AIDS

Research into virus could lead to treatment of associated diseases

By JENNIFER HALLIDAY

AIDS or Acquired Immune Deficiency Syndrome, now threatens to be the major lethal pandemic of the second half of the twentieth century—more than 5,000 people have already died in the United States and recent estimates suggest there will be 40,000 new cases in the next two years. Fortunately, along with the predicted acceleration in the incidence of AIDS is a predicted acceleration inthe rate of progress in AIDS research. Compared with the normal rate of progress in research on human diseases, AIDS research has already proven to be very fast. This article is intended to answer some of the basic biological questions about the nature and discovery of the cause of AIDS.

In 1978, the American lab of Robert Gallo isolated a virus from a patient suffering from a rare type of leukemia. The discovery of this human T-cell leukemia virus (HTLV) marked not only the first time a virus was directly linked to a human cancer but also the first time that a human retrovirus had been isolated and identified. This discovery marked the official opening of the field of human retrovirology, the study of a class of viruses known as retroviruses.

What are the properties of retroviruses?

Retroviruses are a special class of viruses whose genetic material consists of RNA rather than DNA. When retroviruses enter a cell they employ an enzyme known as reverse transcriptase to copy their RNA into DNA which is then integrated into the DNA of the host cell. The integrated virus, known as the provirus, then replicates its own genes from within the host cell and the new virus particles produced then go on to infect new cells.

What are the known human retroviruses?

The search for human retroviruses as the causes of various human cancers and other diseases such as AIDS dates back to the turn of the century with the first association of this class of viruses with animal cancers. The discovery of the human T-cell leukemia virus prompted researchers to search for a retrovirus as the cause of AIDS. So far, the only well characterized human retroviruses, including the AIDS virus, belong to the single group HTLV, for human T-cell lymphotropic retroviruses.

What diseases do the known human retroviruses causes?

The single viral group consisting so far of three members—HTLV 1, HTVL 2, HTLV 3, are known to cause two diseases which involves the disturbance of T4 lymphocytes, a specific target cell type central to the regulation of the immune system. This cell type is disturbed by the HTLV viruses in one of two ways—either it is induced by HTLV 1 to excessive proliferation (a leukemia state), or the cells are killed by HTLV 3 (acquired immune deficiency syndrome). Because of the unique target cell specificity, the HTLV virsuses thereby destroy the immune system of the infected individual. The third member of this family, HTLV 2, has been detected only rarely and has not yet been linked to any human disease.

What are the prospects for prevention and intervention against retroviral infections?

Knowledge of the agents of diseases eventually leads to the formulation of possible strategies for disease prevention. Specifically, molecular biological techniques have allowed for the biological elucidation of the structure and mechanistic function of these viruses and may in the future allow for a direct attack on the infectious agents. For example, so far two proteins specific to both HTLV 1 and HTLV 3 are expressed in bacteria and will soon be available for blood bank assays. Also, the prospect for a vaccine is encouraging from the recent demonstration of the neutralization of antibodies in AIDS and pre-AIDS patients. Further approaches under study are the usage of monoclonal antibodies as cell killing agents, and the development of chemical inhibitors of virus replication. In addition, since all human T-lymphotropic viruses share many structural and functional featres, it is possible that the prevention of human retroviral infections will lead to the alleviation and treatment of a variety of other associated diseases such as leukemia.

York chemistry and biology departments lead way in studying methods of inhibiting cell mutation

By PAULINA SALINAS

Excalibur's resident polycyclic aromatic hydrocarbon and cytological expert.

This past Octoaber, The Ministry of Environment announced the allotment of a $103,830 grant to York University for research on Polycyclic Aromatic Hydrocarbons (PAH's).

York chemistry professor Maurice Katz, who applied for the grant, will be heading the study.

Celine Labonte, from the Ministry's communications office, said that York University is presently the only institution doing this kind of research, although other types of environmental pollutants are being studied by other Ontario universities and private consultants also backed by the ministry.

PAH's are chemical substances present in the environment, which, once metabolized by the body, can produce mutagens and carcinogens, eventually becoming cancer.

In a recently published report of the Canadian Journal of Genetics and Cytology, Professor Katz and York biology professor A.S. Raj stated that the principle sources of PAH's are combustion products, fumes from coke ovens, motor vehicle exhaust, cigarette smoke, and high boiling petroleum distillates.

One of the primary aims of the study is to find chemicals which will inhibit the mutations of cells. Funding, however, is of the utmost importance. "It costs about $150,000 to test each distinct chemical," Raj said, adding "it takes approximately two years to finish each test."

Both the chemistry and biology departments are involved in the study, which includes short-term tests on both bacterial and tissue cultures, as well as in-vivo mammalian tests, where chromosomal breaks in lab mice are examined.

Unlike other researchers around the country, York scientists have thus far not encountered any opposition from the various animal rights groups.

Research has so far led to the discovery of five different chemicals known to inhibit cell mutation, caused by PAH's, all naturally existing in food. These have only been tested within the strict confines of the laboratory, and, according to Raj, it is difficult to estimate how each will react with all 13 known PAH's which are in the environment at any given time.

Studies into this particular form of cancer-causing pollutants are not new. Chemists and biologists have been studying PAH's for the past 15 years with York University at the forefront of this research. Presently York has 10-14 programs in this area being funded by the Ontario Ministry of Environment.