

## **CELL BIOLOGY**

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### **ABSTRACTS**

**Role of Calmodulin in Nerve Function.** Z. IQBAL, L. McKITRICK, and S. OCHS, Department of Physiology, School of Medicine, Indiana University, Indianapolis, Indiana 46223. — Calcium plays an important role in a number of physiological functions and recently it has been demonstrated that the effects of calcium are mediated through a calcium-binding protein calmodulin. Calmodulin, a heat-stable acidic protein of about 17-18K Dalton has been found present in a variety of tissues isolated from various sources. We have recently isolated and characterized the protein from mammalian nerve fibers. This communication describes the possible role of this protein in an important nerve cell function, i.e., the axoplasmic transport. Axoplasmic transport is required for the supply of needed materials in the nerve cell processes for the maintenance and normal physiological activities. The study of axoplasmic transport in our laboratory is conducted with the help of a radioactive tracer technique. The radioactive labeled aminoacids are injected into the L-7 dorsal root ganglion of cat and the sciatic nerve is removed from the cat after an *insitu* transport of 2 hr. The peroneal branch is desheathed to expose it to the *invitro* medium while the tibial branch is left intact to act as control. After a determined time interval the nerves are assessed for the radioactivity. Employing these procedures we have found that depletion of calcium from the medium or the incorporation of calmodulin-inactivating agents like trifluoperazine blocks the transport of the labeled proteins in the peroneal branch of the nerve which was exposed to these agents thus suggesting that the transport is dependent on calcium and that the effects of calcium are likely to be mediated through calmodulin.

**The Effect of Hyperthermia on the Murine Mammary Tumors: A Light and Electron Microscopic Study.** MOHINDER S. JARIAL and DUNCAN T. KENNEDY, Department of Physiology and Health Science and Muncie Center for Medical Education, Ball State University, Muncie, Indiana 47306. — Renewed interest in treating malignant tumors with hyperthermia led to this investigation of structural changes in murine mammary tumors following hyperthermia. Female, Strong A mice, which have a high incidence of mammary tumors, were anesthetized with Nembutal (40 mg/Kg, i.p.). Tumors were removed at 5, 20 minutes, 24, 48, 72 hours and 7 days after localized heating for one hour via hot water (47.5°C) circulated through a plastic bag.

A significant EM observation in untreated tumor cells was presence of large numbers of virus particles in virtually all Strong A mouse tumor cells. These particles, larger in acinar lumina and spaces than in cytoplasm, had membrane bound dense cores. Treated cells showed nuclear membrane thickening, cytoplasmic vacuolization and mitochondrial disruption at 5 minutes posthyperthermia. At 24 hours tumor cells were separating, their nuclei showed fragmented, clumped

chromatin with blebs and breaks in the membrane. Acid phosphatase-positive lysosomes containing dense bodies and virus particles were most prominent at 24 hours. After 24 hours tumor cells showed severe degenerative changes with loss of cell boundaries and cytoplasmic organelles.

This study confirms the effectiveness of hyperthermia in destroying malignant tumor cells *in vivo* and suggests that increased lysosomal activity with damage to the nucleus and cytoplasmic organelles are critical in the process. Supported by a grant from Delaware County Cancer Society.

**Superoxide Dismutase Activity in Crown Gall Tumors.** JULIE A. OLSEN and MARK HATFIELD, Wabash College, Crawfordsville, Indiana 47933.—Numerous studies of mammalian tumor cells have shown these cells to have reduced levels of Mn superoxide dismutase (MnSOD). This enzyme deficiency in mammalian tumor cells is thought to lead to increased levels of superoxide which causes further cell damage. It is of interest to determine whether this is a common feature of both mammalian and plant tumor cells. Of particular interest is the crown gall tumor which is currently being explored as a screening system for antineoplastic agents.

Three different strains of *Agrobacterium tumefaciens* were used to generate crown gall tumors in etiolated decapitated pea stems. The soluble superoxide dismutase activity in individual pea stem tumors was compared with untransformed etiolated decapitated pea stems. The MnSOD activity did not diminish due to tumor cell transformation. Variations in the MnSOD activity appear to be correlated with the length of the side shoots produced on the stem. The CuZn SOD activity varied widely; however, the CuZn SOD activity in the tumor cells did not fall below that in the normal tissue.

**Effects of Dietary Stearic Acid on Cellular Characteristics of Mouse Mammary Tissue and Spontaneous Mammary Adenocarcinomas.** M.L. RICHESON, Assistant Professor of Biology, I.U. at Purdue, at Fort Wayne, Fort Wayne, Indiana 46805 and A.S. BENNETT, Department of Biology, Ball State University, Muncie, Indiana 47306.—High fat diets have been implicated in the production of mammary adenocarcinomas, but mechanisms involved are not clear. Strong Strain A female mice maintained on a 15% fat diet (13+ % stearic acid) develop spontaneous mammary adenocarcinomas at a later age than those fed Purina Rodent Chow (4% fat). Dietary fatty acids have a significant effect on the fatty acid distribution of tumorous tissue and plasma membrane composition of mammary tissue.

This study was conducted to compare effect of dietary stearic acid on morphological characteristics of normal and tumorous mammary tissue. Particular emphasis was placed on identifying the distribution and localization of lipid in cell structure of tissues removed from animals on high and low fat diets.

**Retinol Enhances Aggregation and Fusion of Egg Lecithin Liposomes.** WILLIAM STILLWELL and STEVEN NAHMIAS, Department of Biology, Indiana University-Purdue University at Indianapolis, Indianapolis, Indiana 46223.—Previously we have demonstrated that retinoids, vitamin A and related compounds, can affect several physical parameters of lipid bilayers (Stillwell, Ricketts, Hudson, Nahmias, 1982, *Biochim. Biophys. Acta* 688: 653-659). Retinol and retinoic acid both increase membrane permeability to cations, anions, neutral solutes and water, increase electrical conductance of planar bimolecular lipid membranes and lower the phase transition temperature of synthetic phosphatidylcholine membranes. Here we report a retinol-dependent enhancement of aggregation and fusion of egg lecithin liposomes. Aggregation is followed spectrophotometrically by changes in absorbance or light scattering while fusion is demonstrated by a sensitive fluorimetric

technique employing mixed populations of terbium-containing liposomes and dipicolinic acid-containing liposomes. Rates of aggregation and fusion are increased by retinol when incorporated into the lipid bilayers at levels from 1 to 10 membrane mole percent. The significance of these results in elucidating the systemic, non-visual role for vitamin A is discussed.