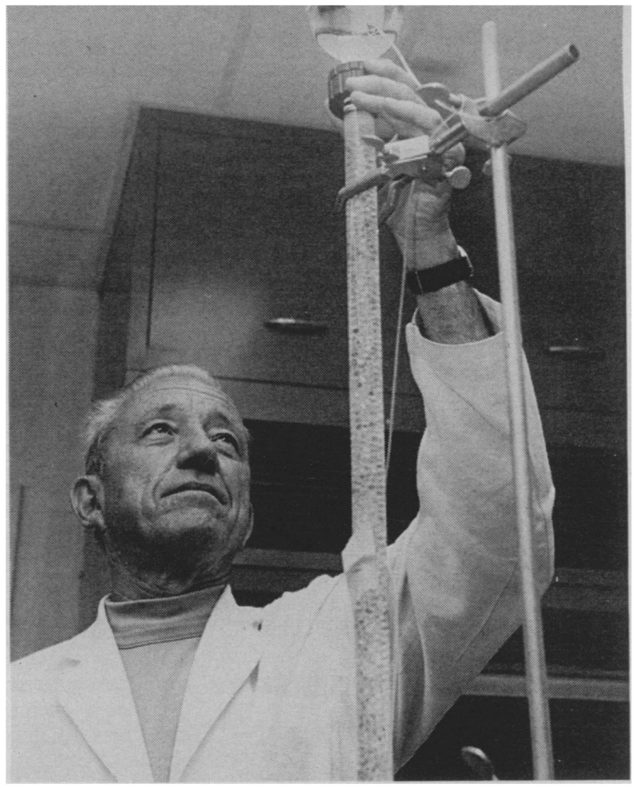
Transferring cancer immunity from animal to human cells

Immunity may soon join drugs, radiation and surgery as treatment for cancer patients



Robert M. Boyce/Ohio State Univ.
Dodd separates crucial immune RNA from RNA batch.

For what appears to be the first time, immunity has been transferred from animal to human cells—and against possibly the most dread human disease, cancer. The achievement opens the door to the first use of immunity as a therapeutic tool against human cancer. Other approaches now being used include drugs, X-ray treatment and surgery.

The accomplishment, by Matthew C. Dodd, Maurice E. Scheetz Jr. and Jeffrey L. Rossio of Ohio State University, is based on 10 years of work and exploitation of the latest biochemical knowledge and fractionation techniques. Their goal, now completed, was to extract from lymphocytes RNA that appears to contain the active messenger component for immune transfer at the cellular level. RNA is the translator of cells' genetic information. Lymph cells are one of an organism's main defenses against foreign invaders, such as cancer. The immune lymphocytes were taken from animals that had a kind of cancer known as polyoma virus tumor.

By putting the lymphocytes in the test tube with specimens of the animals' tumors, the Ohio microbiologists proved that the lymphocytes taken from the cancerous animals had built up immunity against cancer. As expected, the lymph cells reacted against the tumor cells, reflecting their immune response to cancer. But the real difficulty was the subsequent chore of extracting from lymph cells RNA that could be shown to contain or to confer immunity. Here, the researchers incubated different fractions of lymph-cell RNA with normal human white blood cells. Ultimately only one of the many fractions, representing no more than about five percent of all the RNA tested, turned out to contain an immune response. Proof of this response was the RNA's ability to direct human white blood cells to attack the animal tumor cells under test-tube conditions.

Dodd, Scheetz and Rossio conclude that animal lymphocyte RNA can transfer cancer immunity to human cells. "Whether the RNA serves as an actual messenger in conveying immunity from animal cell genetic material to human cell genetic material, we do not know for sure," Dodd admits. "The RNA," he suggests, "might also serve the human cells as a repressor chemical of sorts against attacking tumor cells."

The question now is whether the animal immune RNA fraction directs human cells to destroy a human tumor. The Ohio State group intends to inject human tumor cells into rats so that the rats' lymphocytes give off immunity against the human cancer cells. They then plan to isolate the immune RNA from the rats' lymph cells and put the RNA into a culture of lymphocytes taken from a person who has just had a tumor removed. Then they will inject the human cells that have had their immunity heightened with immune RNA back into the area of the patient's body from which the tumor was removed. The researchers anticipate that the injection of these human lymph cells, which contain increased immunity, will help the patient fight off any new tumor growth.

They will be using animals as immunity intermediates in their forthcoming clinical experiments because of the danger involved in injecting tumor cells into human volunteers to obtain cancer-immunized lymphocytes from them. The reasons for injecting human cells containing immune RNA, rather than injecting RNA alone, into a patient are twofold. Cell cultures can be checked before injection into a patient to make sure they contain an immune-active RNA activity, and if RNA were injected directly into a patient, his body's enzymes would probably destroy the RNA before it could provide the patient with any immunity at the tumor site.

The Columbus scientists foresee their technique being used as a therapeutic adjunct to chemotherapy, radiology and surgery—now the predominant forms of treatment for cancer patients. Dodd says he doubts whether the technique would ever result in a cancer vaccine, since he is convinced that the many kinds of cancers produce their own antigens, which in turn demand specific immune responses from a patient. Thus, injecting immune RNA against one kind of cancer would probably not ward off other kinds of cancer.

"A cancer vaccine is a distinct possibility, though," Dodd admits, "even if I don't live to see it." □