Kalicki, H. G. and Thomas J. Trzaski.
Adelphi University, Garden City, New York. RNA synthesis in the Drosophila ring gland during pupal development.

The activity of the corpus allatum in the larva of the ebony mutant about to undergo puparium formation is higher than in the wild type (Canton-S) at a comparable time, and is manifested on the histophysiological level, by larger nuclei, a larger corpus allatum with evidence of secretory activity, and on the phenotype level, by a lack of tanning of the puparium (Kalicki, 1963; Wolsky and Kalicki, 1959). This higher activity suggests that there may also be a difference in the activity of the ring gland during pupal development.

Pupae, selected at five levels of development were injected with tritiated uracil in the posterior abdominal region and allowed to rest for two hours. They were then fixed, embedded in paraffin, sectioned serially, processed for autoradiography and stained with Methyl Green Pyronin. Grains over the prothoracic gland and the corpus allatum were counted in each section, and the counts for all the sections in the series were totaled to give the uracil uptake in the entire organ.

RNA synthesis, as indicated by uptake of radioactive precursor, in Canton-S prothoracic gland (Fig. 1-A) is high before pupation, and generally lower during pupation. There is a slight increase in synthesis during eye pigmentation which decreases only a little during bristle pigmentation, but this is followed by a sharp decline when the imago is ready to emerge. In the corpus allatum (Fig. 1-B) RNA synthesis is low during puparium formation and pupation, but increases markedly during eye pigmentation, after the corpus allatum has migrated into the thorax. Synthesis decreases during bristle pigmentation and in the ready-to-emerge imago.

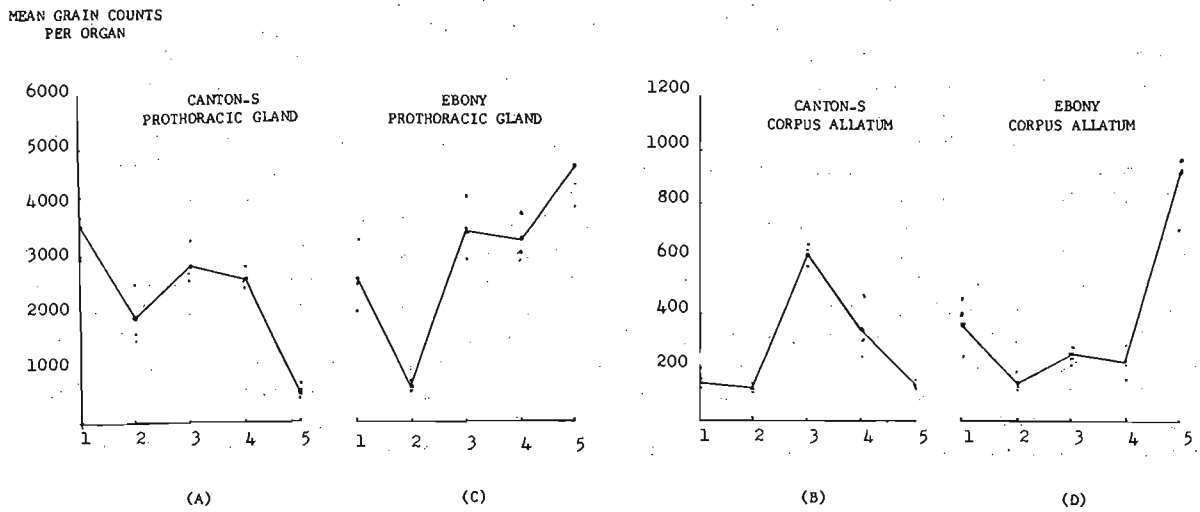

Fig. 1. Uptake of tritiated uracil in ring gland during pupal development:
(1) separation of prepupa from puparium
(2) pupation and secretion of pupal cuticle
(3) completion of eye pigmentation
(4) bristle pigmentation
(5) ready to emerge imago

RNA synthesis in the ebony mutant prothoracic gland (Fig. 1-C) is somewhat lower than wild type during puparium formation and drops to a lower level during pupation. Synthesis increases more sharply than wild type during eye pigmentation, remains high at bristle pigmentation, then, unlike the wild type, reaches a peak in the ready-to-emerge imago. In the corpus allatum (Fig. 1-D) RNA synthesis is higher at puparium formation, decreases to about the same level as the wild type at pupation and does not show the same increase of uptake at eye pigmentation. This low activity persists through the stage of bristle pigmentation, but uptake increases to a high peak at the period of pre-emergence.

A comparison of the activity of the ring gland during pupal development in the monogenic ebony mutant and in the wild type shows a dissimilarity in the patterns of synthesis. The wild type gene and its allele "ebony" are not equally susceptible to regulator influences. If RNA synthesis in the nucleus can be interpreted to reflect a derepression of the repressor locus of the chromosome, then the response of the mutant gene is quantitatively different from the wild type.

References:

Kalicki, H. 1963, Folia Histochem. et Cytochem. 1:423.
Wolsky, A. and H. Kalicki, 1959, Nature. 183:1129.

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Host specificity of cactiphilic Drosophila in the Sonoran Desert.

Arborescent cereus cacti of the Sonoran Desert provide specific habitats for different species of Drosophila. From samples of rotting limbs collected in the field from 1962 to 1967, we have reared the following species in the laboratory (see localities on map): Lophocereus schottii (senita) 19 localities in Jan. Feb. May June Nov. Dec. reared 2,380 D. pachea; Carnegiea gigantea (saguaro) 4 localities in Jan. Feb. Aug. Oct. Dec. reared 12,172 D. nigrospiracula; Pachycereus pringlei (cardon) 3 localities in Feb. May Dec. reared 353 D. nigrospiracula; Machaerocereus gummosis (agria) 6 localities in Feb. Mar. May Nov. reared 1,048 D. mojavensis; Lamaireocereus thurberi (organpipe) 5 localities in Jan. Nov. Dec. reared 113 D. mojavensis, 3 D. arizonensis, 1 D. longicornis; Rathbunia alamosensis (cina) 4 localities in Jan. Feb. Nov. Dec. reared 790 D arizonensis, 20 D. mojavensis, 13 D. pseudoobscura, 1 D. hamatofila.

Of the four most abundant species, D. pachea is the only one truly monophagous. D. nigrospiracula has been bred also from Ferocactus. It is therefore classified as an oligophagous species. D. arizonensis is polyphagous having been bred also from Ferocactus, Opuntia, squash and citrus fruits. D. mojavensis has been bred also from Opuntia. It becomes more difficult to classify these species within the large genus, Drosophila, as each one becomes more monophagous. For instance, D. pachea (monophagous) belongs to a very small species group having only a few morphologically distant relatives. D. nigrospiracula (oligophagous) is a member of the large repleta species group but does not clearly fit any known subgroup. D. mojavensis and D. arizonensis (polyphagous) are closely related sibling species and have 10 other closely related members collectively known as the mulleri subgroup of the repleta group. The different degrees of host plant specificity may represent different levels of time with D. pachea being the oldest. We thank Dr. L. E. Mettler for checking D. arizonensis and D. mojavensis cytologically.

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Inability of D. pachea to breed in cereus cacti other than Senita.

From our records D. pachea breeds only in the rot pockets of the arms of the cereus cactus, Lophocereus schottii (called senita) where it obtains the sterol, schottenol, necessary for its growth and reproduction. The question arises whether or not pachea can utilize other cereus cacti in the laboratory which grow sympatric with senita in the Sonoran Desert.