

Laboratory animals equipped with a human immune system

In the April 2, 2004 issue of Science Dr. Markus Manz of the IRB and coworkers report about a major advance in establishing a human immune system in a mouse. *Development of human adaptive immune system in cord blood cell-transplanted mice*” Elisabetta Traggiai, Laurie Chicha, Luca Mazzucchelli, Lucio Bronz, Jean-Claude Piffaretti, Antonio Lanzavecchia, Markus G. Manz, *Science* April 2, 2004



The complex reactions of the immune system that are initiated when a living organism is challenged with an infection or possibly a malignant tumor are often poorly reflected by experiments done in the laboratory culture dish. Therefore, biomedical research is dependant on small animals as worms, flies, and mice, which greatly have improved knowledge and consecutively medical therapies. However, although similar in many aspects, the immune system of small animals and humans differ to some extend, reflecting the different environment and life expectancies of different species. To overcome this limitation and still do research on human immune system cells in a living organism, substitute small animal models have been created during the last two decades. In these, human blood and lymphatic organ cells were transplanted into genetically modified animals. Existing models, however, were not very informative because they sustained only limited development and maintenance of human cells, and therefore rarely produced human immune responses.

In the April 2, 2004 issue of Science Dr. Markus Manz and coworkers report about a major advance in this field. He simply combined his laboratory and clinical knowledge in blood stem-cell transplantation and immune system development. He figured that cells will do best if they are introduced directly in the blood forming organ of an organism that is just trying to build its own immune system. Dr. Manz therefore transplanted human cells into newborn immunodeficient mice and was impressed how human cells over time almost completely substituted the lacking mouse immune cells. It is expected that this new finding will strongly sustain efforts to better understand human immunology and to test new prevention methods and therapies for human infectious disease and tumors, the currently most challenging tasks in medicine. For the last fifteen years scientists tried to "reconstruct" the human immune system in a small animal model with limited success. The new system established by Dr. Manz is the culmination of this line of research and offers for the first time the possibility to investigate and exploit the human immune response in an experimentally manageable system. This work represents a breakthrough not only for the study of certain viruses that target the human immune system (such as Human Immunodeficiency Virus, HIV, Hepatitis C Virus, HCV, and Epstein Barr Virus, EBV) but also for testing new vaccination and immunomodulation protocols.

Innovative research at IRB is seminal for scientific collaborations in Ticino

The latest publication lunched by Dr. Manz of the IRB nicely shows that collaborative efforts in Ticino are successful. Four different academic institutions, the IRB (*Dr. Elisabetta Traggiai, Laurie Chicha, Prof. Antonio Lanzavecchia and Dr. Markus G. Manz*), the Cantonal Institute of Pathology (*Dr. Luca Mazzucchelli*), the Regional Hospital of Bellinzona (*Dr. Lucio Bronz*), and the Cantonal Institute of Microbiology (*Prof. Jean-Claude Piffaretti*) collaborated in this project. The position as leading institute in this common research project shows that the IRB is an important pole to promote science in Southern Switzerland.