (which look identical with the RNP particles) in the cell sap. These aggregates differ from the usual "cored" in that they are partly or completely remodeled by a membrane. Often the particles are very regularly arranged along the inner aspect of the membrane. In contrast to the arrangement of RNP particles of the granular reticulum, which lie along the outer surface of the cisternal membrane. The centre of this membrane-bounded new cytoplasmic component usually contains material with an appearance which resembles the stalk, but in some instances the contents have an intense ornithinolys. Though a sequence of forms starting with the aggregation of several small spherical particles and progressing through a membrane-enclosed particle-studded body to a large aggregate, the detailed sequence of the particles on the outer surface of the membrane is not clear. In order to identify the nature of these particles, alanine-8l was injected into the cisternal cavity of spiders. Autographs for light microscopy show labelling of the cytoplasm and stalk. One interpretation of these new cytoplasmic structures is that they represent polyribosomes-messenger RNA complexes in situ in a cell which is secreting a material that includes a large proportion of protein, riboflavin (Abstr.).


The reaction of the competitive inhibitor dehydroacetone with ATP in the presence of freezler luciferase has been reported to result in the inactivation of two of the six sulphohydryl groups in the enzyme. Because the titration of all of the sulphohydryl groups in luciferase results in total inactivation, it was of interest to determine the amino acid sequence in the vicinity of the protected sulphohydryl groups; labelling of the essential sulphohydryl groups with i-ethylmaleimide-1-C12 followed by tryptic digestion resulted in the isolation of a single radioactive decapetide whose sequence was determined. In view of these results molecular weight studies of native and denatured luciferase together with amino terminal analysis and tryptic peptide patterns of the enzyme were undertaken. The results indicate that freezler luciferase is composed of two like monomeric units of molecular weight 56,000 (CA).


Investigations of the properties of ribosomes and polyribosomes isolated from adult housefly, Musca domestica, have shown that the ribosomes on the part played by these structures in protein biosynthesis and suggest that nascent protein may be an important constituent that holds a polyribosome together. 14C-ribose was used in the study.


Hydrolyzate was used as a protein precursor to analyze protein synthesis in the larva infected with nuclear polyribosomes. The larva was administered perorally to 4th-instar larvae. On the 5th day after inoculation the larva was given a subcutaneous injection of 3H-thymidine (specific activity 185 mCi/mg, 30 pmol/g body weight), with subsequent examination of various tissues. Protein synthesis was not found to be appreciably enhanced in diseased cells, up to a point just prior to polyhedra formation. Subsequently, active protein synthesis was very pronounced around the newly developed polyhedra and correlated with polyhedrin growth.


Quantitative data are presented on the distribution of proteins, primary xanthoprotein, hemoepoiesis, cuticle proteins, and lectins in adults and developing pupae of the butterfly Colias eurytheme.
pletholone biosynthetic pathway in the developing wings of Callis was studied by the use of radioactive precursors injected into whole pupae and incubated in Kinger's solution with excised, developing wings. By comparison of the uptake incorporation by pupae and isolated wings of adenosine- and guanosine-1-14C; (1) and guanosine-6-14C, it was concluded that Callis forms the pletholone ring from guanosine (as a phosphorylated derivative) with loss of the C-8 of guanosine. Pletholone interconversions were examined by studying the kinetics of incorporation by the pletholone from I immediately after its injection into whole pupae, and by studying the incorporation patterns obtained upon labelled with incorporated into wings with xanthofermin-14C, leucotropin-14C, and erythrocrin-14C. The pletholone pathway is bipartite, one branch leading to position 6-s side chain-bearing pletholone, the other leading to pletholone not alkylated at position 6. Within the latter branch, xanthofermin serves as precursor of leucotropin and erythrocrin. The origins of the position 5 side chain of xanthofermin and the position 7 side chain of erythrocrin were studied by incorporation of radiolabeled with radioactive pyruvate, malate, lactate, succinate, fumarate, and 6-hydroxyhexylurea. There was no incorporation into the xanthofermin side chain from any of these, but there was marked incorporation into the erythrocrin side chain from pyruvate, malate, and lactate. In addition, xanthofermin made by Callis from I was oxidized to 2-amino-4-hydroxy-6-erythrocrin-6-carboxylic acid, and the specific radioactivities of the parent compound and oxidation product were compared. The observed loss of specific activity agrees quantitatively with that expected if the xanthofermin side chain arises by modification of substitution on the initial pletholone position 6 side chain derived from guanosine ribose. The prediction of the alternative hypothesis of cleavage and replacement of the initial side chain is not compatible with the values observed. (CA 69, 1967, 5299I/A).


Adult female Leucophaea fat body was incubated in a Warburg apparatus in the presence of [14C]-alanine with and without corpora cardicae. Corpora cardicae taken from animals in the stage of cooyte maturation stimulated oxygen consumption and synthesis of proteins in fat body of insects taken during the same phase of the sexual cycle. Incubation of fat body of pregnant females with corpora cardicae of cooyte maturation-animals resulted in increased oxygen consumption, but had no effect on protein synthesis. The fat body responds phase-specifically to the hormone of the corpora cardicae, which is probably stored in an inactive material. (Author, summary).

See also:

- Some biochemical aspects of insect metamorphosis. (Gilbert, L.I., et al., 1962)
- Glycogen accumulation during oogenesis and its premature release by blocking of the RNA supply. (Study on *Musca domestica* L.) (Engle, W., et al., 1967)
- Action of insect hormones on the fat of 14C-glucose in the disapplying, braining pupa of *Sarmia synthia pretor*. (Kobayashi, M., et al., 1967)
- Effect of DDT on incorporation of 14C-labelled glucose into proteins and soluble intermediates of nymphal *Triatoma infestans*. (Villa, E. et al., 1967)
- Control of synthesis of RNA and protein in disapplying and injected coropica pupae. (Berry, S.J., et al., 1964)
- Effects of hormone and injury on RNA synthesis in naturalistic motifs. (Berry, S.J., et al., 1967)
- The induction by ecdysone of puff modifications in the salivary gland chromosomes of *Chromatomyia texana*. (Clever, U., et al., 1960)
- Induction and repression of a puff in *Chromatomyia texana*. (Clever, U., 1960)
- Gene activity patterns and cellular differentiation. (Clever, U., 1966)
- Radiocarbon incorporation and nucleic acid synthesis in diteran embryos. (Bady, W.W., et al., 1967)
- The role of the nucleus in RNA and protein metabolism of the *Chromatomyia texana* cooyce. (Guerova, M.N., 1966)

1. 2. 5.


By light microscopic and electron microscopy examination, RNA was found to be synthesized in the nucleus and 5 of the chromatin. From microscopical examination,
studied by the use of radioactive
labeled adenine- and guanine-U-14C
in animals with excited, developing wings.

Effects of substrate on gene-controlled enzyme activities in cultured embryonic cells of

Drosophila. (Levitzki, M., et al., 1967)

Inhibitors of protein and glycogen metabolism by 3-isoleucine-6- and 4-isoleucine-9
resulting in the inhibition of gene expression.

Study on the structure and function of the lampbrush Y-chromosome in Drosophila. (Manning, W.

1967)

Effects of substrates on gene-controlled enzyme activities in cultured embryonic cells of

Drosophila. (Levitzki, M., et al., 1967)

RNA and protein synthesis in nuclei of isolated salivary gland chromosomes of Chironomus.

(Lezzi, M., 1967)

Insect embryogenesis: macromolecular synthesis during early development. (Lelethkin, R.A.,

1962)

Variations in metabolic activity during the larval development of Rhynchosoma. (Maitningly, E.

et al., 1965)

Variations in metabolic activity during the larval development of Rhynchosoma. (Maitningly,

E.M., 1965)

Formation of hormone and RNA synthesis in pupal tissues of Sialididae moths. (Oberlander, H., et al.,

1963)

Incorporation of uridine and leucine in vitro by Cornelia silkworm wing epidermis during


Apoptosis of structure of polyvaline chromosome multiple DNA of Drosophila hamlet derived from experiments with antibiotics. (Reiss, F.M., et al., 1966)

Nucleic acid and protein synthesis in somatic pupae. (Science, J.B., 1967)

RNA, protein, and uric acid content of body tissues of Periplaneta americana (L.) as influenced by corpora allata during ovarian development. (Thomas, K.K., et al., 1966)


Studies of the formation of the acidic protein and des proteins chez les Insectes. (Zolokas, M.,

1965)

Isolation of diglycoside-bound lipoprotein from insect hemolymph. (Chiao, H., et al., 1967)

Study on the function of some cells in the insect fat body, with special reference to
gonadotropic factors in the abdomens of Otochoeta. (Ries, K., 1965)

Cocoon, the growth of giant cells. (Ries, K., 1967)

Structure and function of ovary chromosomes and nuclei and extra-DNA during the oogenesis of
pinocytic and motile insects. (Ries, K., et al., 1967)

The deposition of nucleic acid in an insect, Calpodes etholus florl (Leptogaster, Hesperidinae).

(Coudert, W.V., et al., 1966)

Hormonal control of reproduction. 1. Initiation of oocyte development in the isolated abdomen

Gonadotropic lysophosphatidic acid. (Koenig, R.C., et al., 1965)

Isolation of proline in insect flight muscle and its significance in stimulating the oxidation of
pyruvate. (Fischer, R.B., et al., 1967)

Biochemical changes in the larvae of the variegated cutworm, Peridea sarcodes, after injection
with a nuclear polyhedrosis virus. (Van der Meer, L.P.S., 1967)

Use of radioautographs for studies on the ecology of tick vectors of disease. Progress Report,

April 1, 1966 - January 1, 1967. (Semancik, D.E., 1965)

Central amino acid transport in vivo. Effect of hypoxia induced by cyanide in vivo. (Lori, G., et al., 1967)

1.2.5. Nucleic Acids. Nucleotides.
synthesized in the nucleus in about 30 min after the injection of precursor and transported on rough endoplasmic reticulum to the cytoplasm in 24 h. (CA 85: 1986, 14818f)


The characteristics of RNA synthesis in D. hydei have been studied using autoradiographic techniques. A method for correcting grain counts for self-absorption of 3H-RNA is described. The correction factor was established by determining the specific activities of the nuclei in the midgut. It was found that the uncorrected grain counts for nucleolus were too low by a factor of 12. Those for nucleoplasm, by a factor of 3.5, and for the cytoplasm, by a factor of 3.4. When isolated salivary glands were exposed to uridine-$^{3}$H for a 10-min interval, label was localized primarily over the nucleolus; with a 1-min exposure to isotope, RNA in the nucleoplasm also was labeled. It was concluded that some portion of the nuclear RNA is synthesized in the nucleolus, and is not transferred from other regions of the nucleus. However, an examination of the time-course of incorporation does not exclude the possibility of a chromosomal origin of some fraction of nuclear RNA. After extraction of RNA with N HCl after incorporation of uridine-$^{3}$H, a small percentage of the label was retained. The label was assumed to be incorporated in DNA, possibly by conversion of uridine-$^{3}$H to thymidine-$^{3}$H. In Feulgen-stained nuclei, the non-extractable label was evenly apparent over the nucleolus, and with longer intervals in isotope, also appeared over the chromatin. In glands which had been preincubated in Actinomycin D before exposure to uridine-$^{3}$H, it was found that the non-extractable label was present only over the chromatin; the antibiotic inhibited incorporation of label into the intranuclear DNA. A 15-min preincubation with $10^{-7}$ M Actinomycin D, followed by a 3-min exposure to uridine-$^{3}$H, revealed an 88% inhibition of RNA synthesis in both nucleolus and nucleoplasm. With longer exposures to uridine-$^{3}$H, a gradual increase in the amount of isotope incorporated in both nucleolus and nucleoplasm was apparent. Glands which were incubated 25 min in isotope after Actinomycin preincubation incorporated about 80% of the control level of label in both nucleolus and nucleoplasm. A delayed appearance of label in cytoplasmic RNA indicated a dependence of this labelling on some nuclear process which is affected by Actinomycin. Incorporation patterns of uridine-$^{3}$H and cytidine-$^{3}$H were compared by exposing isolated salivary glands to labelled precursors, followed by transfer to a solution of unlabelled nucleotides. The data suggest that two different RNA's are present in the nucleolus. One fraction is characterized by a higher uridine incorporation, a rapid synthesis and rapid disappearance from the nucleolus. The second fraction incorporated less uridine, was synthesized more slowly, and remained associated with the nucleolus for longer periods of time. Similarities to the isotope incorporation pattern of the rapidly turning over nucleolar fraction and the RNA of nucleolus suggest that this might be a messenger type of RNA. (DA)


Embryonic cells were treated with thymidine-$^{3}$H and autoradiographed. Exposure for 6 h to thymidine-$^{3}$H resulted in 90% labelling of the metaphases. After 3.5-4 h of exposure, 80% of the metaphases were labeled. All of the chromosomes were labelled in most species, indicating that the cells picked up the label at various stages of the 3rd half of the 3 period. In male cells, the X chromosome was either late in duplicating or the loss to terminate synthesis along its entire length. The Y pair of autosomes was frequently labelled together with the sex chromosomes, while the other 2 pairs had little or no label. The data suggest that the pattern of late DNA replication coincides with the zone distribution of heterochromatin. (CA 63: 1966, 9925c)


Elements containing DNA have been found in association with nucleoli of third instar larval salivary gland cells of various Drosophila species. This DNA is defined by its secondary fluorescence when stained with acridine orange or orceinophosphate O; its sensitivity to nuclease digestion, and, in the case tested, its capacity to incorporate [$^{3}$H]-thymidine or to show a positive Feulgen reaction. It is largest in amount in the surface of nucleoli in standard squash preparations. Although there may be variations in the appearance of this material with larval age, its morphology is to a large extent species specific. (CA 85: 1986, 14818f)

270 Benzi, G., NUCLEIC ACIDS IN HEART. V. Phys. V.

The metabolism of nucleic acids studied, employing autoradiography, the synthesis of DNA possibly as a defense mechanism, and the multiplication of viral nucleic acids. Although the breakdown of heart syntheses of viral DNA has been completely broken, a

241 Berendes, H.D., DIFFER Drosophila. Chromosomes

The replication patterns of tubulin were studied by autoradiography in association with 3H thymidine synthesis, the effective thymidine incorporation in chromosomes was shown by autoradiography of the female X-chromosome and autoradiography of the female X-chromosome. The autoradiography patterns in the chromosomes and autoradiography of the female X-chromosome is discussed. (DA)

242 Berendes, H.D., Keyt, H. OF POLYTENE NUCLEI OF Drosophila. Chromosomes

The brain ganglia of Drosophila is particularly suitable for a study and is an excellent site for the autoradiography of the female X-chromosome. DNA synthesis in the X-chromosome of female Drosophila was established, which were sometimes but not always, autoradiography. It is a section of the X-chromosome and each of the types of chromosomes

243 Berry, S.J., Kirshner, PROTEIN IN DIADEMS, $1^{14}$-thymine, 10 µCi/g wet wt showed an increased synthesis
4. When isolated salivary glands were incubated with antibodies, the labeling was reduced compared to the control, indicating a possible role of reactivity in the inhibition of the labeled organ.

5. A notable difference in the expression of nuclear DNA between males and females was observed. In the male, the nuclear DNA is located in the nuclei of the testis tissue, whereas in the female, it is found in the nuclei of the oocytes.

6. The study of the distribution of nuclear DNA in different tissues of the D. melanogaster showed a significant increase in the male gonads compared to the female gonads.

7. The autoradiographic techniques allowed for a detailed analysis of the nuclear DNA distribution, providing insights into the cellular differentiation and development of the species.

8. The results suggest a possible role of nuclear DNA in the regulation of gene expression and cellular differentiation in D. melanogaster.
synthesis in all papal tissues, also the synthesis of several blood proteins. A precocious synthesis of a protein ("injury protein") which normally appears in the blood during adult development was also found to be stimulated by injury. This was confirmed by experiments involving the injection of \(^{14}C\)-labelled algal protein hydrolysate (1.46 mg / mg). Actinocyrin D, injected at 2 mg/g of body weight, blocks the injury-stimulated increase in blood protein synthesis and the injury-induced synthesis of injury protein. At concentrations of 0.6 mg/g, however, it prevents the induction of injury-protein synthesis but does not prevent the increased synthesis of other blood proteins. These results suggest that low concentrations of actinocyrin may inhibit the synthesis of new kinds of messenger RNA but still permit the continued synthesis of mRNA's already in production at the time the actinocyrin is injected.


The rate of RNA synthesis during post-embryonic life was studied in related silkworms (Lepidoptera): Hyalophora cecropia, Samia cynthia walteri, and Antirheses polyphemus, which have a pupal diapause, and S. c. autumnalis, which normally has no diapause. Autoradiographic determinations were made of the rate of incorporation of \(\text{H}^{3}\)-thyidine in various tissues during normal development and in insects subjected to endocrinological and surgical manipulations. The effects of inhibitors of RNA and protein synthesis during the life cycle were also analyzed. The effects of inhibitors of RNA and protein synthesis during various stages of the life cycle were also analyzed. The rate of RNA synthesis in many tissues roughly paralleled the rate of replication during various stages of the life cycle, but there were significant differences in temporal patterns of RNA synthesis not only between tissues but within a tissue. During larval molt cycles, chitinogenesis epithelia, tracheae, and foregut showed temporal patterns of RNA synthesis which correlated directly with the process of molting. In other tissues, the temporal pattern of RNA synthesis did not parallel the events of the molt cycle. The rate of RNA synthesis was higher during larval development than in any other stage. After pupation, RNA synthesis decreases in most tissues and is extremely low during diapause at which time only a few tissues such as hemocytes, brain, oocytes, Malphigian tubules, and perigonadal fat body continue to synthesize RNA at significant rates. During the first half of the pupal-adult transformation, the rate of RNA synthesis increased initially, but thereafter it decreased in many tissues. Exogenous injury to diapauing pupae stimulated RNA synthesis. A systemic stimulation of RNA synthesis which roughly paralleled the increased regeneration stimulated by injury was observed in all tissues except the gonads. A pupal cuticle was synthesized by the regenerating epidermata in the absence of juvenile hormone. When RNA synthesis was blocked in diapauing pupae with actinocyrin D, pupae survived and continued to synthesize proteins for 24 hours, suggesting that messenger RNAs survive for many days. When protein synthesis was blocked with puromycin, diapauing pupae died within 17 hours. During periods of rapid RNA synthesis such as larval life, early stages of adult development and after injury, the insects were promptly killed by low doses of actinocyrin. When RNA synthesis was low, such as during diapause, in late stages of adult development, and during adult life, they were insensitive to large doses of actinocyrin. Experiments on developing adults indicated that the mRNA for many specific developmental events was made many days prior to the event.


A mass of extranuclear DNA appears in the ows of Drosophila during germ cell development until it finally reaches the nucleus of the egg. It consists of fine fibrils. In Drosophila \(\text{H}^{3}\)-uridine was found to be incorporated into the entire region within the oocyte nucleus taken up by these fibrils. Such incorporation was not confined to the early stages but also continued in the later stages of oogenesis. The possible function of the DNA mass is discussed at this admittedly preliminary stage of the investigation.

246 Bristow, M. L., Jacob, I., Stahl, J. L. ANALYSIS OF NUCLEIC ACID RNA SYNTHESIS IN DIFFERENT SALLIVARY GLANDS. Arara Biol. 120, 1/4 (1965) 569-587.

Salivary glands of larvae of Drosophila melanogasterse were removed at the 6th week and incubated with uridine \(\text{U}^{3-}\)-\(\text{H}^{3}\), \(\text{U}^{3-}\)-\(\text{H}^{3}\), \(\text{L}^{3-}\)-\(\text{H}^{3}\), \(\text{L}^{3-}\)-\(\text{H}^{3}\), \(\text{L}^{3-}\)-\(\text{H}^{3}\), \(\text{L}^{3-}\)-\(\text{H}^{3}\), 2-methyl-\(\text{H}^{3}\), and \(\text{H}^{3}\)-uracil. Surprisingly

247 Camargo, E. Pezzuto. TRITIATED ACTINOMycin D.

Salivary glands were de-\(\text{H}^{3}\)-actinomycin D for 3 hours and exposed to actinomycin D. Each label was then exposed to digestion of preparation of actinomycin D. The last of the mixtures was prepared to demonstrate in vivo

248 Casey, E. W. SOMA. 7th-4 - September 1, M.

Progress is reported on an injection of 6-bromo-d, 5-bromodeoxynucleotides.


The influence of r-iodo 6-iodo-2-deoxyadenosine on the life-history of Drosophila melanogaster, after 3 hours a 20 mg injection. It is concluded between DNA synthesis.

250 Chauhan, K. D. IONIC ACID IN Tribolium con.

The in vivo synthesis of RNA at different stages is observed to be inhibited, which in a non-existent larval growth phase, all rate of DNA synthesis, and that of the larvae Drosophila. On the other hand, DNA of the insect is the

251 Clarke, K. U., Gibbon, GANGLION IN Leukem. 7 (1967) 27-84.

A physiological investigation of the effect of light and in control operated and small of absent, and the
gradient analysis of RNA synthesized by the glands showed the newly formed RNA to be highly heterogeneous with labels in soluble RNA, ribosomal RNA, and RNA larger than 28S. In the presence of DMSO (D, L-dithiole-1-D-thiole-4-sulfoxypentane) and TRH (4, 5, 6-dithiole-1D-thiole-4-sulfoxypentane) the incorporation of labelled material into the RNA of the chromatin and cytoplasm, but not the nucleus, was inhibited. Radioactivity in this case was mainly in low-molecular-weight RNA (4S). Labelled D-thymidine-3H was transferred almost specifically to the nuclear 4S RNA, the transfer of 3H-C representing transmethylation to the RNA. The amount of methylated-3H-RNA was very small. When incubated with D-thymidine-3H the nuclear RNA contained a significant amount of ribosomal-3H, further supporting the theory that transmethylation is to newly synthesized 4S RNA. 


Saliivy glands were derived from 3rd-instar larvae of Drosophila melanogaster and D. hydei. 1H-actinomycin D was used (0.3 ml 10μCi/ml of water). Acid and enzyme extractions preceded exposure to actinomycin D. The specificity of 1H-actinomycin D binding for DNA is evident from (2) label only being detected at known DNA sites, and (3) a total absence of label following degradation of preparation with RNase. This has no measurable effect on subsequent binding of actinomycin D. The amount of binding is affected by the method of fixation. Hydrolysis of salivary gland squash preparations with RNase in complete suppression of subsequent binding. - Attempts to demonstrate in vivo binding of actinomycin D are discussed.


Progress is reported on studies on the induction of somatic mutations in the moth Sphingina by the injection of 5-bromo-2-deoxyuridine, 5-bromouracil, or DNA from Sphingina during various development stages. 1H-thymidine was used in conjunction with 5-BDU.


The influence of 5-BDU on the formation of abnormal scales was studied. Labelled 5-BDU is injected into 3rd-instar larvae is taken up by the nuclei of the wing buds. 5-BDU and thymidine, injected into 3rd-instar larvae, induce an immediate increase in the number of mitoses, followed after 3 h by a decided drop. Labelled thymidine is not found to be incorporated into mitotic figures up to 2 h after injection, and only a small proportion of metaphases are labelled up to 24 h after injection. It is concluded that the C-G period is very long or irregular, so that there is no relation between DNA synthesis and the time of the next mitosis.


The in vivo synthesis of DNA, as shown by the rate of incorporation of 3H-thymidine, has been investigated at different stages in the life cycle of T. castaneum. During the larval period, a close similarity is observed between the rate of DNA synthesis and the pattern of growth. The pupal stage, which is a non-growth phase, is characterized by a cessation of DNA synthesis. During the larval growth phase, although the 3-d-old larvae have the lowest and the 13-d-old have the highest rate of DNA synthesis, the rate of DNA degradation in the older larvae is almost twice as great as that of the younger larvae. These findings are consistent with the observed total concentration of DNA of the insects at these stages. (Amb.)


A cytochemical investigation was made of the RNA content of the cells of the mid-gut, fat body and epidermis in 3rd- and 4th-instar L. migratoria. From which the frontal ganglia had been removed, in control operated and in starved animals. In operated locusts the nucleus was smaller, the nucleolus small or absent, and the cytoplasmic RNA much less than that found in operated controls. No differences
were observed in the DNA content of the cells. No "all-or-none" effect has ever been noted following the removal of the frontal ganglion. For example, there was some synthesis of mid-gut protease, some incorporation of uridine into RNA within the medulla, and some incorporation of C\(^\text{14}\)-glycine into proteins. Autoradiographic studies were made of the uptake of H\(^\text{3}\)-uridine into the cells of operated and control operated larvae. In operated larvae the appearance of labeled uridine in the nucleolus was delayed, the rate of uptake slower, and the total amount incorporated less (even more than 20\%) than in the controls. Studies were made of the uptake of C\(^\text{14}\)-uridine into the nuclei of operated and control operated larvae. Nuclei were isolated from locusts killed at known times after the syringe had been injected and their radioactivity was measured. The results confirmed those found in the radioautographic studies. The significance of these results is considered in light of the Jacob & Monod model of the control of protein synthesis.


\(^3\)H-ecyton was injected into last-instar larvae, and the chromosomes autoradiographed. The modifications observed in the chromosomes are apparently a morphological indication of gene activity in the particular regions involved.


The distribution of active sites within the genome as well as the relationship of their activity to other physiological processes within the cell has been studied in different laboratories, making use of the "puff" phenomena which occur in the giant chromosomes of Diptera and which have been accepted to represent synthetically active genes. Work in this field is reviewed, and numerous studies quoted in which autoradiographic techniques have been used.


Special attention is paid to puff phenomena. Various differences in chromosomal structure and changes in differentiation are discussed, with the aid of ecyton. Autoradiographic methods are used extensively in much of this work.


Two puffs in salivary glands, I-18-C and IV-2-B, seem to be controlled by the concentration of ecyton. Towards the end of the feeding period, IV-2-B regresses while I-18-C is still of maximal size. Injection of ecyton into old puffs does not re-establish IV-2-B, whereas this locus in larvae of all other stages rapidly responds to the hormone. Hæmolymph from old puffs without IV-2-B induces puffs I-18-C and IV-2-B when injected into last-instar Internuntial larvae, and thus stimulates the effect of injected ecyton. This ability is not lost by heating the hæmolymph to 97°C. Hæmolymph from Internuntial larvae does not have any effect, whereas hæmolymph from very young last-instar larvae has an effect on IV-2-B. Tissue puffs, although it has the effect of ecyton, is found to larvae before they examine the effect of DNA H\(^\text{3}\)-uridine-acetone medium of H\(^\text{3}\)-amino acids into ecyton, but not into ecyton treatment, while after 24 h. The H\(^\text{3}\)-amino acids were compared. Hæmolymph is high at the end of the stage in which the nymph is considered.

257 Clever, U. GEN ACTIV 35-41.

Putting in giant chromosomes these chromosomes, in an 1960 have been observed in patients of potential activity of these loci, it is by factors of the extracellular matrix function, such as to more basic metabolic functions with changing cell function glands of Chasmocephalus act breakdown at the end of the larvae islar, but the enzyme specifically active during the metamorphosis. The induction of the new steps in this sequence, synthesis, either by including the subsequent puff synthesis as, as an outgrowth of the whole general problem of the cells.

6 Numerous supporting text
very young 1st-instar larvae and from young prepupae apparently has a slight effect on I-18-C, but no effect on IV-2-B. Treatment with cycloheximide results in the reappearance of IV-2-B in old prepupae, although it has no effect on pupation as this occurs in larvae of other stages. To examine the effect of cycloheximide on protein synthesis, I-35-uridine and I-35-valine (-50 μC/ml) were injected into larvae after various periods of treatment and incorporation was allowed for 1 or 8 h. To examine the effect on RNA synthesis, glands were incubated at intervals and incubated in a I-35-uridine-containing medium (20 μC/ml) containing 10 μg/ml cycloheximide. Almost no incorporation of I-14-C into cytoplasm or TCA precipitable material was detected after 4 h of cycloheximide treatment, while incorporation of I-35-uridine into chromosomes and nucleoli was unchanged after even 24 h. The I-35-uridine incorporation pattern in cycloheximide-treated glands and in control glands were compared. Puffing is prevented by actinomycin D. It is concluded that the sites of edeysone synthesis is high at the end of the prepupal molt. This implies an antagonistically acting factor at this stage which mediates IV-2-B. The apparent relationship of this factor to protein synthesis is considered.


Puffing in giant chromosomes of Drosophila is considered to reflect the pattern of active gene loci in these chromosomes. In any one case only a relatively small portion of the total bands (about 10 to 20%) have been observed to form a puff at some time in another in larval development. These patterns of "potentially active" loci are specific, though greatly overlapping. The actual rate of activity at these loci is controlled independently in each other and independently in each tissue by factors of the extracellular metabolite. Puffing at some loci seems to be related to specific cellular functions, such as secretion of the salivary glands. The activity of others may be related to more basic metabolic processes. In relation to larval development, puffing patterns may change with changing cell functions or with developmental processes in the cells themselves. In salivary glands of Chironomus activity of DNase and of acid phosphatase seems to change in relation to cell breakdown at the end of the prepupal molt. Changes of acid phosphatase activity begin early in the larval instar, but the enzyme is bound to lysesomes until metamorphosis. This suggests that the genes specifically active during metamorphosis have an interaction with a long-term control-system of development. The initiation of metamorphosis is a sequential process, gene activations being among the first steps in this sequence. The activation of these genes by edeysone is independent of protein synthesis. It is only the reaction of these genes that leads to the subsequent events in the cell, including the subsequent puff activations. This is shown by the fact that they depend on early RNA synthesis as well as on protein synthesis. These results on puffing are discussed with regard to the general problem of the relationship between patterns of gene activity and differentiation. (Auth.)


Thymidine metabolism of the silk gland secretory tissue was examined during in vitro incubation of glands taken on the 4th day of the 5th stage. The cell walls showed a high permeability to thymidine, and the nucleoside was converted to nucleotide in the glandular cells. Enzymic reactions were negligible. The total amount of nucleoside-forming increased to a maximum within 30 min incubation, and this maximum level was maintained for at least 60 min. Some thymidine mononucleotides were released into the incubation medium. Thymidine mononucleotides, dT-, and tri-phosphates were formed, the latter during the last 5 min of incubation. The equilibrium between the various enzymic reactions changed during the incubation. Although the total quantity of nucleotides increased, the relative proportions of thymidine triphosphate and monophosphate, but not of thymidine diphosphate, varied. The phosphorylation reaction appeared to be blocked at the initial stages after the 1st 5 min of incubation, although the production of thymidine triphosphate increased during the 2nd 5 min of incubation. Thymidine was incorporated into DNA at a constant rate, and the labelling of DNA appeared to be insensitive either to variations in the amount of thymidine triphosphate or to the increase in the amount of labelled nucleotides. (CA 68: 1149v)

In in vitro incubations, radioactive thymidine in the medium was exchanged with part of the endogenous thymidine in the silk glands obtained from silkworms in the 4th day of the 5th instar. Not all of the precursor was directly available for DNA synthesis. A reserve compartment and an active compartment within the cell are postulated. (CA 69:1968, 7697b)


"H-methyl thymidine was used. Though the DNA synthesis in the silk gland on day 6 of the 5th stage is slowed down, thymidine easily penetrates into the in-vitro incubated gland. The activity of the phosphorylating kinases is lower in younger glands. However, the rate of production of the nucleotides is higher than their rates of utilization by DNA, which incorporates the precursor at a very low rate. On increasing the thymidine concentration of the medium, the incorporation of the precursor into DNA soon reaches a max. (0.50% nucleic acid synthesis/h). The amount of endogenous thymidine precursor available could not be accurately estimated; it is ~0.01% of the thymidine contents of the gland DNA, and does not seem to be capable of ensuring more than 1.3% synthesis. The possible parts played by thymidine kinases and endogenous precursors in the regulation of DNA synthesis are discussed.


The transport towards the silk gland of the nucleotide injected in the haemocoele is very fast. Experiments were carried out on days 3 and 4 of the 5th instar. At both ages, the major part of the thymidine disappears from the haemocoele within 10-15 min, due to immediate metabolism of the nucleotides. On day 2, 15 min after injection of labelled thymidine, radioactivity in the gland is due to nucleotides or degraded compounds. The labelled nucleotides (thymidine-O-3H and "H-methyl-thymidine) are soon incorporated in the pool of endogenous precursors. The rate of appearance of labeled nucleotides may therefore be roughly equated to the rate of renewal of the endogenous pool, i.e. 8.6 times/h on day 3. Under these conditions, the precursor is very quickly incorporated in DNA, from the start of the experiment. The rate of labelling then slows down; peak DNA radioactivity is reached within 2-3 h, on days 3 and 4. The decrease in specific radioactivity allows DNA synthesis in the gland to be estimated. On day 6, a slowing up of the various processes was observed. - Findings are compared with in vivo results.


Larvae from the late 2nd to the late 3rd instar were given "H-thymidine in their diet during 11 h period. The first developmental stage studied. Autoradiography of the salivary glands showed an initial intensive synthesis to 4.5 times the original DNA after which the labelled nuclei decreased rapidly to 20% of the amount observed with the x-ray. At 159 h, a period of synthesis occurred increasing to the papillae. The DNA content per gland during a restricted period in the 2nd instar corresponded to at least two doublings. These results are based on physiological events in molting but not with ecdysone. (CA 66:1967, 8831d)


A group consisting of L. Darsali, A. Ass, C. Gérard, N. Lacroix and R. Tenche have between them been investigating the action of hormones on giant chromosomes of *Drosophila* (using "H-thymidine and "H-uridine).

Darsali (cf. 6, 2.1) has shown DNA and RNA increase in the size of Teneur and Lacroix (9) in +RNA synthesis, by Floc (cf. 6, 2.2) found much more uniformly Darsali and Tenche have found that DNA and RNA increase when ENase inhibitors are used during the preparation of the RNA. The same data is true for RNA synthesis by the enzyme that covalently binds to enzymes. At the incorporation of *H*-labelled labelled RNA in distal cell in the proximal cell.


Autoradiography of egg of the cells of the syrinx before maturation of the olfactory organ was 3.7 x 10^5 pg of DNA of egg plus following low egg ratio increases show that RNA is synth. RNA is transferred from

Darsali, J. E., Dansel FROM ISOLATED NUCI. *Bioch. Biophys.* 23, 2, 1971. "H-thymidine and "H-uridine and "H-cytidine components of *C. elegans* component which is composed of the heavy 30S. The finished heavy be a specific intermediate and subcellular component a labelled 45 RNA peak label among the chromosome also produce poly(d,p sper function of hereditary polydipsia RNA has a (Essentially auth.))
DESALI (cf. 6.2.3) has found that basic proteins (various fractions of haemolymph have been tested) strongly inhibit DNA and RNA synthesis in all bands. Microinjection of tryptophan into larvae has caused an increase in the size of existing pupae, and increased incorporation of uridine into the chromosomes. Tencer and Lareux (8.2.3) have attempted a direct demonstration of the role of nucleolar organizer in r-RNA synthesis, using autoradiography, without obtaining positive results so far. From (cf. 8.2.3) it has been found that in Drosophila, ribosomes are localized to "crypts" which appear more uniformly than the Feulgen reaction, so that interbands may also contain DNA. Lareux, DESALI, and TENCER have found a histone labelling with actinocytin in Chironomus which becomes homogenous when RNase treatment is given.


The autoradiographic localization of spermazime (1) and the effects of polyamines on RNA synthesis in vivo in polytene chromosomes of D. melanogaster were reported. An initial decrease in RNA levels during the prepupal stage was followed by a significant increase in RNA on pupation. A 2nd increase in RNA coincided with the maturation of the adult organs of the imago. The increase in polyamine content, most notably of putrescine, during the prepupal stage was followed by a decrease upon pupation. At approx. the midpupal period, i.e., when the imaginal eyes were pigmentation, the prepupal polyamine levels were re-established. Upon feeding, the level of putrescine dropped markedly, and concurrently small increases in the levels of S and spermine were observed. 1 at 6.0 x 10^-4 and 10^-3 partially inhibited "H-labelled uridine incorporation into the nuclei in salivary gland cells of D. melanogaster. 1 at 6.0 x 10^-4, 4 x 10^-4, produced concomitant changes in nuclear structure. All spermine concentrations investigated (2 x 10^-4 - 4 x 10^-4) strongly inhibited the incorporation of "H-labelled uridine. Although the nuclear to cytoplasmic labelling ratio of tritiated 1 in dorsal cells of the salivary gland is approx. 1, the label appears uniformly distributed in proximal cells. (CA 63: 2166, 4757b)


Autoradiography of eggs of G. bimaculatus, labelled with thymidine-3H and adenine-14C show 50% of the cells are synthesizing DNA. Traces of radioactivity were observed in the cytoplasm just before cessation of follicle epithelial activity. Analysis shows 9-12 x 10^-9 of DNA/egg compared to 5.7 x 10^-9 of DNA/ploidal sperms, confirming the occurrence of endonucleases. The A/T ratio of DNA of eggs plus follicle cells is 3.8, of eggs alone 3.8, and 1 in the DNA of testes. The low egg ratio increases during embryonic development to 1 at the blastula stage. Autoradiography shows that DNA is synthesized by d in chromosomes, passing to metaphase and cytoplasm in 40 d. RNA is transferred from follicle cells to the ovary. (CA 65: 2369, 8986p)


3H-uridine and "H-erythrodine were used. Sedimentation analyses of labelled RNA from isolated nuclear components of C. termitus salivary gland cells are presented. It is shown that nucleolus forms a 35 S component which is converted to one 30 S and one 16 S component. The 5S fraction is probably composed of the heavy ribosomal RNA fraction and an intermediate precursor, stably larger than 5S. The fraction of 17 S RNA fractions, into which the 20 S component is believed to be a specific intermediate precursor, was observed in the nucleus. Label due to preribosomal and ribosomal components was absent from chromosomes and nuclear sap. The nucleoli do not show a labelled 4 S RNA peak, in contrast to chromosomes and nuclear sap. The distribution of 4 S RNA RNAlabel among the chromosomes suggests its formation from a large number of no. The chromosomes also produce polydisperse RNA in the sedimentation range of 10 - 30 S. The polydispersity is not a function of heterogeneity in band origin but is found in the RNA of the single Balbiani ring. The polydisperse RNA has a sedimentation range that is higher than that reported for messenger RNA.
RNA synthesizes from fly larvae and yeast were fractionated on DEAE-cellulose columns. The insect-derived thymidylate RNA synthesizes gave two phenylalanine-synthetase, $E_1$ and $E_2$, differing in elution by aqueous NaCl, which corresponded to the 3 phenylalanines types of s-RNA in the fly larvae, as shown by aminoacylation with phenylalanine-14C. The yeast-derived synthetase material gave but one fraction of active enzyme in $E_2$ fraction eluted from DNA-cellulose by aqueous NaCl. This was identical with the 1st fraction of phenylalanine type of s-RNA of the fly larvae. Thus, there is a universal type of phenylalanine s-RNA. The other insect RNA-synthetase was apparently specific for the insect. (CA 69, 1967, 23569m)


Owing to the fact that diptheric insect embryos are closed systems and exhibit high impermeability to water-soluble metabolites, it was difficult in the past to determine the biochemical changes that occur during embryogenesis in these organisms. Studies in our laboratory with P. americana have shown that these difficulties can be overcome, and that histologically labelled metabolites can in fact be used to study diptheric embryo development. Eggs are collected for 1.5, sterilized and de-chlorinated with NaClO, transferred with sterile Ringer's solution to flasks containing sodium lactate, and then vigorously aerated by shaking during the entire developmental period. Viability is high and good synchrony in development is obtained. Aqueous solutions such as H++ DMEM, uridine, thymidine, and glucose, and HCl, are readily taken up, and, as indicated by chemical fractionation experiments, are assimilated into the expected macromolecular components. With this information at hand, studies were undertaken to delineate the nature of nucleic acid formation in these embryos. The embryos were incubated with ^3H-uridine, ^3H-thymidine, or ^3H-glucose for various periods. This was followed by extraction of the nucleic acids with phenol and purification by alcohol precipitation and chromatography on columns of methylated albumin-sucrogels. The oligosaccharide fraction was rapidly labelled at all stages of development. The synthesis of soluble RNA and ribosomal RNA, however, did not occur until approx. 25% of the total development period (18 h) had elapsed - a time corresponding to the onset of gastrulation. A nucleic acid fraction containing H from both ^3H-uridine and ^3H-thymidine was detected during the early stages of nuclear acid synthesis and presumably represents RNA-DNA hybrid material. The formation of B-galactosidase and the pattern of protein biosynthesis were also measured in these organisms. (Abstr.)


The pathway of deoxycytidine utilization was investigated in developing pupae of Hyalophora cecropia. The following intermediates were identified in a single assay system starting with deoxycytidine: deoxycytidine, deoxyuridine monophosphate, thymidine monophosphate, thymidine diphosphate, and thymidine triphosphate. The existence of this pathway was confirmed in several ways in addition to the detection of the actual intermediates. First, the injection of [methyl-3H]deoxycytidine or [methyl-3H]deoxycytidine into developing pupae resulted in the incorporation of the label into the thymine moiety of DNA and no significant radioactivity was detected in the cytochrome cy, Second, omission of various components from the complete assay system produced a predictable loss of certain intermediates. Third, the activity of other enzymes which might compete with this pathway were not detected or detected in trace amounts, e.g. deoxycytidine monophosphate deaminase, deoxycytidine kinase, thymidine synthetase, deoxycytidine monophosphate kinase and deoxycytidine degradative enzymes. The enzyme which converts deoxycytidine monophosphate to thymidine monophosphate (thymidylase synthetase) was not detected in dispersing or inducing dispersing pupae, but was present in significant amounts in developing pupae. The injection of [methyl-3H]thymidine into developing pupae also resulted in the association of radioactivity with DNA-thymine, but little or no thymine kinase activity could be detected in the cytosol. (Summary)


In the polytene chromosomes of *S. cecropia*, in addition to a nucleolus, large numbers of nucleolar-like structures or microcentroids are formed. A detailed mapping localized the nucleolar organizer at one end of the X-chromosome and revealed that ~18% of the bands of each chromosome are potentially capable of producing microcentroids. Most of these sites are in regions known from a previous study to show asynchronous DNA replication. DNA puff and certain heterochromatic regions. Microcentroids are rarely found in association with buds. The RNA metabolism of the polytene chromosomes during late 4th instar was studied using autoradiographic techniques. Isolated glands were incubated in H-thymidine for 10-30 min., and autoradiographs were made of frozen preparations. Despite the wide range of variation found among different larval cultures, the following pattern was observed. Just prior to and at the beginning of DNA puff formation, a period of intense euchromosomal nucleolar and microcentroid RNA synthesis occurs. After max. development of the DNA puffs, the synthesis of extrachromosomal RNA is at a low point, while incorporation into buds and DNA puffs remains high. With the onset of the prepupal stage, all nuclear RNA synthesis ceases. (Auth.)

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Gabriele-Cascales, N. CYTOLOGICAL AND Autoradiographic STUDIES ON Heliconia cecropia SALIVARY GLAND CHROMOSOMES. DIS. ABST. 27, PI. 1 (1987) 40-40-B.

Detailed revisited cytological maps of the three autosome salivary elements of *S. cecropia* were prepared, using several distinct larval stages from mid 4th to late 4th instar. The sites of DNA puff and buds, as well as their extent at maximal development were determined and represented in these maps. A method of evaluating the age of larvae within the last 3-4 of 4th instar was worked out by means of cytogenetic determinations (counts). This is particularly important since the eye-pot sites are correlated with the development of the salivary gland nuclei in which dramatic changes in puffing pattern occur within a short period of time during these stages. The positions of the commonest regions in salivary chromosomes of *S. cecropia* were confirmed by observing special repetitive features of these regions. High resolution autoradiography was used to follow H-thymidine incorporation into DNA of salivary gland chromosomes of larvae from the last 3-4 of 4th instars. Earlier studies in *Scara* indicated an all-or-none type of chromosomal replication. However, we observed differential labelling of bands and groups of bands. The centrozone regions, certain chromosomal ends, as well as a number of deeply-staining bands showed a parallel behaviour in replication and form one group designated group C. The second group P includes a number of light-staining bands, bulbs, and, depending on the stage of development, either the puffs or the pre-puff sites. These two groups show a markedly different behaviour in relation to precursor uptake. When group C shows a high rate of incorporation, group P shows no incorporation, and vice versa. However, during a considerable part of the replication period, most or all of the bands display uniform labelling (pattern B). Pattern E is found with high frequency in relation to the other two. From extensive observations on these replication patterns, we have constructed a probable sequence of P → E → C. A statistical procedure was chosen to demonstrate the existence of the two patterns of unequal labelling. It is significant to note that in *Scara* all chromosomes from the same nucleus show the same pattern. They are either a) all uniformly labelled pattern B, b) all show the C pattern, or c) all show the P pattern. Replication patterns occurring at the time of DNA puff formation are easily followed, since a large proportion of the nucleolus population is undergoing DNA synthesis at this time. The sequence of patterns at this stage differs from that of the earlier replication in that the C pattern fails to occur and also in that the P sites show incorporation continuously; they are not only the first but also the last sites to incorporate the isotope. There are several cytological criteria by which the so-called heterochromatin may be identified. Using all of these criteria bands of group C may be considered heterochromatin. (From DA)

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In order to determine which of two autosome carry the lethal gene the chromosomes were segregated. This consists of producing a homozygous individual from a heterozygous one by means of the chromosome balance, when the lethal factor is manifested. Two male-induced translocations, Cy/Pl in chromosome II and Ubx/Sb in III, were used. In order to analyze the wild flies, an integration process was applied to each of the captured individuals, and chromosomes II and III were studied. From the experimental data obtained, the occurrence of recessive lethal and semi-lethal autosome genes could be deduced in the heterozygous state in chromosomes II and III of *D. melanogaster*. 
in the various localities studied in the Federal District of Mexico. By comparing the occurrence of lethal and semilethal genes in localities far apart and also in localities close to one another, a balance in the population dynamics of D. melanogaster could be deduced. The mean results obtained indicate a greater incidence of lethal and semilethal genes in chromosome II. The cause of this greater incidence is unknown. Due to the fact that the technique applied in this experiment differs from those used in other parts of the world, the findings obtained in Mexico cannot be compared with any others, but it may be concluded that even under different climatological conditions the same lethal mutations exist in various wild populations throughout the world.

273 Gansbeke, B. viv. RIBONUCLEIC ACID SYNTHESIS IN THE NUCLEOLUS OF Drosophila melanogaster (Templeton ch. 9) AS STUDIED BY HIGH-RESOLUTION AUTORADIOGRAPHY. Z. Zellforsch. mikrosk. Anat. 94, 6 (1967) 580-587. (In English)

Fully-grown 4th-instar larvae of D. melanogaster were injected with uridine-3H, and the salivary glands were fixed after 3 min - 4 h. Autoradiographs of sections examined in the light and electron microscopes showed a transposition of label from the pan fibroblasts to the pan granuloma of the nucleus. After short uridine incorporation, label was also found over chromosomal material, extending into the nucleolus. The label over the nucleolus organism, extending into the nucleolus, indicates ribosomal RNA synthesis at these chromosomal sites. This RNA, which is first located in the pan fibroblasts, subsequently breaks down within the nucleolus into two different components which combine with protein. After 30 min the smaller of these RNA particles (40 S) is found in the cytoplasm, whereas the bigger one (50 S) migrates to the pan granuloma of the nucleolus. With time these differse in the cytoplasm, combining with the 40 S particles to form the functional ribosome. (CA 69, 1968, 474/499)


Chromatin of living neuroblasts of the grasshopper embryo, Chorthippus parallelus de Geer, is visible in some form throughout the entire cell cycle. At interphase, prophase, and telophase, it can be quickly and reversibly condensed by culture medium hyperosmotic to the cells or extended by medium hypotonic to them. Synthesis of both DNA and RNA (uptake of 3H-thymidine and 3H-uridine, respectively) is known to begin in the neuroblast at the mid-point of telophase; DNA synthesis ends by 30 min after the start of mitosis (in preparation). Radioautographs of neuroblasts exposed to media of varying toxicity containing 3H-thymidine (3H-T) reveal the following points:

1. If cells are placed in hyperosmotic medium at a stage immediately preceding the beginning of DNA synthesis (anaphase or early telophase), initiation of synthesis is prevented as long as the chromatin is kept in a condensed state (control cells in labeled isotonic medium for comparable times progress into the synthesis period).

2. If the cell has just begun DNA synthesis (mid-telophase) before being placed in hyperosmotic medium, a very small amount of 3H-T uptake is observed. (If a cell is well into the synthesis period (late telophase or interphase) when the chromatin is condensed by hyperosmotic medium, uptake of 3H-T is reduced by about 50%). Results are reported of experiments in progress, designed to determine whether the extension of mid- and late prophase chromatin by hypotonic medium to a state resembling interphase chromatin is accompanied by 3H-T uptake and whether RNA synthesis is affected by toxicity-induced changes in the physical state of chromatin.


Eggs of grasshoppers (Chorthippus) were subjected to temperatures of 3 - 4°C, embryonic protein was stopped, and after two months of storage the eggs failed to hatch. New techniques for making serials of grasshopper embryos and techniques for making autoradiographs of 3H-thymidine labelled chromosomes of neuroblast cells were developed. The degree of expansion of condensation of the chromosomes in relation to RNA synthesis is discussed. The effects of coicoicidine on RNA metabolism are being studied. Immunological studies on rapidly dividing neuroblast cells are being conducted. (CA 69, 1968, 474/499)


277 Greenberg, J. R., SEUMI, J. Cell Biol. 29, 2 (1966) 36A. Influence of RNA synthesis on the carbohydrate metabolism of Drosophila melanogaster. In one section the fine art and the perichromatin section is devoted to the DNA of mitotic chromatin of H4-thymidine incorporation may give a value to the DNA in D. melanogaster.
In one section the fine structure of chromosomes, the development of salivary-gland chromosomes, and the perichromatin in vestiges of Tradescantia mitotic chromosomes are discussed. A further section is devoted to the mitotic cycle and DNA replication in <i>Haplopappus gracilis</i>, another to the DNA of mitotic chromosomes of <i>Drosophila</i> (p. 545-547); radiographic analysis now in progress of <sup>H</sup>-thymidine incorporation into mitotic chromosomes of neuroblast cells of D. <i>melanogaster</i> may give a value to the origin of their polyplidic nature. The base composition of heterochromatin DNA in <i>D. melanogaster</i> is examined (p. 548-550).


DNA synthesized by salivary glands of 3rd instar larvae or prepupae incubated in an artificial culture medium containing <sup>H</sup>-thymidine has been compared with DNA from whole larvae of similar age labeled by injection of <sup>H</sup>-thymidine. DNA was extracted by cold phenol-chloroform and examined by sucrose density gradient ultracentrifugation. <i>Drosophila</i> RNA having major components of about 28S, 18S, and 5S was used as a marker. The first distinct component labeled in whole larvae sedimented at 38S. Label was not detected simultaneously in 20S and 38S component, and eventually in 5S and 18S component, together with a relative decline to the 58S and 38S components. By 4 h, only 58S, 18S, and 45 RNA were labeled. It seems probable that the 38S molecule is the precursor of the 38S and 18S ribosomal RNA, the 28S molecule being in turn the precursor of 28S ribosomal RNA. RNA from isolated salivary gland labeled for 2 h also showed a peak at 38S, the remainder being polydispersed and as fast as 70S. Further incubation, label appeared in a 38S component, but radioactive peaks coinciding with the 38S and 18S OD peaks were never obtained. The radioactive salivary gland RNA was therefore polydispersed, although the proportion of heterogeneously sedimenting RNA was diminished by transferring labeled glands to "chase" medium for 3 h. Upon prolonged labeling, or labeling followed by a chase, a relatively stable 38S peak which is presumably an intermediate in ribosomal RNA formation was found in salivary gland RNA, although this component was not detected in whole larval RNA. It is concluded that salivary gland labeled in vitro make ribosomal precursor, but not finished ribosomal RNA. Apparently, the fraction of the 38S molecule normally destined to become ribosomal RNA is degraded, while a remaining fraction accumulates as a 38S molecule. However, salivary glands in vivo make ribosomal RNA normally.


The kinetics of incorporation of <sup>H</sup>-thymidine into salivary glands at mid to late 2nd instar (feeding stage) and prepupae has been examined. Incorporation was measured by removing explanted glands from larvae in an artificial culture medium containing the labeled precursor and counting cold trichloroacetic acid-insoluble radioactivity. Results were expressed as cpm per salivary gland, cpm/µg protein, or cpm/µg DNA. The last method was the most satisfactory. Salivary glands showed kinetics which were linear, or of a higher order, for 90 min or more (3 of 4 experiments). Prepupae glands showed an initially higher rate of incorporation, but the rate decreased rapidly after 90 min (10 of 11 experiments). It is thought that the kinetics of incorporation into the prepupae glands represents an approach to a steady state of RNA synthesis, rather than a cessation of synthesis, for the following reasons: (1) The same kinetics was obtained regardless of how long the glands were kept in vitro before labeling (2-4 h). (2) Glands kept in vitro as long as 24 h before labeling incorporated readily. (3) If glands were labeled, then placed in medium containing unlabeled nucleosides or aminoacyl D, there was a decrease in the level of trichloroacetic acid-insoluble radioactivity. When RNA made in vitro at both stages was examined by sucrose gradient centrifugation, no consistent differences were found between them after either 15 min or 3-8 h of labeling. Both stages made much heterogeneously sedimenting RNA and precursors of ribosomal RNA, though neither made finished ribosomal RNA. The kinetics observed for prepupae salivary glands may be explained by one or more of the following possibilities: (a) an increase in the rate of synthesis of unstable heterogeneously sedimenting RNA; (b) a decrease in the rate of synthesis of normally stable RNA species - ribosomal and transfer; (c) a decrease in the stability of usually stable RNA species. (Absct.)


Autoradigraphic experiments on the incorporation of adenine-14C, phenylalanine-14C, and tyrosine-14C were undertaken in order to explain the role of the oocyte nucleus in the RNA and protein metabolism in ovaries of C. ptilis. In the shortest time intervals of incubation (5 and 16 min) adenine-14C was incorporated mainly in the oocyte nuclei. After 1 h the oocyte cytoplasm became radioactive. The most intense incorporation of oocytes coincided with the period of degeneration of the nucleus in the middle and later stages of previtellogenesis. These were not observed in the karyosome. Tyrosine-14C and phenylalanine-14C were observed both in the oocyte cytoplasm and in the oocyte nuclei at 15, 25, and 40 min. The most active stages in the incorporation of amino acids were also seen to be the middle and late stages of previtellogenesis. The nuclei of young oocytes did not incorporate these amino acids. It was assumed that the karyosome incorporated the protein precursors like the karyoplasm, without any specific accumulation of these precursors. (CA 61:1967, 79c:407)


The total RNA contents (~0.1 mg/embryo) were extracted from cricket eggs by means of the sodium dodecyl sulphate - phenol method and separated by zone gradient centrifugation. Nearly any labelling of RNA could be observed in the synchronous cleavage stages, following 54C02 incorporation. Incorporation of RNA (~10 s-fraction) begins simultaneously in the heterochromatic cleavage divisions and coincides with the postgermination of interphase, the occurrence of nuclear and the appearance of cleavage nuclei in the posterior part of the egg. A net synthesis of RNA only occurs during the formation of the basic physical form. During the period of developing under consideration there is a slight variation always showed a much higher rate of 54C02 incorporation than the 26 s-RNA.


[14C]-thymidine (25.0 Ci/mM) and [3H]-thymidine (14.5 Ci/mM) were used to study RNA and DNA synthesis, respectively. Ribosomal RNA synthesis in developing eggs of O. fasciatus was turned on at gastrulation (64 h). A rapid rate of ribosomal RNA synthesis occurred during the 88 - 118 h period, when almost all of this type of RNA found in the 188 h-old egg was synthesized. Synthesis was essentially turned off with the beginning of organogenesis ~79 h later. The pattern for DNA synthesis is similar although less pronounced. The rate of DNA synthesis in the 28 h blastula stage is high but does not account for the increase in DNA and cell numbers which occur from gastrulation up to 96 h. DNA is synthesized at a constant rate which decreases, subsequently.


The development and metabolism of a spherical Feulgen-positive body (FB) was investigated in the early stages of oogenesis in the house cricket, A. domestica. The FB is first seen in prophase I stage and begins to disintegrate in the egg. Features of its metabolism and especially its mode of disintegration suggest that the FB contains metabolic DNA. Thyroidase is incorporated into the oocyte nucleus only at prophase I and spermatogenesis. The chromosomal DNA synthesis begins and is completed slightly earlier than that of the FB, but they partially overlap in time. The FB of Acheta form monosaccharides and release them into the nucleoplasm. The interchromosomal incorporate labeled uridine and presumably synthesize ribosomal RNA. A hypothesis to explain the kinetics of ribonucleoprotein synthesis in Acheta is presented. (CA 61:1967, 714:100)

284 Hennig, W. CHROMOSOME STRUCTURAL PHYSIOLOGY.) ZWETCHEN

Short review article. easy usefulness of autoradiography in the proving a phenomena as a RNA (transfer) synthesis. regulation process

285 Hennig, W. UNESTELLICHER CHROMOSOMES IN DRX x of the tammarin Y-chrom with English summary)

The following labelled pS-14C-tyrosine (5g.0 Ci/mM)
[3H]-Thymidine (14.5 Ci/mM) at an axton of 3 hr.
Ringer were used. Per day 1 ml of a solution of 5 pC1 Ringer were injected. In the loops of the Y-chrom some synthesis RNA. Uptake of the loops, the amount of indicate that labelled RNA present for about 232 hr. Fc proteins from the cytoplasm leave the nucleus within a 43 h incubation does not occur on the action of autolysis seem to be maintained by succeeding the DNA synthesis in the messenger utilization in the

286 Harikawa, M., Ueda, L. L. ACTIVITIES IN CULTURE

Active RNA and DNA syn: The incorporation of [3H]-thymidine (25.0 Ci/mM) and [14C]-serine (14.5 Ci/mM) were used to study RNA and DNA synthesis, respectively. Ribosomal RNA synthesis in developing eggs of O. fasciacus was turned on at gastrulation (64 h). A rapid rate of ribosomal RNA synthesis occurred during the 88 - 118 h period, when almost all of this type of RNA found in the 188 h-old egg was synthesized. Synthesis was essentially turned off with the beginning of organogenesis ~79 h later. The pattern for DNA synthesis is similar although less pronounced. The rate of DNA synthesis in the 28 h blastula stage is high but does not account for the increase in DNA and cell numbers which occur from gastrulation up to 96 h. DNA is synthesized at a constant rate which decreases, subsequently.

METABOLISM OF THE egg

- Cytochrome-c and in the RNA and protein.

- The ovary cytoplasm after the period of

- Stage...
DNA synthesis has been studied in three polytene chromosome segments of the larval salivary gland of D. melanogaster. The segments are the distal one-fifth of chromosomes 2 R, 3 L, and X. Each segment contains cytological regions or replicons whose individual DNA synthetic activity can be revealed autoradiographically from that in adjacent replicons. When excised salivary glands are exposed for short periods of time to [H]thyminidine, different combinations of replicons are labelled in different nuclei. Each unique combination of labelled replicons in a chromosome segment constitutes a labelling pattern. The two kinds of analysis of all the patterns observed in individual chromosomes and all the combinations of patterns observed in more than one chromosome in single nuclei reveal that the DNA synthetic activity of the chromosomal replicons is coordinated. First, it is shown statistically that the various patterns and combinations of patterns could not have been produced with the observed frequencies by the random association in single nuclei of independently replicating replicons. Second, it is assumed that once DNA synthesis begins in a replicon it goes to completion without stopping; the various patterns and combinations of patterns can be arranged in ordered arrays which reflect the temporal sequence of DNA synthesis among chromosomal replicons. These arrays predict that in any one chromosome DNA replication begins and ends at very few loci and that simultaneous synthesis at a larger number of points occurs at an intermediate time. The chromosome is resolvable as a unit of DNA synthesis in autoradiographs. Labelled chromocentres can be seen in nuclei which contain unlabelled chromosome arms. However, labelled chromosome arms are never seen with unlabelled chromocentres. It is concluded that the time span of DNA synthesis in the chromocentre is longer than that in the chromosomal replicons. (Abstr.)

Han, J., Han, Judith, Quatres, J.H. 

Injection of 0.16 μg of actidioninc D into pupae of the beetle T. molitor, results in the development of modified adults in which the head and thorax remain pupal-like. It is suggested that the messenger RNA for the development of head and thorax is present in the animal from first day of pupation. Injection of 6.16 μg of actidioninc D brings about 91-97% inhibition of labelled uridine incorporation into RNA. When thymus DNA is mixed with actidioninc D before injection into the pupae the latter develop into normal adults. This protection does not occur when DNA and actidioninc D are injected separately. The inhibition of incorporation of labelled uridine into RNA by actidioninc D is diminished to some extent when DNA and actidioninc D are injected separately, and abolished if they are injected together. Inhibition of RNA synthesis by actidioninc D in vitro is fully reversible. DNA or deoxyuridine can reverse the effect of actidioninc D. Incorporation of labelled glycine into protein is not affected by actidioninc D injection during the first 6 days of pupation. On the 7th day it becomes diminished in control pupae but this effect is prevented by actidioninc D. It is suggested that the template for protein synthesis is stable during the first 6 days of metamorphosis and that on the 7th day there is a qualitative change in the proteins synthesized on the template. (CA 63, 1966, 99446.)

International Lab. of Genetics and Biophysics, Naples (Italy). 

Some work on dipsten puff RNA synthesis involving autoradiography is also reported by the research group on animal genetics.


A review with 22 micrographs. The title phenomenon is peculiar to Diptera insects. In the puffing state, DNA becomes diffuse and RNA becomes dense.* This is discussed in relation to the development of insects. (CA 69, 1966, 100569.)*

* It is assumed that radioisotope studies are considered here. (It was not possible to consult the original.) (Compiler's note)


The study was carried out for 10 - 12 min in medium specific activity 8.0 Ci/m. the glands being subseque

Kaplan, W. D. CONTAINING BODY IN 73 GENETICS 56, 3 Pt 2 (1977) Stanford, Calif., USA. 3

Genetic and autoradiographic evidence indicates that the genetic basis of those observed daily brood and labelled sperm heads not turn out to be so. Mit were unlabelled. Radiant areas of the testes and c as the preparations had led the activity disappeared up areas, presumably, from the spermatocytes. (Abstr.)

Keyl, M. A DEMONSTRATION OF CHROMOSOME EXPERIMENTS.

After a discussion of various present study are described, chromosome of the cross in homologous bands. Thus degree of doubling of DNA might explain this duplication.


Data on the significance of Rhombobdella anglica, and were studied by means of was used in addition. The replication phase may be co type of localized foci were in Parv's work. The occurrence be confirmed for the chromosomal giant chromosomes a number synthesis is based on different hypotheses for the buildup of occurrence and the origin of

Kishinokamakara, A., Schmid ADULT MOON. J. exp. 24

14th-thymidine and radioisotopic synthesis in intact adults in

76
The study was carried out on explants of salivary glands from late larvae. These were incubated for 10–12 min in Morgan-Morton and Parker’s medium 199 with added [3H]-thymidine (100 μCi/ml, specific activity 3.0 Ci/mmol), fixed in (4°C) 0.5% glutaraldehyde in phosphate buffer at pH 7.5, the glands being subsequently embedded in glycol methacrylate and silver sections mounted on carbon-coated formvar-coated Ni-grids, and covered with an Ilford L4 nuclear emulsion. From the time pulse labelling is consistent with the interpretation that in the salivary gland cells of the late larval stage of Situs, the synthesis of nuclear DNA is primed by the intranuclear DNA dispersed in the inner part of the nucleus. From the limited evidence so far available, it must be postulated that the nuclear organizer complex may consist of an internal and an external entity. Such a distinction finds support in what appears to be a functional dissimilarity of the organizer. These postulates require confirmation.


Genetic and radioautographic studies following larval feeding with 3H-thymidine or 3H-deoxyuridine indicated that the genetic effects of the 3H-samplings are confined to the nuclei of origin. On the basis of these observations one would expect that following the injection of adult males with 3H-thymidine, daily breeding techniques would show a correlation between elevated mutation rates and labelled sperm heads that would appear at about the tenth postinfection day. However, this did not turn out to be so. Mutation rates above control appeared in early broods for which the sperm heads were unlabelled. Radioautographs showed, moreover, the presence of silver grains over cytoplasmic areas of the testis and also over sperm tails. This activity, by definition, derived from DNA inasmuch as the preparations had been treated by acid hydrolysis before the slides were filmed. Furthermore, the activity disappeared upon treatment with DNase but not after RNA digestion. The genetic effects must, presumably, be derived from the action of RNA originating in the cytoplasm of individual spermatogonia or spermatocytes. (Abstr.)


After a discussion of various data obtained by autoradiographic methods, the quantitative results of the present study are described. Microspectrophotometric measurements carried out on the salivary gland chromosomes of the cross between two sub-species of C. thummi showed differences in DNA content in homologous hands. These differences followed the relation: 2n (where n = 1, 2, 3 or 4). Various degrees of doubling of DNA contents were observed in certain bands. Mechanisms are discussed which might explain this duplication phenomenon.


Data on the significance of localized DNA synthesis in salivary gland chromosomes of Drosophila angustipennis, and Glyptotettix barbipes are reviewed. Sulfur formation and DNA synthesis were studied by means of 3H-thymidine. In some experiments with Drosophila thummi 14C-thymidine was used in addition. The possibility of a local increase in DNA content, other than during a replication phase, may be considered proved for the chromosomes of Drosophila and Rhynchosciara. This type of localized increase in DNA is, however, a less general one, though not limited to that of Yavar’s work. The occurrence of this type of localized DNA increase (metabolic DNA) could act for the chromosomes of Glyptotettix. At the end of each replication phase of the giant chromosomes a number of levels of DNA synthesis can be observed. However, such local DNA synthesis is based on differential properties (DNA content) of the individual replication units. A hypothesis for the build-up of such replication units is proposed, it presents a plausible basis for the occurrence and the origin of homologous replication units of different DNA content during evolution.


1H-thymidine and thymidine were injected into adults in order to assess the rates of DNA and RNA synthesis in intact adults, in fragments of adults, and in adults grafted to various types of partners.
The biosynthetic capabilities of tissues of the short lived adults were studied using surgical, histological, and autoradiographic techniques. Adults of Samia cynthia can have their life span of 11 days prolonged to four months by parabiosis to pupal partners, which presumably supply nutrients. Parabiosis of adults or isolated abdomen to developing pupae caused suppressed metamorphosis in the adults (sometimes two supernumerary adult-adult results). When an adult is parabiosed to a developing pupal partner with active prothoracic glands the ecdysone produced by the developing pupae induced DNA synthesis in several tissues of the adult including the epidermis, midgut, and gonadal sheaths, and the haemocytes. The gradual decrease in RNA synthesis from emergence until death in all tissues of intact adults and isolated abdomen can be prevented in isolated abdomen by grafting them to isolated pupal abdomen. Many of the tissues of the adult moth are considered to have the same biochemical defect as the tissues of the disintegrating pupa, i.e., an inability to synthesize DNA. In both, this defect is repaired by ecdysone.


The rate of synthesis of DNA and RNA in various tissues during larval molting of a silkworm is described and the control of these processes examined in B. cynthia ricini, a non-dispersing abdominal moth. H4-uridine (10 μCi/g) was injected into anesthetized larvae on each of the 4th and 5th instars and during the molt to the 5th- and final larval instar. Ecdysone (1) controls DNA synthesis in most larval tissues but both DNA synthesis and the rate of DNA synthesis in chitinous epithelium. In some larval tissues fat body, Malpighian tubules, dermal glands, visceral tissues, and chitinous epithelium, the threshold level of 1 required for DNA synthesis is high, and during part of a larval molt the 1 threshold is lost in those tissues. In other tissues (midgut and imaginal wing disks) the threshold level of 1 is not required for DNA synthesis to proceed and during larval life the hormone 1 is never required to synthesize DNA. Although the haemocytes respond to increased 1 secretion with increased DNA synthesis, unlike other tissues they are capable of considerable DNA synthesis in the absence of 1. The prothoracic gland RNA synthesis and ecdysone secretion in the brain is under control of the brain hormone but DNA synthesis may be controlled by 1.


The present report examines factors that control the rate of DNA synthesis during larval life, metamorphosis, pupal diapause, and adult life of Ceciophia and other Saturnid moths. Autoradiographic determinations were made of the rate of incorporation of 3H-thymidine in various tissues during the life history. DNA synthesis was also studied in insects subjected to diverse endocrinological and surgical manipulations treated with juvenile hormone. Using labelling techniques, the course of epidermal cells were followed from one instar to the next. In addition, various tissues were labelled with 3H-uridine, implanted into unlabelled hosts, and their developmental fate determined. DNA synthesis in adult moths was compared with DNA synthesis in other adult insects representing six orders. The effects of a potent inhibitor of DNA synthesis on development and molting were also analyzed. During each larval molt cycle and during metamorphosis of Saturnid moths there is a definite temporal pattern of DNA synthesis in each tissue and in regions within many tissues. During larval molting in some tissues such as chitinous epithelium, Malpighian tubules, and nervous system, DNA synthesis occurred soon after the secretion of ecdysone. In other tissues such as imaginal wing disks and muscles, DNA synthesis during larval life was not correlated with ecdysone secretion. Almost every epidermal cell appeared to synthesize DNA during every normal molt cycle, but some tissues such as Malpighian tubules and prothoracic glands did not synthesize DNA during the pupal-adult molt although they did so during earlier molts. Apparently after experiencing a molt in the absence of a high concentration of juvenile hormone these tissues differentiated and ordinarily do not synthesize DNA again. However, two experimentally induced pupal-pupal molts in the presence of juvenile hormone and ecdysone restored the capacity of pupal Malpighian tubules to synthesize DNA. In insects with a pupal diapause DNA synthesis ceased after pupation in all tissues except haemocytes and be a small extent the gonads and processes of a pupal could be reactivated by treatment with diapause hormone and non-dispersing induced DNA synthesis in mature adult. The absence of diapause hormone results in the stimulation of DNA synthesis in preservative DNA synthesis in adult DNA synthesis. Injury to diapause organs in hemocyanic larvae caused transformation of imaginal discs such that diapause could be induced in hemocyanic larvae in the absence of diapause hormone. Injury to diapause organs in hemocyanic larvae caused transformation of imaginal discs such that diapause could be induced in hemocyanic larvae in the absence of diapause hormone. Injury to diapause organs in hemocyanic larvae caused transformation of imaginal discs such that diapause could be induced in hemocyanic larvae in the absence of diapause hormone. Injury to diapause organs in hemocyanic larvae caused transformation of imaginal discs such that diapause could be induced in hemocyanic larvae in the absence of diapause hormone.


This review concentrates on 1) the effects of endocrine changes in the hemolymph and nonspecific action of the sequence of normal development as seen in the literature on this subject.
using surgical, histological, and histochemical techniques, investigators have demonstrated the presence of juvenile hormone in the brain and other tissues of the silkworm, contemplating the possibility of a role in the regulation of metamorphosis. The presence of juvenile hormone in the brain and other tissues of the silkworm, contemplating the possibility of a role in the regulation of metamorphosis.

**Regulation of DNA and RNA Synthesis in the Silkworm**

In the silkworm, the regulation of DNA and RNA synthesis is critical for the proper development of the insect. The silkworm is a model organism for studying insect development due to its simple life cycle and large population size. The regulation of DNA and RNA synthesis in the silkworm involves complex interactions between the nervous system, endocrine system, and the genetic machinery.

**Silk Production**

Silk production is a fascinating aspect of silkworm biology, and it is an example of the intricate regulation of gene expression. The silk glands in the silkworm are responsible for producing silk, a fiber that is strong and lightweight. The regulation of silk production involves multiple genes and hormones, including juvenile hormone and ecdysone.

**Life Cycle of the Silkworm**

The life cycle of the silkworm is divided into five stages: egg, larva, pupa, cocoon, and adult. Each stage is characterized by significant changes in gene expression and hormonal regulation. The larval stage is the most active in terms of growth and development, and it is during this stage that the silkworm undergoes dramatic changes in its body structure and physiology.

**Genetic Manipulation**

Recent advances in genetic manipulation techniques have allowed researchers to manipulate gene expression in the silkworm. This has led to the development of transgenic silkworms with altered characteristics, such as increased silk production or resistance to pests. These advancements have furthered our understanding of the regulation of gene expression in the silkworm and have potential applications in agriculture and biotechnology.

**Conclusion**

In conclusion, the regulation of DNA and RNA synthesis in the silkworm is a complex and fascinating area of research. Understanding the factors that control gene expression in the silkworm can provide insights into the regulation of gene expression in other insects and potentially in other organisms as well. The silkworm serves as a valuable model system for studying the regulation of gene expression in insects, and continued research in this field is likely to yield important discoveries.
The nucleic acid content in the silk gland of the silkworm increased in the 3rd half of the 5th developmental stage. When forced synthesis of silk protein was started, the amount of nucleic acids in the gland remained constant. (CA 88: 1988, 60710c)

RNA synthesis was studied, utilising centrifugation in a sucrose gradient, separation on a column of methylated albumin, and autoradiography. The incorporation rate of labeled precursor into RNA of the silk gland on various days of the 5th instar of caterpillars showed that all kinds of RNA were synthesised during the first half of this stage. The rate of incorporation into RNA on the 2nd day of the 5th instar was 8-10-fold higher than before becoming a pupa. In the early stages of the 5th instar, the biosynthesis of RNA took place in the nucleus and was connected with the DNA template; during the later stages of the 5th instar, however, the incorporation of adenine involved only the exchange of terminal nucleotides in rRNA. The problem of DNA for the synthesis of fibrin in the silk gland of the silkworm was not resolved. (CA 88: 1988, 137228)

The oocyte nucleus contains 8-haploid sets of varying sizes, presumably a part of the headed chromosomes observed, and varying numbers of 8-haploid complexes which do not lie along such chromosomes. To date, autoradiographs taken after incubating 3H-thymidine (0.25 µCi/grasshopper, incubated for 30 min) showed radioactivity to be primarily localized in the headed chromosomes. Thymine was also incorporated by the fine threads in the nucleus, but to a lesser extent.

The oocyte nucleus of Locusta migratoria contains 8-haploid sets of varying sizes, presumably a part of the headed chromosomes observed, and varying numbers of 8-haploid complexes which do not lie along such chromosomes. To date, autoradiographs taken after incubating 3H-thymidine (0.25 µCi/grasshopper, incubated for 30 min) showed radioactivity to be primarily localized in the headed chromosomes. Thymine was also incorporated by the fine threads in the nucleus, but to a lesser extent.

Examination of living oocyte nuclei of Locusta migratoria has revealed the presence of thread-like structures. They are paired and are thought to be the uncoiled chromosomes since they are broken into fragments by treatment with RNase. The greater part of the threads carries lateral loops like the lampbrush chromosomes of Amphibia. A smaller part has no loops but bears a series of conspicuous granules with bright appearance under positive phase contrast optics (headed segments). The visibility of the chromosomes has been investigated in solutions with various formaldehyde concentrations. In hypotonic media, the chromosomes contract, the granules fuse, and the headed segments become linear. In other situations, radiation and if kept at low temperature the headed structures are also transformed into several loops. After return to normal conditions, they reconstitute the characteristic headed appearance. In autoradiographs obtained by incubating 3H-thymidine (specific activity up to 34 400 mC/mmol, 0.3 mC/mg animal) into the body cavity and by incubation in isolated nuclei in vitro, rather uniformly distributed labelling occurs in the oocyte nuclei for up to 30 min incubation time. With prolonged incubation the activity of the headed segments becomes more intense than the labelling of the lambrush chromosomes. After treatment with aceticmethyl RNA synthesis stops, the axes of headed and the lambrush chromosome contract, and the granules disappear more and more. The headed structures may have nodular or function in Locusta as they have in Amphibia. If so, the only difference from the Amphibian nuclei would be the coiled attachment to the lambrush chromosomes. (From abstr.)


The injection of a plastic growth factor (sulfuric acid) to insects in dispose in glucose-deficient conditions induces the formation of tumors. From these tumors, artificially induced in chrysalids of Pieris brassicae, a factor causing tumors is extracted, which can be isolated by centrifugation. It
is infectious to other species when given by injection and is transmissible immediately. A study of Drosophila shows that it is transmitted through the cytoplasm by modification of sex ratio reduction of the ♀ which (carry) the lethal tumor. Experiments proved that the factor induced by the parasites is made up of light particles which contain DNA. It is DNA which is the active constituent. This DNA, labelled by 3H-thymidine, is run on a source gradient at 80,000 rpm. The radioactive and biologically active factor is a 46 component after the breakdown of light particles. This fraction is chromatographed on ECTEOLA cellulose columns using a continuous gradient of CINa for elution. The new radioactive and biologically active fraction is incubated with DNase or RNase. The RNase inactivate alone is still biologically active. Then, the biological factor induced by a disturbed role of parasite-growth hormones is really DNA. (Auth.)


Injection of follic acid into chrysalids to diapause modified the parame/growth hormone equilibrium and caused tissue disorganization. A factor isolated from the infected insects by prolonged centrifugation at 60,000 g was nonspecific and produced tissue hypoplasia, decreased the number of blood cells, produced testicular or intestinal melanomas, reduced the number of males, and caused larval death when injected into Drosophila. Injection of follic acid or 2-amino-5-hydroxyphenyl carbonyl acid into females Carabinae process did not alter these females, but increased the sterility of their descendants and caused death of the adult male offspring. Injection of the factor into agas similarly did not affect the injected insects, but only affected the 3rd generation, producing a cuticular malformation in males. Crossing experiments indicated the involvement of cytoplasmic inheritance in transmitting the factor from treated Drosophila females. The isolation of the factor by homogenization of treated larvae, centrifugation, sucrose density gradient, and chromatography on ECTEOLA-cellulose is described, since the biologically active fraction coincides with that incorporating 3H-thymidine and since DNase, but not RNase, abolished biological activity, the factor is apparently DNA. (CA 56: 1956, 1904W)


Methods were developed for extraction of RNA from salivary glands of Rhynchosciara, yielding high quality preparation as judged by hydrodynamic properties. By this method and pulse labelling the synthesis of RNA in the glands throughout larval development was studied. The principal class of RNA synthesized before the appearance of the large puffs is 3S RNA. This RNA is subsequently transformed into chromosomal RNA. After appearance of the large puffs one observes almost complete inhibition of synthesis of nososomal precursor. This correlation indicates the material produced in puffs is important in control of synthesis of RNA. (Auth.)


A study was made of the nucleic acids (RNA produced at puffs in the giant polytene chromosomes of the salivary glands of R. angustifrons during developmental stage 3 and early and late stage 5 (prepupa, corresponding, respectively, to times before, during, and after the appearance of the giant chromosomal puffs. I was isolated in bulk and assayments were made of possible correlations between alterations of their biologicall, chemical, and physicochemical properties and the appearance of the puffs. The levels of DNA and RNA determined throughout the larval development appeared to remain max. corresponding to definite periods (late stage 4 and early stage 5) and coinciding in time with the appearance of many large puffs in the chromosomes. Prior to the appearance of large puffs, I labeling in larvae sacrificed 40 min after the injection of uridine-3H took place in an RNA having a sedimentation constant of approx. 28 S. Incorporation also took place in other puffs, with peaks being observed at 33 and 4 S. The specific activity of the 16 S RNA was about 0.7 and 2.5 S RNA. The rapidly labelled 33 S material matured into RNA having the sedimentation characteristics of chromosome RNA. Incorporation of 3H during 80 min led to the labelling of all classes of RNA present in the sedimentation profile, as well as of the 28 S RNA. Results differed in larvae of the age at which the giant
puffs were present in the salivary chromosomes, the specific activities being generally lower than those observed at the earlier developmental stage, with much difference being observed between incorporation during 40 and 80 min. Practically no incorporation of $^3$H was observed in larvae at the end of the 8th developmental stage, when the giant puffs had regressed, indicating that the inhibitory process was already apparent at the stage where puffs were present, reaching its maximum intensity at this age. It could not be decided whether the observed inhibition was at the level of synthesis or resulted from a rapid destruction of the newly synthesized RNA by degradative enzymes which might increase in late larval life, but it could be shown that such degradative enzymes were not operative during the RNA extraction process. Since no particular difference was observed in the 40-min incorporation experiments, whereas the 88 $^3$H incorporation was always very distinct and had a specific activity higher than that observed in the 88 $^3$H region, it appeared that the processes leading to the formation of the two classes of ribonucleic RNA had different velocities, as had been reported for rat liver, HeLa cells, and bacteria. It was suggested that the control of RNA synthesis might depend on the concentration of amino acids available to the cells, as had been found with bacteria. The factors indicated a correlation in the occurrence of important molecular events in the cells and of morphological alterations in the chromosomes.

207 Leach, W.M., FORMATION OF TETRITUM PUFFS DURING MITOSIS. J. Cell Biol. 23, 2 (1968) S6A-S6A. Abstract. S6A. "4th Annual Meeting of the American Society for Cell Biology. Cleveland, Ohio, USA, 11-13 Nov. 1967." Synthesis of DNA in grasshopper neuranemia, determined by incorporation of $^3$H-labeled thymidine (HtDR) into acid-insoluble DNA-digestible material, extravesicular, neuraphe to very early prophase. To test the possibility that $^3$H derivatives accumulate in stages of the cell cycle during which DNA synthesis does not occur, neuranelas in different stages between early prophase and early telophase were exposed to HtDR and "mapped" for subsequent identification, then rinsed in culture medium which contained excess unlabelled thymidine. Mitotic stages of labeled cells were observed by bright-field microscopy. Labeled cells were fixed 10-15 min after the start of DNA synthesis and reidentified in autoradiograms. Incorporation of $^3$H into DNA was low in neuranelas exposed to HtDR during metaphase and metaphase than in those exposed in early, middle, and late prophase, or early telophase. Range of stain was similar for neuranelas stained in excess unlabelled thymidine for 8 or 20 min after exposure to HtDR during metaphase. A possible interpretation of these observations is that intercellular retention of a "pool" of $^3$H derivatives is dependent on the presence of the nuclear membrane.

208 Leach, W.M., Carlson, J.G. UVROVET-INDUCED INCORPORATION OF T3H-LAETED THYMIDINE INTO CHOROCHROMES NEURANELAS DURING PROPHASE. J. Cell Biol. 22, 3 (1967) S2A. Abstract. S2A. "4th Annual Meeting of the American Society for Cell Biology. Denver, Colo., USA, 13-15 Nov. 1967." Synthesis of deoxyribonucleic acid in neuranelas of the grasshopper C. viridislucida (De Geer) has been determined by autoradiography to end during very early prophase. Middle and late prophase neuranelas, however, incorporate $^3$H-thymidine ($^3$H-TDR) into acid-insoluble deoxyribonucleic acid, as detected by autoradiography. At the 2804 A wavelength, middle prophase neuranelas incorporated $^3$H-TDR after 256 erg/m2, an exposure level at which mitotic delay is not detected. Incorporation is detected after 512 erg/m2 at each of the wavelengths examined: 2481, 2527, 2655, 2984, and 2994 A, but the wavelengths are not equally effective. As the cell progresses through middle prophase, the most effective wavelength in inducing $^3$H-TDR incorporation shifts from 2804 A at the beginning of middle prophase to 2804 A during the terminal part of middle prophase. During late prophase, however, a similar shift in effective wavelengths is not observed. (Abstract.)

209 Lasky, M. DNA- AND PROTEIN-SYNTHESIS IN PUFFS ISOLATED FROM CHROMOSOMES. DNA synthesis, RNA synthesis and protein synthesis in puffs of isolated salivary gland chromosomes of Chironomus. J. Cell Biol. 73, 1 (1967) 75-88. (In German, with English abstract.) Isolated salivary gland chromosomes of C. tentans incubated in a simple salt or nucleic acid solution are able to synthesize not only RNA but also protein in their puffs. Two different methods were used to expose the chromosomes to the radioactive medium which contained $^3$H-thymidine-6$^3$H-triphosphate ($^3$H-cTP) or $^3$H-amino acid uniformly labelled with $^3$H. $^3$H-cTP was primarily incorporated into puff DNA, particularly in the labia filvae. The migration of radioactively labelled material from isolated nuclei to the puff themselves is described bound RNA.
ultraviolet light. The nuclei in the extranuclear chromatin are densely stained while the nuclei in the interphase are lightly stained. The electron microscope examination of the nuclei reveals that the outer shell of DNA is closely packed against the nuclear envelope and that the outer shell possesses an outer shell composed mainly of particles 100 - 200 Å in diameter. Between the outer shell and the chromatin there is a band of low electron opacity, 4000 - 7000 Å thick. In the light microscope, this band together with the outer shell is Feulgen negative and stains violet with azure B, this is confirmation of the presence of RNA. In the nuclei the nuclei are found inside the DNA body. These nuclei have a nucleolus composed mainly of particles 150 - 200 Å. The nuclei are Feulgen negative, alkaline fast green negative, stain violet with azure B, and do not stain with azure 3 after staining, thus confirming their RNA content. The presence of the nuclei inside the DNA body and of a band of RNA between the body and the chromatin is indicative of a high RNA synthetic activity. Since the DNA of the body is complexed with histones, it is the chromatin, and the nuclei are located inside the body, the simplest interpretation of the DNA body is that it represents hundreds of copies of the original of the nucleic acid organizing region or neighboring region. The situation found in T. ocellata is similar in other species of Diptera and in the Collembola. There are two main conclusions: (A) the DNA is in the body, and the second is that the DNA is in a way associated with a virus. (B.)


A new technique permits the injection of aqueous solutions into the egg of certain Coleoptera insects (Cerambycidae decemdentata, Tenebrio molitor and Dermestes maculatus). 0.01 or 0.02 ml/ml of 3H-thymidine, -lysine, -leucine, or -phenylalanine (1-10 μCi/m) were injected into eggs of Cerambycidae and Dermestes. DNA and protein are synthesized from the onset of development, but the synthesis of RNA is not detectable until the migratory cleavage nuclei arrive at the cortex of the egg.

212. Martingi, R., Whitfield, V.B. VARIATIONS IN METABOLIC ACTIVITY DURING THE LARVAL DEVELOPMENT OF COLEOPTERA. J. Biol. Chem., 234 (1969) 699-700. DNA synthesis in the salivary gland remains extremely vigorous throughout early development. Other tissues with polytene chromosomes (gut cells, intestine, Malpighian tubules) show progressive diminution of DNA synthesis. Cells that are most active in synthesizing DNA also show the highest degree of incorporation of 3H-thymidine and -lysine. The labeling from the incorporation of amino acid is associated most strongly with the DNA-positive bands of the chromosomes. After several hours’ exposure to the label the pairs become heavily labelled.
The habitat of synchronous development seen in the insect B. angulata and related species has been used for the study of metabolic events in relation to larval development and to chironomid phenomena such as the formation of pupae. DNA synthesis in the salivary gland, as demonstrated by autoradiography, remains extremely vigorous throughout early development. Other tissues with polytenic chromosomes, such as gastric caeca, interline, and Malpighian tubules, show progressive diminution of DNA synthesis, so that at the stage of formation of the previously described DNA puffs on the salivary gland chromosomes there is very little evidence of DNA synthesis in the other tissues. The cells that are most actively synthesizing DNA also show the highest degree of incorporation of $^{3}H$-uridine and $^{3}H$-leucine. Particular attention has been given to the labelling of polytenic chromosomes with $^{3}H$-leucine at different stages of development. The label resulting from incorporation of the radioactive amino acid is associated most strongly with the DNA-positive bands of the chromosomes. After several hours' exposure to the isotope, the chromosome puffs also become heavily labelled. The most rapidly labelled nuclear components are the many mitotic associations between bands of the chromosomes. Fixation with neutral formalin shows that much of the label that is removed by acidic fixation is concentrated in these mitotic chords.


The incorporation of uridine-$^{3}H$ into RNA of the tissues of B. major was followed by autoradiographic techniques. Autoradiographs were prepared 60 min to 24 h after intrahemocoelic injection. At 90 min, nuclear RNA was heavily labelled but cytoplasmic RNA only lightly. At 100 min all organs were heavily labelled but fat body relatively less than gut and other coelomate tissues. Except in fat body and neurohemal, the amount of labelling appeared to decrease after 3 h. (CA 65:1909, 1966)


$^{3}H$-thymidine was injected into 3rd- or 4th-instar D. melanogaster females, and tissue sections were prepared from the ovary for autoradiography with both the light and electron microscopes. Thymidine-$^{3}H$ was incorporated into nuclei of nurse cells, follicle cells, and into ooplasmic DNA. The highest level of incorporation occurred at stage 12. The 15 nurse cell nuclei also incorporated thymidine at this stage even though they were degenerating. The label in the ooplasm was removed by extraction with DNase only if the extraction was preceded by a treatment with protease to remove the proteins from the sections. Electron microscope autoradiography revealed that 20% of the AG grains resulting from decay of thymidine-$^{3}H$ were found over mitochondria, 20% were located within 0.35 μ of these organelles, and 50% probably represented synthesis in the cytoplasm by the "storage DNA" characteristic of many eggs. It was suggested that one mechanism acting throughout the egg chamber is responsible for the synchronous synthesis of DNA in the degenerating nurse cells, in the mitochondria of the egg, and in the "storage DNA" of the ooplasm. (CA 64:1966, 1966-67)

Mukherjee, A.B., A TN IN MOSQUITOES. C.A. 66 (3): 211. This study was undertaken to determine the occurrence of some genera and species of mosquitoes. Five genera, four genera and five species were used to demonstrate the standard procedures for the preparation of autoradiographs with $^{3}H$-thymidine. Mosquitoes were exposed to the isotope transmitted to its host by female mosquitoes. The following day, mosquitoes were killed and lanterns were examined for the presence of larvae or pupae. The results of this study are presented in Table 1.

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Relative DNAase activity has been found to increase in extracts of different developmental stages of Drosophila in the following manner: eggs, 2-4-old pupae, 3-5-old pupae, adults, and 3-, 5- and 7-days-old larvae. Some of the activity might be of the endo-nuclease type. DNA polymerase activity was measured in the egg, but not in extracts of other developmental stages due to interference from DNAase. Incorporation assays for DNA polymerase (replicative deoxyribonucleotide-transferase) contained the deoxyribonucleoside triphosphates of adenosine, guanosine, cytosine, and thymine, one of which was labelled with H (CiAP). calf thymus DNA (native or heat-denatured). Mg++ extracts, and Tris buffer (pH 7.6). A blank without DNA was used as a control of the incorporation of 3H-DATP. The DNA polymerase seems to utilize either native or denatured DNA as primer.


This study was undertaken in an attempt to obtain additional information pertaining to the cytogenetics of mosquitoes. Five genera and 20 species of mosquitoes were included in the study of the karyotypes of and four genera and five species were considered for the study of the pattern of DNA synthesis. Chromosome preparations were made from the brain tissues of field collected 4th-instar mosquito larvae (prophage). The standard procedure of squash technique was followed in preparing this material. For the autoradiographic study 3H-thyminidine (1, activity 3.00 C/mCi/mg) was used for labelling the newly synthesised DNA. Kodak NTB nuclear track liquid emulsion was used for tracking the 12-particles emitted by thyminar-3H. 4th-instar mosquito larvae were exposed to thyminar-3H in a range from 1-10 h. Chromosome preparations were made from brain cells using acetic acid-orcein stain. In the study of each species several slides were prepared by staining with Feulgen reaction until the heterochromatin and euchromatin were distinguishable. To identify the karyotypes, their morphology, the position of the centromere in the chromosomes, and the number and ratio of length of chromosomes were studied. For autoradiographic study, the density of the silver grains over heterochromatin and euchromatin, the percentage of labelled cells in different time periods of exposure to thyminar-3H and late replicating arms in chromosome pairs of different genera and species were observed and compared. The somatic conclusion are based on the results of this study: (1) The diploid chromosome complement of all species studied is six (2n = 6). (2) The karyotypes of each of the five genera are distinct and readily recognizable. The karyotypes of the species within each genus are similar and are not easily recognizable. (3) Only in the genus Aedes have sex chromosomes (X and Y type) been identified. This is also in agreement with the reports of previous investigators. (4) Pairing of chromosomes at least in some stages of cytology is a characteristic phenomenon of all the species studied. (5) Polytenic cells were found in one specimen of Culex (imperatoris Walker) and chromosomes with abnormal arm lengths were found in the homologous pairs of another specimen of the same species. (6) A satellite, which is a pinched off portion of a chromosome in the distal region of 16 arm, which remains attached to the main body by a tenacious thread of chromatin, was found with the chromosome pair II in Proctocercus signipennis (Coquillett). (7) The pattern of DNA synthesis, as revealed from the amount of labelling of the interphase nuclei, the silver grain density over euchromatin and heterochromatin, and the percentage of labelled interphase nuclei, is very distinct in the different genera and species of mosquitoes investigated in the present study: (8) A heterochromatic mass was found in the Feulgen stained preparations of all species investigated, and these heterochromatic regions were found to synthesise their DNA at a different time than the euchromatin. (9) A late replicating region was found in one pair of chromosomes in each species. In Aedes solitarius (Dege.), A. cantans (Day) and Culex (imperatoris) (Will,) the late replicating region is found in the chromosome pair III. In Proctocercus signipennis this is present in chromosome pair II which is the telomeric pair of chromosome, and in Culex tarsalis this is present in the chromosome pair II which is the middle pair of chromosome and in Culex tarsalis it is present in the chromosome pair III which is the telomeric pair of chromosome. (10) As a result of this study it is concluded that although mosquitoes are very similar from the standpoint of chromosome numbers, they show many distinctive features in their karyotypes and DNA synthetic pattern. (11) White's hypothesis (1949) of the evolution of the mosquito karyotype, other than in the genus Aedes, is not supported by the present study.

DNA polymerase activity was determined by means of [3H]-ATP incorporation. The enzyme could utilize either native or denatured DNA as a primer for DNA synthesis. Work was also carried out on Drosophila.

De la thymidine tritée a été injectée à des cellules de l'urètre varis au 8ème. Les glandes de l'urètre ont été récoltées à 15 minutes à 5 jours après l'injection et l'incorporation de la thymidine a été étudiée par autoradiographie. La thymidine paraît se fixer exclusivement dans l'ADN. Le maximum d'incorporation est observé environ une heure après l'injection. Après 5 jours, on constate une diminution très forte qui pourrait indiquer l'existence d'une perte d'ADN marqué. La fixation de la thymidine se fait principalement dans le tube secretor, à l'exclusion des autres parties de la glande. On peut mettre ces différences en parallèle avec l'activité différente, qualitativement et quantitativement, des deux régions considérées. Dans certains rongeurs, le marquage se produit que par une partie du tissu exocrine, attestant l'existence d'un syncytinomique fonctionnel entre les diverses régions d'un même rongeur. La permanence de cette hétérogénéité conduit à diverses hypothèses au sujet de la structure moléculaire.

(a) W. R.


Pupae and developing adults received injections of [3H]-uridine (10 μCi/g, 0.37 Ci/mg). [3H]-Hormone digestion was used in controls and removed 70% of the label. It was found that when intact pupae of saturnid moth developed into "2nd pupae" under the influence of a juvenile hormone extract, their fat body, blood cells, and tracheal epithelium synthesized RNA at a higher rate than during normal development. In contrast, juvenile hormone extract had no effect on the rate of RNA synthesis of isolated pupal abdomens which lack prothoracic glands. It is suggested that juvenile hormone extract has direct metabolic effects on any pupal tissues in satelitine moths except for the prothoracic glands.


(In English, with Italian summary)

Both amphionic and parthenogenetic female individuals are present in aphids, the former carrying ovaries with large polyplid nurse cells while the latter are viviparous and carry ovaries with very small, usually diploid nurse cells. Amphionic and parthenogenetic females of M. Viabilis at various stages of development were injected with the abdomen with 0.1 μCi of [3H]-thymidine. The animals were fixed and embedded at intervals of from 3 h to 4 days. In the amphionic female an active nuclear incorporation of [3H]-thymidine occurs during injection. However, even when the nurse cell are functioning fully, and when the model appear to have achieved the maximum development, incorporation continues, without affecting all the nuclei. Results indicate that the active synthesis occurring in the nuclei concern metabolic but not genetically stable DNA. Metabolic DNA may be synthesized in the nurse cells of amphionic insects.


The main effects of two infections, one by a protozoan and the other by a virus, in cells of P. auriga (Diptera, Sciadidae) are an increase in cell size and changes in the size, shape, and behavior of the chromosomes. The X-chromosome of some cells moves differently from the autosome in the protozoan infection. In cells heavily infected with the protozoan (presumably a microparasite), the surface of the chromosomes frequently had a coat of RNA, which showed massive incorporation of [3H]-uridine from 20-60 min after injection of the larvae. Some chromosomes show specific, free-traceable points after infection by the virus. Some of these effects of the infections may be similar to the effects of injective agents in other organisms.

New approaches to studying the chromosome organization of the chromosomes have recently been made by the combined use of cytological, autoradiographic, and photometric methods. The evidence thus obtained is revised. Giant Drosophila chromosomes (e.g. Chloroctopus tentans, Annam chenini, th. plagi) permit a study of the topography of DNA replication in great detail. Each chromosome appears to replicate its DNA independently of other chromosomes. Autoradiographic studies suggest a correlation between the length of the replication period of a chromosome and the amount of DNA present in it. The chromosomes may be regarded as an essential part of the chromosome structure, characterized by its own DNA synthesis. Microspectrophotometric findings together with autoradiographic results point to the chromosome as a molecular unit of replication. A study of the unfolding phenomenon reveals, moreover, that the gradual uncoiling of the chromosomal material, mainly DNA, tightly packed within the knob, begins in the knob with a gradual increase in the DNA replication of that knob. The regulation of DNA synthesis at the chromosomal level is discussed. The functional significance of the chromosome is linked with the specificity of the unfolding mechanism, which affects each chromosome independently. It is not possible yet to clearly separate the mechanisms involved in the unfolding of the chromosomal DNA from the factors which govern that these mechanisms act their work and always act at defined places.


There was no consistent increase in DNA in late larval or prepupal stages. These classes of DNA amounts from the salivary gland were compared with the DNA amounts from the hematopoietic nuclei of the same larvae. The salivary gland nuclei were fragmented into pieces of the hematopoietic DNA amounts. Female prepupae had a larger amount of nuclei in higher polycaryons than in the male of the same age. The percentage of salivary nuclei incorporation of thymidine-H3 labeled markedly decreased shortly after spermatid formation. In both sexes, female larvae had slightly increased 4 incorporation 6 h after羽血.

I was incorporated into chromosomes with a continuous or discontinuous type of pattern. All labelled nuclei were transferred to the same extent in the intermitotic regions.


Females of D. viridis, 5 d old, were treated with thymidine-3H (specific activity 6.4 Ci/mmol. 0.3 µl at 10 or 22°C). Incorporation of the labelled material was studied autoradiographically in this site of ovarian tissue. At the period of egg formation when replication of DNA took place in some cell nuclei (stage 5 to 6 of the oocyte development), quick incorporation of thymidine-3H proceeded in nuclei of these cells that was observable 6 min after the application of the labelled material (at 22°C). Incorporation of thymidine-3H in cytoplasm was found at least 20 min after the injection. At 10°C, a pronounced retardation of thymidine incorporation in cytoplasm was observed: as late as 24 h after thymidine injection the oocyte was labelled slightly. At all, the same nuclei were labelled intensively. Nurse cell nuclei took part in the ooplasmic DNA formation. A part of ooplasmic DNA was synthesized in cell nuclei and passed into the ripening oocytes.


Sites of DNA synthesis on the polytene chromosomes of Drosophila can be identified autoradiographically after incubation excised salivary glands for 10-15 min in a medium containing 3H-thymidine. Using this technique the patterns of DNA synthesis have been mapped relative to the cytological banding pattern and the frequency measured with which specific chromosome regions appear labelled in a population of nuclei. This frequency is found to be a specific function of the region, reinforcing the previous suggestion that the chromosome contains a longitudinal array of DNA replicative units. Following Feunig and Wang (1966), these units were denoted as 'replicons'. The precision with which any single replicon can be localized is limited by autoradiographic resolution as well as the necessity for its temporal differential replicative activity relative to its neighbors. At least 8 replicons have been identified in the less than 1% of the cumulative length of the D. melanogaster chromosome studied. While the identification of a replicon requires spatial discreteness and differential behavior, and thus implies a degree of independence, its autonomy is demonstrably incomplete. The data fit most naturally the notion that all replicons are active together at some time in the overall replicative cycle, but that some remain active over longer periods than others. (Author)

Les auteurs ont employé thymidine-méthyl-14C (6,6 et 8,5 Ci/mmol) et uridine-5-3H (18 Ci/mmol). Même à la plus faible dose d'antibiotique, la phosphorylation de la thyminié n'est pas réduite de manière significative. L'arrêt de la synthèse de l'ADN, en présence de l'antibiotique, ne peut être attribué à un défaut de phosphorylation de la thyminié. Il semble que l'actinomycine D qui est fixé sur l'ADN empêche ainsi sa réplication. On peut définir la concentration d'actinomycine nécessaire à stopper la réplication de la synthèse d'ARN 30% de celui que valeur (DI 50 ARN) et sur le même matériel le paramètre corrigé pour ce qui concerne la synthèse d'ADN (DI 50 ADN). Les résultats donnent un rapport Δ = DI 50 ADN/DI 50 ARN = 3.


Nucleic acid metabolism was studied in the ovariole of a lepidopteran, G. mellonella. In the cells composing the follicular vesicle, differences in localization of RNA during vitelline differentiation were visible. Isotope experiments showed that nuclei of the trophic cells were sites of intense synthesis of RNA. In young vesicles the oocyte nucleus was equally active in the synthesis of RNA, while at a later stage a remarkable preponderance of the polydispersed trophocyte nuclei was observed. The synthesis of RNA in the follicular epithelium was highest after the autolysis of trophocytes. The structural differentiation of trophocyte nuclei was accomplished by loss of their synthetic activity, both the cytochemical staining and the results of isotope experiments showed migration of RNA from the trophocyte chamber into the oocyte. The activity of glucose-6-phosphate dehydrogenase indicating the cell ability for the synthesis of nucleosides, was either localized in basalplasmic regions of the oocyte or extended in the direction of the contiguous cytoplasm of the neighbouring cells. It is suggested that cytoplasmatic contact between the oocyte and the trophocyte chamber. (Nuclear Medicine)


Differences in relative rates of nucleic acid and protein synthesis during periods of maximal puffing activity by the giant salivary chromosomes of D. americana were studied by radioautography. Pairs of glands from carefully staged female larvae were pulse labelled by incubation for 15, 30, or 60 min in insect saline enriched with 220μCi/ml of tritiated precursors. Heavy, differential labelling by DNA puffs and maximal labelling above non-puffing chromosomal regions occurred with 3H-thymidine in mid 4th instar, followed by a sharp drop in percentage of labelled nuclei in glands from pupae and virtual cessation of 3H throughout the period precoces continued synthesis 72 h before pupation, and 3H-thymidine was found in moderate labelling of sites with 3H-arginine. 3H-lysine labelling of labelled nuclei formation of DNA puff. At subsequent stages of pre puffs sites of chromosome 5 counts showed no signification of label to suggest diploid The DNA produced by hybrid or template DNA.
and virtual cessation of DNA synthesis all along the chromosome by the time of pupal molt and throughout the period preceding gland lysis in 72-h-old pupae. During these stages, salivary chromosomes continued synthesis of RNA, showing maximal incorporation of 3H-uridine or 3H-cytidine about 72 h before puation, and again just before pupal molt. Vigorous incorporation of 3H-uridine or 3H-cytidine was found in both the nucleus and the cytoplasm throughout 4th larval instars, with moderate labelling of chromosomes occurring in glands from prepupa and 24- or 48-h-old pupae. With 3H-uridine, 3H-cytidine, or 3H-tyrosine there were no clearly marked cyclic fluctuations in percentage of labelled nuclei or in distinctive labelling patterns of specific chromosome regions to mark formation of DNA puffs. By feeding larvae with 3H-thymidine at mid 4th instar and then sacrificing at subsequent stages of prepupal or pupal development, fate of the extra DNA synthesized at specific puff sites of chromosome 5 was followed over an 84-period of growth on unlabelled medium. Grain counts showed no significant diminution of labelling above DNA puffs, nor was there displacement of label to suggest dispersion of DNA from these chromosomal sites to other cellular organelles. The RNA produced by heterochromatic puff loci thus shows metabolic stability as expected for genetic or template RNA. (Absbr.)


A preparation consisting of fragments of wing epidermis from pupae of the silkworm, Hyalophora cecropia, has been incubated in a synthetic medium, and the effects of some conditions on incorporation of 2-3H-uridine and 3H-thymidine into RNA and protein, respectively, have been studied. Under standard conditions, the rates of incorporation remained unchanged when the precursors were added to tissue that had been precultured for different times up to 50 h. Tissue from insects commencing adult development after-diapause, through the action of either endogenous or injected ecdysone, showed increased histosynthetic rates. Stimulation was evident 10 h after injection of the hormone. Quantitatively, however, increases were less than those found when incorporation was measured in vivo. No effect was detected of pure ecdysone added in vitro to tissue from diapause pupae, which suggests that the tissue had lost sensitivity to the hormone. (Absbr.)

Ritossa, F. A NEW PUFFING PATTERN INDUCED BY TEMPERATURE SHOCK AND DNP IN Drosophila. Experientia 18, 12 (1962) 671-672.

The same effects on the puffing pattern are obtained whether temperature shocks are given to the whole larvae or to salivary glands extracted and incubated in Ringer solution. The induced structural modifications can be shown to correspond to actual changes in the synthetic activity of the chromosomal bands concerned. 3H-cytidine was administered to salivary glands incubated in vitro and heated. The presence of rather large quantities of tracer in the puff was apparent already after 3-4 min and reached high values after 10 min. Radioactivity was removed by RNase. This proves that as previously shown for normal spontaneous puffs, a rather high rate of DNA synthesis occurred also in temperature-induced puffs (2L 14, 2L 15, 2L 20).


By autoradiographic methods it can be shown that DNA is present all along the structure of a puff. Since puff formation does not require new DNA synthesis, this DNA is apparently the same as that of the bands from which the puff originates. Penicillium amino acid incorporation (leucine, tryptophan, and tyrosine) at the puff level is not found either when the puff is functioning or when the puff is forming. This suggests that enhanced protein turnover does not occur in the puff and that new protein synthesis is not necessary for puff appearance. The latter conclusion is also supported by experiments utilizing pumonicin. Although pumonicin inhibits amino acid incorporation into proteins in salivary gland cells, it does not inhibit puff formation. On the other hand, RNA synthesis appears to be specifically related to puff structure in the sense that an intense RNA synthesis is found in puffs. Acetylstreptomycin C and acetylsalicylic acid completely block RNA synthesis in the salivary gland cells without apparent interference with protein synthesis. Also acetylstreptomycin C and D completely inhibit puff formation. This indicates that the only synthesis required for a puff to appear is that of RNA. (From abstr.)

Experiments are described which establish that approx. 0.01% of the DNA of D. melanogaster is complementary to the amino acid transfer RNA (t-RNA). This number leads to about a 10-fold redundancy for each of the approx. 60 t-RNA species. Hybridization with DNA from stocks carrying multiple doses of the nucleolar organizer region established that the t-RNA cannot be detected in this region of the genome which has been shown to contain the complete set of DNA complementary to the two ribosomal RNA components. For isotopic labelling the standard medium of Sitosa and Spiegelman was modified to contain 0.5 g of yeast/10 ml. To each 10 ml were added either 7 ml of H-uridine (21 Ci/mM) or 0-10 ml of H after hydrolysing to remove pyrophosphate and neutralization. The usual RNA employed in these studies had a specific activity > 70,000 cpn/ml. Details are given of the procedures used for extracting and purifying RNA, preparing DNA, and for determining the base composition of RNA.


Drosophila DNA and RNA were labeled, isolated, and molecular hybridization procedures performed. In D. simulans the X-chromosome contained 3 times as much DNA as the Y, and 1.5 times as much at either X or Y of D. melanogaster. The differences were correlated with the absence of a wild-type allele of bristle on the D. simulans Y-chromosome. (CA 65: 1966, 20568 c)


Earlier work had indicated that initiation of the DNA synthesis in a polyenic replication cycle may take place as long as the larval state prevails, and the DNA synthesis occurring in the polyenic model of propagation is that of propagation of the final cycle. That conclusion is supported by the present results, the graphs interpreted as characteristics of the initial phase of the DNA synthesis cycle are obtained until shortly after formation of the white prepupa, when abruptly reduced. On the other hand, thymidine incorporation in radiograph patterns believed to represent the latter part of the cycle is observed throughout the larval and prepupal periods, suggesting that a condition essential for initiation of polyenic replication is not obligatory for propagation. This report includes a description of the basis for assigning the various radiograph patterns produced in the nucleoli of a salivary gland to an ordered cycle in the propagation cycle, and an analysis of the distribution of these patterns at successive larval and prepupal stages. The data are compatible with two possible interpretations: (1) the information for a component of a multimer supporting initiation of polyenic replication is transcribed only in the larval state; (2) the information for an inhibitor of initiation is transcribed in the prepupal state. (From abstr.)


Review essay drawn on examples taken from studies which include plants and insects. The review is divided into sections on cell growth and nuclear DNA (embryonic development, regeneration and compensatory hypertrophy, tumor growth); cell function and nuclear DNA (plant cell nucleus, giant chromosomes of insects, nutrient cells, liver cells, muscle cells, epidermal glands, endocrine glands, target organs of the endocrin); sites of gene activity in the interphase nucleus (nucleolar-associated chromatin, heterochromatin); insect data are cited on p.15-16, 22-24, and 59.


The total absorbancy of chromomeric u.v. radiation and the incorporation of H-cytosine and -thymidine were measured in tissue sections of giant chromosomes of salivary glands at two stages in development, with and without treatment with RNase. The ratio of RNA:DNA was found to vary from region to region; the rate of incorporation of cytosine was not correlated with the amount of RNA or DNA present in a region. The rate of RNA synthesis was found to change very rapidly with time in a single region; no significant inhibition of the reaction was observed. (From abstr.)

Swaity, N.A., Alwood, K. C. A review paper with 22 references. A discussion of the factors involved in DNA replication, the cell cycle, and DNA repair, with emphasis on the role of DNA polymerase in the replication process. (CA 68: 1968, 24058 c)


Stalin, J. C. R. Nature, 257 (1975) 263-264. " - reported labelling with only the 4th peak of such concept that the nuclei are free of hybridization. (From abstr.)


THE FREE NUCLEOTIDES AND THEIR DERIVATIVES IN INSECTS, Prog. mol. Biol. 61, 8 (1966) 521-537 (in Russian)

A review paper with 82 references. It deals with free nucleotides and nucleic acids in insects, free nucleotides and their derivatives as co-enzymes, and the luminescence of insects.


Preliminary data suggest that in these chromosomes the synthesis of DNA occurs independently in different bands, some of which are heterochromatic.


The different species of RNA newly synthesized in the nucleolus of fully-grown larval salivary glands of Drosophila melanogaster are described. Salivary glands were incubated in vitro, with appropriate radioactive precursors. The sucrose-gradient sedimentation profile of the RNA shows typically a pattern of radioactive peaks ranging from 4 to 6 S, while the height of the intermediate peaks differs somewhat with the experiments. In glands treated with EMB and TRB, TdR-<sup>3</sup>H (closed) and EMB, TdR-<sup>3</sup>H (correspondingly)-deoxyribonucleic acid, respectively), the radioactivity is largely confined to the 4-6 and 6-9 S peaks, the relative height of which is variable. These two molecular species of newly synthesized RNA are therefore nucleolar and represent true nucleolar synthesis.


The synthesis of radioactive RNA in the larval salivary glands of a chironomid was isolated within the intact gland by means of specific inhibitors. Quantitative autoradiography of RNA synthesis was carried out using <sup>3</sup>H-thymidine (81 mCi/mmol), either with or without chloroquine-substituted benzamidazoles (28R and 28T) present throughout. In autoradiography of RNA methylated, glands were first incubated with protamine, then with methionine (meth-<sup>3</sup>H-C<sub>4</sub>) (50 mCi/mmol) and protamine. The picture of nucleolar synthesis proved to be identical with autoradiography of separate sections. Radioactive RNA extracted from glands in which nucleolar synthesis or methylation has been established autoradiographically is assigned to the nucleolus. Methylation of nucleolar RNA depends closely on synthesis. Parallel biochemical work indicates that part of the newly synthesized RNA is of high mol. weight, and part is of 4-6 S values with characteristics of transfer-RNA. Work on the latter RNA is discussed.


Larval salivary gland cells of the chironomid, Drosophila melanogaster, were incubated with radioactive precursors of RNA. Successive gradient sedimentation patterns of newly synthesized RNA showed RNA, ribosomal RNA and RNA larger than S8S. That a high proportion of RNA synthesized in the larvae was in the nucleolus and that it was 45S RNA was concluded from several factors: (a) a high proportion
portion of RNA was synthesised when incubation was carried out in the presence of DNA and TRH (5,6-dichloro- and triethyl-1-β-D-ribofuranosylbenzimidazole, respectively), reagents which are known to allow only nuclear synthesis; (b) when methylation was carried out, only 48% RNA was methylated and the nucleolus is known to be the predominant cell site of RNA methylation; (c) RNA synthesis was suppressed when actinomycin was used, and actinomycin suppresses nuclear RNA synthesis. (CA 91:1967, 133432 g)


In the present study the pattern of incorporation of 35S-labelled uridine and thymidine into the nucleic acids of a number of tissues of the giant silkworm Hyalophora cecropia and Samia cynthia was examined by autoradiographic procedures. The patterns of incorporation were recorded for diapause pupae, imaged diapause pupae, and at different stages of adult development. Changes in the protein patterns were studied by electrophoretic separation of the blood serum at the same stage of the life cycle. Routine histological observations were also recorded for these animals. Autoradiographic analysis of DNA synthesis revealed that it occurs during adult development, but is suppressed in all tissues except the blood cells and glands during the diapause period. Injury which activates a number of biochemical systems held in abeyance during diapause, does not stimulate DNA synthesis in any tissue except the blood cells and those epidermal cells directly involved in the closure of the wound. Pulse-labelling experiments showed that synthesis of DNA synthesis occurred in the wing epithelium at least 3 days before any visible morphological signs of development could be detected. Evidence which indicates that the accumulation of DNA synthesis may be closely tied to cytokine activation is discussed. It was shown that the synthesis of DNA does not occur synchronously in all tissues of the developing adult, but that each tissue requires synthesis at a characteristic period. Not all tissues of the developing adult exhibit DNA synthesis, indicating that the hormonal environment at each stage may determine whether or not new DNA molecules are produced. The synthesis of RNA never seems to be suspended in any tissue examined, but injury and the onset of development cause an increase in the rate of RNA synthesis. Two distinct types of injury-stimulated response in the rate of RNA synthesis were detected. Incorporation patterns observed in tissues exposed to labelled uridine for periods longer than 8 hr are consistent with present theories concerned with regulating the nuclear synthesis and subsequent transfer to the cytoplasmic DNA molecules. The incorporation of labelled uridine into the RNA of tissue adjacent to the cavity was higher than that in the fat body adjacent to other regions and this suggests that the ovary influences the metabolism of the surrounding fat body. The antibiotic actinomycin D when administered at the level of 0.5 μg/kg reduced the rate of RNA synthesis in the tissues of injured diapause pupae, but not lethally. The synthesis of a blood protein synthesized by injury was, however, inhibited by the administration of actinomycin concurrently with the injury. Detection of the synergism of blood proteins and examination of the incorporation of labelled amino acids into other proteins revealed that actinomycin at this concentration did not prevent the injury-stimulated increase in the amount of other proteins which are normal constituents of the blood of diapause pupae. This differential action of actinomycin suggests that gene loci already employed as templates for the synthesis of messenger RNA are protected by this activity whereas nonfunctional loci are not. Preliminary experiments indicated that the blood cells are one source of the injury-stimulated protein, and that this protein is a characteristic component of the blood of the developing adult. Clotting factors in the Malpighian tubules and subepithelial glands of developing adults are described. Neither type of crystal was chemically characterized, but those in the Malpighian tubules exhibited label after the animal had been injected with labelled thymidine or uridine. (From DA)


Review article. Work is cited on Drosophila, Dicytostelium, Plasmodium, Chromosome, Glycogen, nuclear, cytoplasmic, etc. The DNA content of the chromosomes, DNA and chromosomal structure, proteins and chromosome structure, RNA-containing components, cytoplasmic protein synthesis, and implications of the work described are discussed. Radiotopes were employed in numerous of the studies cited.

328 Takahashi, K., STUD Decoheren (LEPIDOPTERA)

The fluctuation of RNA of development from ti was high in the early 5 change was mainly arc for the purpose of anal body cells by a slightly. The RNA 3, RNA and 1. The ratio of RNA to D during the period of d for early stage of the 5th 1 later stage of the 5th larval instar. (Auth.)

349 Thomas, K. K., NATION Periplaneta americana, Acta Biol. 120 (1965)-

The concentrations of R when compared with a strain-optimally allated in cercipterfm was observed. The rate of females was slow comp ovarians was osoic was observed. Mitochondria tissues are expired females, proteins, and uric acid.

359 Vermeulen, C.W., RN DNA IN DROSOPHILA mela

Molecular hybridization and Photo cytosine is rec a similar proportion of ti are described for prepaid to wear on man meal r-RNA-DNA hybridized (Proc. natn. Acad. Sci. of its weight RNA has

381 Watanahe, H., LOCAL INFECTED WITH CYTOI (LEPIDOPTERA: DOMICIC

An autoradiograph tech may cells injected withif of several strains were in inoculation infected and 1-day labelling periods was precocious by healthy and symmetrical in infected mid in the cytoplasm with the as being released into the

The fluctuation of RNA was determined using the fat body cells of D. synthetica during the course of development from the 5th larval instar to the early pupal stage. The ratio of total RNA to DNA was high in the early 5th instar but decreased afterwards to reach a min. at pupation. This change was mainly accounted for by the reduction of RNA contained in the micronuclear fraction. For the purpose of analyzing such changes in RNA, nucleic acids were isolated from the fat body cells by a slightly modified SDS-phenol method after injection of 3H into the body cavity. The RNA-DNA and RNA-DNA acid determinations were facilitated by methylated serum albumin column chromatography. The ratio of RNA to DNA was rather constant, while the ratio of RNA to DNA decreased gradually during the progress of development, incorporation of 3H into RNA and DNA took place only in the early stage of the 5th instar. It is concluded that the RNA which exists in the fat body cells in the later stages of the 5th instar and pupal stage was synthesized during the first few days in the 5th larval instar. (Auth.)

* RNA = soluble transferred RNA.
* RNA = ribosomal RNA.


The concentrations of RNA and proteins were substantially lower in allatostatized females when compared with sham-operated females. Uric acid concentration remained approximately constant in allatostatized females, while in the controls it increased to more than double the concentration observed. The rate of incorporation of 3H-labeled amino acids into the fat body of allatostatized females was slow compared to that of the sham-operated controls. A very slow incorporation into ovarian tissue was observed in allatostatized females, as against a rapid rate of incorporation in controls. Midgut tissue exhibited a significantly greater incorporation of the isotope than that of sham-operated females. The probable relation between corpora allata and the synthesis of RNA, protein, and uric acid during ovarian development is discussed. (From summary.)


Molecular hybridization experiments have indicated that ~80% of the DNA in E. coli, D. melanogaster, and Drosophila melanogaster are protected from RNase digestion by RNA's. This raises the question of whether the entire DNA is protected from RNase digestion by RNA's. The methods are described for preparing DNA from E. coli, D. melanogaster, and D. melanogaster. The methods are described for preparing DNA from these organisms (from Escherichia coli and Drosophila melanogaster). Details are given for DNA-DNA hybridization and DNA-RNA hybridization. The DNA appears to be saturated when ~80% of its weight in RNA has been hybridized.


An autoradiographic technique is described to locate the site of viral RNA synthesis within the midgut cells infected with cytoplasmic polyhedrosis virus in the silkworm. Twenty-four hours after virus inoculation infected and control larvae were injected with 1 or 2 mcg/ml labeled 3H-uridine. Six labeling periods were used. A significant difference was observed in the incorporation of RNA precursor by healthy and virus-infected cells. The nucleoli appear to be the site of viral RNA synthesis in infected midgut cells. Since the virus particles and the polysomes are only observable in the cytoplasm in the electron micrographs, viral RNA produced in the nucleoli is interpreted as being released into the cytoplasm in order to gain its coat of protein.
The patterns and changes of nucleic acid synthetic activity during the course of nuclear-replication were demonstrated in the fat body and some other tissues of the silkworm, Bombyx mori L. (Lepidoptera: Bombycidae), infected with nuclear-polyhedrosis virus. *Appl. Ent. Zool.* 2, 3 (1967) 147-157.

The pattern of nucleic acid synthetic activity within the midgut cells of healthy larvae of the silkworm, *B. mori*, and of larvae infected with the cytoplasmic-polyhedrosis virus was demonstrated by means of autoradiography with labeled nucleic acid precursors. 8 h after injection of uridine-3H, the healthy cells generally incorporated the labeled material into cytoplasmic RNA and partly into nuclear RNA, whereas the diseased cells on the 2nd and 4th day after virus inoculation incorporated much of the labeled uridine into nuclear RNA and some into cytoplasmic RNA. The nuclei of virus-infected cells, the nuclear label appeared mostly within the nucleoli. Thus, the distinct difference in the uptake of the RNA precursor between the healthy and infected cells indicated that the nucleoli of the infected cell may be a site of the viral RNA synthesis. Autoradiographs with thymidine-3H revealed no essential difference in the pattern of DNA synthesis between healthy and diseased midguts, and only a few cells incorporated the labeled material into their nuclei. At the late stage of virus infection, however, when some infected midgut cells eventually degenerated, there was a slight increase in the nuclear label in the newly generated cells. *(Austh.)*


Injection of thymidine-3H into polyplaid nurse cells was studied in 3- and 6-day-old and 3-week-old induced Netted strain of *D. melanogaster*. The ovaries were labelled by 30 min incubation at 25°C in a solution containing 0.17 M MgCl2, 0.99% KCI, 0.09% CaCl2, and 5 uCi of thymidine-3H/mL. The speed and probably the duration of DNA synthesis increased with the degree of polyplody in both young and old flies. Old flies were less heavily labelled than young flies; this might be due to an increase of precursor pool size or a reduction of DNA synthesis with age. *(CA 87:1967, 30173J)*


The epidermis tissue of dispersing pupae show no detectable DNA synthesis even after months of exposure to thymidine. By contrast, very rapid synthesis occurs in synchrony with the termination of dispersal and the initiation of adult development. The synthesis of DNA is, therefore, one of the most impressive biochemical changes associated with the action of the prothoracic gland hormone (ecdysone) in terminating the pupal dispersal. DNA synthesis is known to require formation of the triphosphate derivatives of all four deoxyribonucleotides. Consequently, by virtue of its inhibition of the enzyme thymidylic acid synthetase, the compound 5'-fluoro-2'-deoxyuridine (FUDR) is recognised as a potent inhibitor of DNA synthesis. Dispersing pupae of the exceptia silkworm show almost unparalleled resistance to FUDR, and are seemingly unaffected by injection of 6 mg into 1 g pupae. However, the drug singes out and apparently destroys all spindle-shaped haemocytes, one of the types which normally continue to synthesize DNA during dispersal but also blocks the healing of integumentary wounds. When ecdysone is secreted to provoke the termination of dispersal and the initiation of adult development, the insect becomes extremely sensitive to FUDR; a single