ZOOLOGY

Chairman: Charles E. Mays, Department of Biology, DePauw University, Greencastle, Indiana 46135

John M. Ferris, Department of Entomology, Purdue University, Lafayette, Indiana 47907 was elected Chairman for 1975

ABSTRACTS

Dominance Rank and Physiological Traits as Affected by Shifting Cows From One Group to Another. C. W. Arave, Department of Dairy Science, Utah State University, Logan, Utah 84322 and J. L. Albright, Department of Animal Sciences, Purdue University, West Lafayette, Indiana 47907.——Thirty-four lactating Holstein cows were paired and assigned randomly to 1 of 2 groups. Weekly, 3 or more hourly observations followed equal feeding regimes for establishing social dominance rank (DR). Twice during 10 weeks selected (high, mid or low dominance) cows were interchanged between groups and the effect on daily milk, weekly leucocyte and periodic prolactin levels noted. Correlations between DR and Fat-Corrected-Milk, age, leucocytes, body weight, height at withers, number of social encounters, days in lactation and ng/ml prolactin in milk were .25, .30, .30, .51, .49, .48, .34, and —.34, respectively. Correlations between overall DR and DR for single time period ranged from .67 to .89. DR for interchanged cows remained relatively constant. A significant ($P<.01$) difference was found between weeks for persistency of milk yield as measured by current week/previous week's yield. Group by week interaction was also significant ($P<.05$) but there was no significant difference between groups or between cows. A 5.0% decline in persistency occurring in the second interchange period was significant. At the end of the initial experiment the most dominant cow in both groups injured herself and a toe from her right front foot had to be removed. She subsequently recovered and 1½ years later (May 1974) she was placed back into her original milking group (now 11 cows). Using the same feeding and housing conditions, in a three-day competitive feeding situation it was found that she was still the dominant cow. However, when she was shifted into the group (now 10) of cows (where the 5% decline in milk production occurred), she was unable to keep her position and remain as the dominant cow. The other cows in both groups essentially kept their original rankings.

Behavioral and Physiological Differences of Mice Grown at 4 C and 21 C. Jo Anne Mueller and Wayne Paul Mueller, University of Evansville 47704.——Isolated Swiss mice grown at 4 and 21 C were supplied food in the form of sunflower seeds in shells. When unlimited food was available, the animals at 4 C, as well as those at 21 C, gained weight and appeared to be in general good health, but when the

food supply was limited to that sufficient for weight maintenance for animals at 21 C, the animals at 4 C quickly lost weight.

Each day all mice were supplied tissue paper and string wrapped around metal rods. After 24 hours the nests constructed from the paper and string were graded for complexity. Animals at 21 C made less elaborate nests than those at 4 C when unlimited food was provided. Well fed mice at 4 C constructed deep nests, shredding the tissue paper and incorporating the string into the nests which were constructed on sunflower seed shells. More shells were added to the nests as the kernels were removed and eaten.

Animals at 4 C failed to construct nests when food was limited to the extent that body weight could not be maintained. After several days of limited food, mice at 4 C remained "balled up" and immobile until food was supplied. After consuming the available food they again drew in their appendages and become immobile.

Muscle and core temperature was dependent upon the food supply. Daily readings indicated that thigh and tail muscle temperature dropped quickly after the onset of limited food after which the core temperature dropped.

What Is the Future for Biological Control of Insects? HAROLD L. ZIMMACK, Ball State University, Muncie, Indiana 47306.——The use of microorganisms harmless to man, but effective in controlling destructive insects, has remarkable potential. It is the difficult task of the insect pathologist to identify biological pathogens. Present techniques have not identified many organisms to control insects that are vectors of disease or which threaten our world's diminishing food supply. This report suggests new approaches that should be considered for screening effectively and rapidly for insect biological control agents.

Several techniques have been employed to study physiological responses of fifth instar larvae of the European corn borer, *Ostrinia nubilalis*, experimentally infected with *Bacillus thuringiensis*. Heart beat, respiration rate, differential and hemocyte count were used as parameters for comparing responses in normal and diseased insects. Radioactively-labeled bacteria were also used to determine how long they are retained by the host insect. Theoretical screening is suggested through tissue culture, computer analysis, and insect EKG. These techniques could be used independently or jointly as improved screening techniques.

Preliminary Evaluation of a Tooth Wear Aging Technique for the Big Brown Bat. *Eptesicus Fuscus.* DR. RALPH D. KIRKPATRICK and THOMAS W. LANDRUM, Biology Department, Ball State University, Muncie, Indiana 47306 and Aquatic Control, Inc., PO 100, Seymour, Indiana 47274. ——Previously it has not been possible to determine the year of birth of an unbanded, wild-caught big brown bat after it has attained the age of approximately three months. Degree of tooth wear has been successfully used to determine age in certain other mammals. Arbitrary canine tooth wear classes were erected for the big brown bat. Prelimi-

nary results indicate that these wear classes may have some relation to the age of an individual bat.

Phytoseiid Mites of Pease Woods, Johnson County, Indiana—A Preliminary Study. C. BARRY KNISLEY, Department of Biology, Franklin College, Franklin, Indiana 46131.——Although phytoseiid mites are common and widely distributed and have been studied as predators of agricultural pest mites, rather little is known about their distribution and ecology in natural habitats. In the present study, foliage samples were collected from common trees and shrubs in an oak-hickory forest in southwestern Johnson County, Indiana. Mites were extracted using a Tullgren funnel and mounted in a modified Berlese media for identification.

A total of 912 phytoseiids, representing 11 species, were collected from 19 plant species. Four phytoseiid species were clearly dominant and widely distributed within the habitat. *Galendromus ruralis* was present on 16 plant species, *Phytoseius macropilis* on 15, *Neoseiulus umbraticus* on 12 and *Typhlodromalus robinae* on 11. The other 8 species were much less frequent and considerably limited in host plant distribution. These species, arranged from most to least abundant, are: *Amblyseius driggeri, Galendromus pomi, A. elongatus, Amblydromella nodosella, Amblyseius morgani, Amblyseilla setosa,* and *Typhlodromalus pyri.*

There is no apparent correlation between phytoseiid species distribution and host plant species, although a correlation of some phytoseiids with prey distribution may exist.

Effect of Aging on Erythrocytic 2,3-DPG Concentration. LOREN G. MARTIN, University of Illinois Peoria School of Medicine, Peoria, Illinois 61606.——Rats of various ages (2, 12, 24 and 40 months of age) were exposed for 4 weeks to either a simulated high altitude of 23,000 ft or to a Peoria, Illinois, altitude of 650 ft above sea level. Hematocrit ratios, hemoglobin and erythrocytic 2, 3-Diphosphoglycerate (2, 3-DPG) concentrations were measured at altitude and at sea level to determine both the effect of aging upon these parameters, and if aging alters the capacity for change in these parameters which usually accompanies altitude exposure: Hematocrit and hemoglobin determinations revealed a significant decrease in erythrocytic hemoglobin content with increasing age, and the augmented erythropoietic response was seen in all age groups of animals as a result of altitude exposure. The maximal erythrocytic content of hemoglobin in the 40-month-old animals was significantly lower than that of all other age groups. Erythrocytic 2, 3-DPG levels were significantly changed by aging alone. In the 40-month-old group there was a 35% increase over the next highest sea level value. However, while erythrocytic 2, 3-DPG content increased significantly in all other age groups following altitude exposure, it decreased 46% in the 40-month-old group. The failure of the 40-month-old group to demonstrate the typical increased erythrocytic hemoglobin and 2, 3-DPG content is discussed in relation to its 80% mortality level following altitude exposure.

A Study of Iron Deficiency Anemia in College Females. JOSEPH M. POLAND, Indiana University-Purdue University at Indianapolis, Indianapolis, Indiana 46202.——The study was undertaken to investigate the occurrence and severity of iron deficiency anemia in 50 (25 seniors and 25 freshmen) college females at DePauw University. Blood was drawn by finger puncture for determinations of hemoglobin, hematocrit, red cell count, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, and color index. No significant differences appeared between freshman and senior students. No severe cases of iron deficiency anemia were found in the study when using accepted diagnostic criteria. However, in relation to published values for females during the menstrual years, 82% of all sampled individuals were below the national norms of hematological values. An additional 16% of this former group could be considered very mildly iron deficient according to accepted diagnostic criteria, and could possibly benefit from oral iron therapy. Although further investigation is warranted, DePauw University females may be more iron deficient that all females of a comparable status.

Evidence of Possible Superfetation or Delayed Implantation in the Opossum *Didelphis virginiana.* THOMAS JOSEPH, Indiana University, South Bend, Indiana 46615.——One of several road-killed opossums collected from St. Joseph's County, Indiana during 1973-74 as part of a parasitological survey, had nine young in its pouch. An inspection of the pouch young showed that two of them where considerably larger and advanced in development than the rest. On the basis of data presented by earlier workers on reproduction in the opossum, the two larger young were estimated to be 66 days old and the rest 42 days. Although opossum young within the same litter may vary in size and rate of development, the size discrepancy observed in this case was significantly greater than reported for litter mates. It is quite possible that the two sets of young represented two separate litters born about 24 days apart or that the smaller young may have resulted from delayed implantation, a phenomenon that has been reported in many marsupials.

Studies of a Naturally Occurring Rudimentary Gonad Phenotype in *Drosophila Melanogaster.* LEE ENGSTROM and NICK PAPPAS, Ball State University, Muncie, Indiana 47306.——Problems of developmental homeostasis have traditionally been approached using classical experimental techniques. The study of gentically determined variants of normal developmental systems provides new approaches to such problems. We have been examining a wild-type strain of *Drosophila melanogaster* in which a high percentage (ca. 20%) of the adult males and females demonstrate unilaterally or bilaterally rudimentary gonads. Because the germ (stem) cells of adult gonads are derived from a single population of embryonic cells, the pole cells, this strain may offer an oppor-

* This study received support from grants from the Society of the Sigma Xi, the Indiana Academy of Science, and the Office of Research and Advanced Studies, Indiana University.

tunity to examine the homeostatic phenomena involved in separating this single population of cells into the populations which are incorporated into the two separate gonads. Preliminary data will be presented which indicates the temperature-sensitive, genetic nature of the rudimentary gonad character, the effects of culture density on the character's expression, the cytology of rudimentary gonads, and the reproductive capacity of adults containing one rudimentary gonad.

Studies on Experimental Hypertension in Rats. W. J. EVERSOLE, Indiana State University, Terre Haute, Indiana 47809.——Removal of one adrenal and kidney, enucleation of the remaining adrenal, and subsequent access to 1% NaCl as drinking fluid in weanling rats leads to hypertension within 3-7 weeks following operation. This phenomenon is well documented in the literature and is referred to as Adrenal Regeneration Hypertension (ARH). In these studies I have found that: (1) access to salt water without operative procedures leads to slight elevation of the blood pressure; (2) removal of the right adrenal, enucleation of the left adrenal and ligation of the right ureter results in increase in incidence and severity of hypertension compared to control rats; (3) right adrenalectomy, left adrenal enucleation, and ligation of the right kidney also results in development of the hypertensive state; (4) ligation of the right ureter alone results in an increase in incidence and severity of the hypertensive condition but some animals do not become hypertensive; (5) right adrenalectomy and left adrenal enucleation does not result in a rise in blood pressure when compared with saline fed controls; (6) implantation of kidney tissue into unilateral adreno-nephrectomized, contralateral adrenal enucleated rats on saline failed to modify the course of ARH.

Animals operated by the standard hypertensive inducing procedure showed reduction in severity and incidence of high blood pressure when (1) salt intake was restricted for the first 24 hours following the operation and (2) group housing (12 per cage) was employed. (Aided by a grant from Eagles' Max Baer Heart Fund.)

STH Maintenance in Hypophysectomized Rana Pipens with a Synergistic Affect. GREGORY E. CAPLINGER, Department of Zoology, Anderson College, Anderson, Indiana 46011.——Hypophysectomization of an adult Rana pipens with a variable STH maintenance program produces various efficiency levels of the endocrine system, which in turn affects the metabolism of the frog. With the employment of dosages of STH, along with the injections of Follicle Stimulating Hormone (FSH), Leutenizing Hormone (LH), Thyroid Stimulating Hormone (TSH), and Melanopore Stimulating Hormone (MSH), a hormonal equilibrium is produced in varying degrees which also aids in establishing a metabolic equilibrium. STH used concurrently with FSH, LH, TSH, and MSH did increase the overall rate of function in the hypophysectomized frog in all instances, except after fifteen days post-operative in which a relatively small dosage was employed. With an alteration of the dosage level and time intervals, a fairly stable metabolic equilibrium may be established. Upon observation, some injection intervals and dosages produced very little,

if any, type of hormonal and consequently metabolic equilibrium. In dealing with amphibians and the *Rana pipens* in general, one must quantitate the metabolic equilibrium in close conjunction with the hormonal equilibrium, and thus a maintenance program for the hypophysectomized animal may be established. The best means for establishing a quantitative set of data is to take a Basic Metabolic Rate reading on the animal. From this reading and measurement of hormonal output, a direct correlation can be made between a metabolic equilibrium and a hormonal equilibrium. Thus, unless there is a fairly constant flow of hormones within the endocrine system, the various target organs may atrophy and become non-functional. Extremely large dosages may maintain equilibrium, but the long-term effect may result in irreparable damage to the target organs affected. The results have shown that employment of STH alone will not affect the metabolic equilibrium. Thus, STH in hypophysectomization is the key biological synergist.

Blood Clearance and Tissue Uptake of AG in the Turtle, *Pseudemys scripta.* DIANNE VERMILLION and WILLIAM BRETT, Department of Life Sciences, Indiana State University, Terre Haute, Indiana 47809.——Tritiated aminoglutethimide (AG) was injected intraventricularly into *Pseudemys scripta* in doses of 100mg AG with a specific activity of 25uCi/Kg of body weight. Blood samples were drawn at regular intervals and tissue samples were taken upon sacrifice of the animal. Blood and tissue samples were digested and dissolved in scintillation fluid and analyzed in a scintillation counter. Blood levels of AG reached a low at 40 minutes and then leveled off. Tissues sampled showed differential uptake of AG with relatively large amounts in the pituitary, kidney and heart tissues. Both the liver and kidney were shown to function in excretion of AG from the body.

Tissue Uptake, Accumulation, and Retention of AG in the Rat, *Rattus Norvegicus.* SHERI PARR and WILLIAM BRETT, Department of Life Sciences, Indiana State University, Terre Haute, Indiana 47809.—— Tritiated aminoglutethimide (AG) was injected intraperitoneally into *Rattus Norvegicus* in doses of 100mg AG with a specific activity of 25uCi/Kg of body weight. Retention and accumulation studies were conducted. Blood, urine and tissue samples were taken upon sacrifice of the animal and analyzed in a scintillation counter. All times examined showed AG uptake with the pituitary showing a relatively high concentration. After six days all tissues still contained some AG with the level being between 20-40% of day one. Tissues of rats injected for three consecutive days showed no significant difference in concentration of AG than tissues of animals injected for one day. AG is excreted by way of urine and feces.