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******Symposium on immunological features of hamster draws researchers in virus, transplant, cancer and immunology.*

DALLAS--Is the hamster a better guinea pig than the mouse?

Around a hundred researchers in immunology, cancer, transplants, and virology think it is for certain diseases. They gathered at The University of Texas Health Science Center at Dallas (UTHSCD) May 31-June 2 to swap information on the little furry creature that is either blessed or damned with a body which is a lot like a human's in some ways.

"Hamsters have been handicapped throughout their laboratory career by late arrival in a mouse-oriented society," said Dr. Rupert Billingham, professor and chairman of the Department of Cell Biology at UTHSCD.

Participants in this international symposium on "Hamster Immune Responses: Experimental Models Linking Immunogenetics, Oncogenesis and Viral Immunity" were intent on pooling the knowledge gained in their various disciplines.

Hamsters are uniquely suited to the study of certain diseases--specifically viruses, including slow virus infections and cancer. The species demonstrates an unusual lack of naturally occurring viral infection and cancer, but it is strongly susceptible to these kinds of disease from other species. Malignant tumors, even from humans, can be grown in hamsters, and hamsters are the only animal in which human leukemic cells have been propagated. The animal's immune responses are of particular interest because of these surprising findings.

A problem in working on slow virus infections, such as kuru or Creutzfeldt-Jakob disease in humans or scrapie in sheep, has been the long incubation period required until the disease becomes manifest.

This work is facilitated with hamsters because the infection process is accelerated. According to Dr. Richard F. Marsh of the University of Wisconsin, hamsters develop slow virus infection so quickly (57 days) that researchers can perform three scrapie experiments per year instead of one per year with mice or one every three years with sheep.

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Also Marsh has transferred Creutzfelt-Jakob disease from humans to hamsters for the first time.

Marsh reported his most recent findings about the elusive slow virus. Since he has found no infectious RNA particles in the brain of mice and hamsters with scrapie, he concludes that scrapie is probably not a viroid. The scrapie infectious agent is found in brain cell fragments, but virus particles have never been seen. It is a "very cell-associated virus," possibly membrane-bound, according to Marsh.

The scrapie agent in hamster brain is 10 to 100 times more concentrated than that produced in other species. This peculiar talent of the hamster for producing large concentrations of viruses from other species leads some to call hamsters "virus factories." It may also lead to the long-sought identification of slow viruses.

Long-time hamster researcher Dr. Helene Toolan of Putnam Memorial Hospital, Bennington, Vermont, presented her literature survey indicating that only four viruses are indigenous to the hamster. None of these viruses cause disease in the hamster, even though the animal is quite susceptible to viruses from other species.

Their low virus "background" makes them invaluable to virologists as an experimental model. In addition, when the question of why they have no indigenous pathological viruses is answered, it may provide many clues to virus infection problems in humans.

The hamster central nervous system (CNS) is unusually susceptible to virus infections, especially paramyoxoviruses, which include mumps and measles. Dr. Kenneth Johnson of University of California, San Franscisco, presented studies of mumps and measles viruses which indicate viral persistence. He admitted that implications for humans are not yet understood.

All hamsters in his study infected with mumps as sucklings developed hydrocephalus("water on the brain")weeks or months after recovering from the mumps infection.

The hamster CNS is also much more susceptible than that of mice, guinea pigs or rats to measles or rubeola virus. Measles produces a widespread encephalitis which may be fatal, completely cleared or the beginning of a persistent infection depending on the age and immune status of the hamster.

Measles virus is known to produce postinfectious encephalitis in humans. It also produces a rare disease, SSPE (subacute sclerosizing panencephalitis), which occurs about once per million children in the U.S. Almost all of the affected children were infected with rubeola during the first 18 months of life.

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Also of interest is the increased concentration of measles antibodies in the majority of persons with multiple sclerosis. No measles virus is present in these people.

In Dr. Johnson's study hamsters were inoculated with HBS virus from children with SSPE. The suckling hamsters died, but the adults recovered. In those 21 days old about one-third died. In the survivors the virus continued to be present in the tissue with some animals developing lethargy and seizures some weeks later.

Adults with their immunologic function completely suppressed died with the virus present in the brain. The virus was converted to a defective one in other adult animals.

Hamster susceptibility to mumps and measles is similar to that of man and primates and dissimilar to other rodents. This may relate to unique features of the hamster's immunologic system, and/or to special characteristics of the cell membranes of this species.

Dr. J.H. Coggin, Jr., of the University of South Alabama in Mobile reported the extraordinary situation of horizontal transmission of lymphomas among three different hamster populations in his laboratory. Although the mechanism of the transmission is not understood, sera from animals present which did not develop lymphomas neutralized the infectivity of lymphoma extract. It was possible to immunize new animals coming into the colony with irradiated lymphoma cells or with filtered extracts from lymphomas.

Among the hamster's immunological differences from other experimental animals is its early maturation, according to Dr. J.B. Solomon of the University of Aberdeen in Scotland.

"The hamster passes such immunological milestones in a great hurry because he has only some seven weeks from the time of conception before he, in turn, may conceive," said Dr. Solomon.

Another difference makes the hamster valuable in the study of transplantation and tumor biology. Due to a lack of lymphatic drainage the cheek pouch is an immunologically privileged site, i.e., the tissue in that area has no immunity to tumor or to transplants. Dr. Billingham quoted August Krogh's thesis that eventually a scientist can find an animal which appears to be designed by nature for the solution of the biological problem under investigation.

In addition, the hamster is the only mammal in which a pheromone has been isolated and synthesized. Phermones are special chemical signals produced by an animal which, detected by the sense of smell, cause a certain behavioral response in another animal.

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third add hamsters

For example, when not in heat, female hamsters are hostile toward males. When they are in heat, they secrete a pheromone which signals a welcome.

"It becomes very important to the male hamster to be able to detect the odor of the pheromone, otherwise, he can be badly hurt or killed," said Dr. Robert J. O'Connell of Rockefeller University in New York City.

According to Dr. Wayne Streilein, professor of cell biology and internal medicine at UTHSCD, hamster pheromones are of interest to researchers because the hamsters' mate selection procedure may be related to antigens involved in transplant rejection. Mating preference in mice is known to be related to the genes involved in graft rejection, and possibly pheromones are related to the recognition of these genes. As the only mammal in which a pheromone has been isolated, the hamster is a prime subject for study of the mate selection mechanism.

Dr. William Duncan, fellow in cell biology at UTHSCD, described the status of research in hamsters in the genes involved in transplant rejection.

Dr. Streilein called the symposium a success.

"People working with hamsters in tumor biology, immunology and viral infection were able to transmit their information to people working in immune responses and vice versa. As a consequence each received some insight into some of their observations that might have been unexplainable before," said Dr. Streilein, who chaired the symposium committee. Other committee members included Dr. Billingham; Dr. Duncan; Dr. David Hart, assistant professor of microbiology; and Dr. Joan Stein-Streilein, fellow in microbiology.

The symposium was sponsored by the Transplantation Society with support from the National Institutes of Health, UTHSCD and Charles River Breeding Laboratories, Inc.

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