

ZOOLOGY

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ABSTRACTS

A Freeze-Fracture Study of the Mouse Ovarian Follicle and Zona Pellucida. LARRY R. GANION, Department of Physiology and Health Science, Ball State University, Muncie, Indiana 47306.—The origin of the mammalian zona pellucida is controversial. A freeze-fracture study of maturing ovarian follicles was initiated to further elucidate the mechanism whereby the zona is formed. Ovaries were removed from 17 to 20 day old, C3H mice, fixed in 3.5% glutaraldehyde in 0.1M phosphate (pH 7.2) for 20 minutes, and infiltrated with 25% glycerol. After 2 hours, the tissues were frozen in liquid Freon 22, fractured, and replicated on a Balzers BAF 301. All replicas were cleaned with bleach and subsequently viewed in a RCA EMU 3C electron microscope. As previously shown, zona pellucida formation commences in unilaminar ovarian follicles. At this time, the follicle cells are filled with rough endoplasmic reticulum and Golgi. Replicas revealed the presence of numerous vesicles within the follicle cell cytoplasm adjacent to the developing zona. These vesicles frequently are fused with the follicle cell membrane. In later stages of zona formation, large vesicles occur in the cortical ooplasm and appear to fuse with the oocyte membrane. The zonae of multilaminar follicles are traversed by follicle cell projections and oocyte microvilli. The granulosa cells exhibit both gap and tight junctions, whereas only tight junctions occur in the theca. It is speculated that the exocytotic activity of the follicular envelope and oocyte is involved in the deposition of the zona pellucida. The possibility that the cytoplasmic vesicles contain newly synthesized zona material is currently being tested by means of high resolution autoradiography.

The Northern Ringneck Snake A Host of *Cepedietta* sp. JOHN D. GOODMAN, Department of Biology, Anderson College, Anderson, Indiana 46011.—The genus *Cepedietta* Kay, 1942 (for *Haptophrya* Stein, 1867; Corliss, de Puytorac and Lom, 1965) is exclusively parasitic in amphibians. The type, *C. gigantea* (Maupas, 1879), is from frogs (Algeria and Tunisia); *C. michiganensis* Woodhead, 1928, from *Hemidactylum*; *C. virginensis* Meyer, 1938, from *Rana*; *C. fibrillata* Kay, 1942 from *Eurycea bislineata*; plus a record in de Puytorac (1963) from plethodontid salamanders.

Northern Ringneck Snakes, *Diadophis punctatus edwardsi* (Merrem) collected in Central Indiana contain what is likely a new species of *Cepedietta* and constitutes a new host record, the first in a reptile. However, it is possible that *Diadophis*, a confirmed feeder on amphibians, might obtain *Cepedietta* in its diet.

Variation of Lead Acetate-Induced Mortality in Estradiol-Treated Male Mice. G. R. HOGAN, Department of Biological Sciences, Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana 46805.—Lead acetate, $Pb(Ac)_2$, is known to exert a wide variety of deleterious effects to a broad spectrum of biologic

systems. It has been reported, however, that estrogens appear to render the female less vulnerable to the lethal effects of this lead salt. The studies reported here were undertaken to test the female hormone, β -estradiol, for its ability to modify mortality in young adult male mice treated with $\text{Pb}(\text{Ac})_2$.

Males were injected with β -estradiol on two subsequent days. Immediately following the second hormone injection, $\text{Pb}(\text{Ac})_2$ was administered at four subgroup dosages ranging from 75 to 600 mg/kg body weight. A control group of males was injected with only $\text{Pb}(\text{Ac})_2$. At regular intervals following lead, the median lethal dosage (LD_{50}) was calculated using a method of moving averages. Results indicate that treatment with β -estradiol does not reduce lead toxicity but rather intensifies it. LD_{50} values were lowest for both β -estradiol groups. Mice receiving $\text{Pb}(\text{Ac})_2$ only, exhibited the highest LD_{50} values throughout the period of observation, indicating that that group was the most tolerable one to $\text{Pb}(\text{Ac})_2$ injections.

The Fine Structure of the Rectal Pads of *Grylloblatta compodeiformis*. MOHINDER S. JARIAL, Department of Physiology and Health Science and Muncie Center for Medical Education, Ball State University, Muncie, Indiana 47306.—The fine structure of the rectal pads of *Grylloblatta compodeiformis* has been investigated and contrasted with other species. Such a study is of interest since *Grylloblatta* has been described by Walker as a "living fossil" and is adapted to a low range of temperature. The freezing point depression of the haemolymph and rectal fluid obtained from one specimen was found to be 0.69°C and 1.45°C respectively, indicating that this insect produces hyperosmotic rectal fluid.

The rectal sac of *Grylloblatta* is lined with cuticular intima which extends over the six prominent, somewhat irregularly arranged, rectal pads. Each rectal pad is broad and oval in outline and is composed of a single layer of tall columnar epithelial cells with oval nuclei that are placed near the apical surface and slender, spindle shaped junctional cells. The epithelium is surrounded by an extensive connective tissue space which contains fibrillar material, elongated cells, numerous axonal endings resembling neurosecretory terminals and tracheoles. The connective tissue space is covered externally by a layer of smooth muscle. The apical membrane of the epithelial cells is thrown into numerous infoldings, some forming stacks and their cytoplasmic surface is covered by a particulate coat. The lateral plasma membranes are infolded encircling mitochondria and enclose large intercellular channels and spaces. Near the apical and basal surfaces the lateral membranes of the adjacent epithelial cells are connected by septate desmosomes. The cytoplasm contains numerous mitochondria, free ribosomes, microtubules, dense bodies but Golgi apparatus and endoplasmic reticulum are rarely seen. The slender processes of the junctional cells from a compact sheath around the base of the epithelial cells. The ultrastructural features of the rectal pads of *Grylloblatta* suggest their role in the reabsorption of ions and water from the rectal fluid.

The columnar epithelial cells of *Grylloblatta* rectal pads are basically similar in structure to those of other orthopteran species except in the absence of subepithelial sinus and the tracheoles not penetrating deep into the pad. The main difference is in the absence of secondary cells which have been implicated in recycling solute through the rectal pad cells in other species. In this regard *Grylloblatta* rectal pads resemble those of *Periplaneta* but differ from those of *Blatella*, *Blaberus* and *Schistocerca* which have secondary cells. This feature may be related to the demand and conservation of water in different habitats.

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Fatty Acid Distribution in Salamanders of the Family Plethodontidae. DOYAL R. LANK JR. and ALICE S. BENNETT, Ball State University, Muncie, Indiana 47306.—Fatty acid distributions in tissues from salamanders of the family Plethodontidae were compared to determine the feasibility of using such differences as a taxonomic tool. Intraspecific, generic, and interspecific variations in the fatty acid composition of one species of genus *Desmognathus*, two species of genus *Eurycea*, four species of genus *Plethodon*, and one species each of genus *Gyrinophilus* and genus *Pseudotriton* were compared.

Intraspecific variation in fatty acid percentages were found when sex, size, season of collection, geographic locality, and altitude were compared on a variety of tissue extracts. Sex and geographic differences seemed to be of the least importance, while differences in the other three comparisons were distinct. Fatty acid compositions of salamanders of various sizes were compared and it was found that tissues of larger salamanders had smaller percentages of short chain fatty acids. Seasonal variation was apparent in that there was an increase in short chain fatty acid percentages of tissues of salamanders collected toward the fall, compared with those collected in the spring. Tissues of specimens from higher elevations were found to have more short chain fatty acids than those from lower elevations.

A trend toward larger proportions of short chain fatty acids was found among salamanders of genus *Eurycea* which has the greatest diversity in habitat. This trend graded toward lower percentages as the genera became more aquatic, as in genus *Gyrinophilus* and genus *Pseudotriton*, or more terrestrial, as in genus *Desmognathus* and genus *Plethodon*.

Few interspecific variations were found which would allow consistent differentiation between species. One notable exception was the presence of fatty acid 17:2 in *Eurycea multiplicata multiplicata*, and not in the other species of *Eurycea*.

This study suggests that the biochemical taxonomic differentiation of salamanders of family Plethodontidae using fatty acid distribution may be possible in a more comprehensive investigation using larger sample sizes.

Biochemical Effects of Tioxidazole on *Hymenolepis diminuta* in vivo. RICHARD O. MCCracken, PEGGY A. JOHNSON, and DORIS D. TAYLOR, Department of Biology, Indiana University-Purdue University at Indianapolis, Indianapolis, Indiana 46205.—An investigation of the chemotherapeutic and biochemical effects of a new anthelmintic, tioxidazole (methyl-6-propoxybenzothiazole-2-carbamate), on the tapeworm *Hymenolepis diminuta* in experimentally infected rats is reported. Tioxidazole proved to be highly active against *H. diminuta*; a single oral dose of 75, 150, and 300 mg/kg on day 15 of infection eliminated 0, 87, and 100% of the tapeworms respectively as determined at necropsy 4 days after treatment. The chemotherapeutic actions of tioxidazole on *H. diminuta* were accompanied by marked changes in worm weight and chemical composition. Tapeworms recovered from rats that had received a therapeutically effective dose of tioxidazole 24 hr earlier were significantly smaller and contained much less glycogen (as a percent of the wet weight) than worms from unmedicated controls. Protein concentrations rose in tioxidazole treated worms and at a rate sufficient to offset the decline in glycogen concentration. Glycogen/protein ratios in tioxidazole-treated worms were considerably lower than the corresponding control values. Differences in the absolute

amounts of glycogen and protein between control and drug-treated worms were even more profound.

Vertebrate Remains from Carcass Crypt Cave, Lawrence County, Indiana.

RONALD L. RICHARDS, 8141 Pickford Drive, Indianapolis, Indiana 46227.—Excavation within Carcass Crypt pit-cave, Lawrence County, Indiana produced skeletal remains of 44 vertebrate species many of which were deposited as a co-existing assemblage. Bones of spotted skunk, woodrat, and hairytail mole occurred out of their modern distribution. The black bear and porcupine represented have been extirpated in Indiana. Pit entrapment accumulated most of the larger species. While much of the microfauna may have inhabited the cave, some shrews and voles represent pellet debris of small owls.

The Movements of A Jumping Rotifer, *Polyarthra* sp. HENRY TAMAR, Department

of Life Sciences, Indiana State University, Terre Haute, Indiana 47809.—Specimens of a *Polyarthra* rotifer species collected from a temporary mud puddle were observed to move forward fairly rapidly through a volume of water. Since the 6 saw-toothed skipping appendages (paddles) on each side of the body remained inactive at the organisms' sides during forward movement, the last presumably was performed by means of the corona. At times the rotifers made short, rapid, straight backward jumps, as when they hit the substrate with their anterior end. Some jumps which followed contact with the substrate were only mainly backward in direction. At certain locations 2 or 3 jumps were performed in succession. During jumps the so-called skipping appendages remained in place at the sides of the body, and the corona appeared to continue its normal ciliary activity. Instead, a backward contraction of primarily the anterior body accompanied each jump. Backward jumps by a *Polyarthra* species not involving the skipping appendages have heretofore not been reported. Perhaps the described jumps were powered by the ejection of water in a forward direction when the anterior body contracted backward. The skipping appendages could on occasion be extended laterally and may have a defensive role.

The jumps of *Polyarthra* appear to have an avoidance function. This is interesting from a phylogenetic viewpoint, since the jumps of jumping ciliate protozoans either are the first escape movement of a complete avoidance reaction or make up all of a partial avoidance reaction (Tamar, Arch. Protistenk. 122 (1979):290-327).