science news
OF THE WEEK

Virus now, cancer later

Viral expression early in life may spell your doom

The viruses known as C-type RNA viruses have been heavily implicated in cancer, particularly in leukemias and sarcomas. The viruses, or particles of them, have been recovered from 12 species, including humans. Most of the C-type material has been taken from animals and persons with naturally occurring tumors. But exactly how the presence of the C-type virus material relates to cancer has not been known.

Four cancer scientists now report they have found that expression of C-type material early in life invariably leads to cancer later in life. They were able to predict this connection with almost 100 percent accuracy in mice. The animals with early viral expression later came down with a leukemia, a sarcoma or some other kind of cancer.

Their findings are the first evidence in living organisms that latent viral information is switched on later in life to cause cancer. The work is reported in the May PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES by Hans Meier, Benjamin A. Taylor and Marianna Cherry of the Jackson Laboratory in Bar Harbor, Me., and Robert J. Huebner of the National Cancer Institute.

A number of questions, however, need to be answered. For example, what switches viral information on in the first place? In recent months cancer viral markers have been raised in animals and tissue cultures by hormones, radiation, DDT and other environmental factors (SN: 8/29/72, p. 68).

On the other hand, Meier and his colleagues have evidence that several genes regulate expression of C-type viral material in mice. Some other researchers, notably John R. Stephenson and Stuart A. Aaronson of the NCI, also have evidence that genes turn on C-type viruses.

How environmental regulators and genetic regulators interact, researchers don't know.

Might some of the genes that allow the expression of C-type viruses be, instead of regulatory genes, genes that actually make the viruses? The hypothesis that the genetic material of viruses is actually part of cells' genetic machinery is known as the oncogene theory.

Meier is convinced that the genes that make C-type viruses are oncogenic—part of cells' genes. Stuart and Aaronson's latest findings, reported in the May 25 SCIENCE, also suggest that some of the genes that allow C-type viral expression in cells are structural genes.

But some scientists disagree with the oncogene theory. They have evidence that although cells' genes may regulate the expression of C-type viruses, the viruses, and their structural genes, enter cells from the outside. This theory is called the provirus theory (SN: 1/27/73, p. 56).

Regardless whether a C-type virus is a natural outgrowth of a cell or a foreign object in the cell, how does it make a cell cancerous? The process is still, angonizingly, a mystery. Particularly nettling is the reverse transcriptase enzyme. At first researchers thought that the enzyme was a unique tool of cancer viruses. Now there is evidence that the enzyme might be a normal cell enzyme.

Might people be diagnosed early in life for C-type material to see whether they might get cancer later in life? Possibly, Meier says, but what is the point since there is no cancer cure?

Researchers push on to answer these and related questions. Even with millions of government dollars, the cancer conquest comes hard.

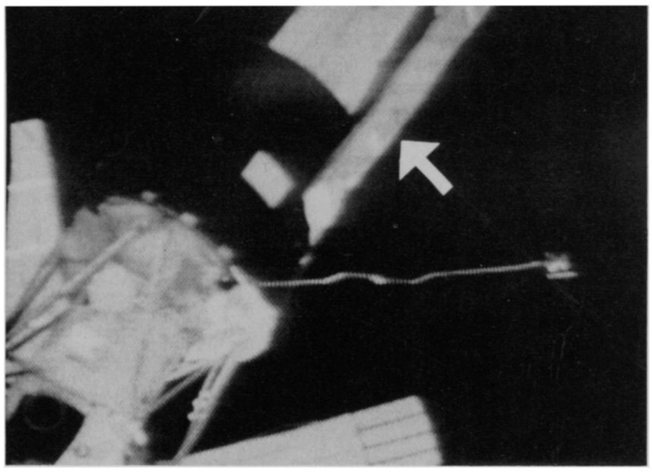
Meier, Taylor with mice subjects.
The Jackson Laboratory

Wide World Photos
Kerwin floats between compartments.

An eventful

The scene was stranger than fiction; the men, both heroic and human; the tools, down to earth. By the end of the astronauts' second day in space, Skylab director William C. Schneider was proclaiming the salvaging job on Skylab a success. The orange parasol draped over the space station's workshop was bringing down the seething temperatures inside the workshop. The effort to deploy the one remaining solar panel wing was not successful, but even then all was not lost. It could be done. With other tools or other men—later. By Monday noon the station was activated.

Astronauts Charles Conrad, Paul Weitz and Joseph P. Kerwin had gotten off to a hopeful start with a perfect launch May 25. Seven hours later they approached the damaged space station. A quick fly-around revealed what the launch had wrought. "As you suspected, solar wing two is gone, completely off the bird," Conrad reported. All that was left were some tubes and wiring sticking out. "Solar wing one is, in fact, partially deployed." The solar panel was seemingly trapped by pieces of the meteoroid shield that had ripped off during the launch. The astronauts soft-docked with the station, took a dinner break and planned their method of attack. They had a shepherd's crook and wire cutting tools and prongs. When ground control next tuned in to the men (communication is broken by widely dispersed ground stations), Weitz was hanging out of the command module's hatch poking and pulling at a stubborn piece of angle iron fastened to the solar panel's beam and fairing assembly. Kerwin was holding on to Weitz's knee, trying to give directions. Conrad was trying to fly the spacecraft, keeping it steady at a cautious distance from the station and working



NASA

Skylab's undeployed solar wing (arrow) remained jammed.

Wide World Photos

Conrad at wardroom food tray, Weitz at radio controls.

first week in space for the crew of Skylab

around the other two men as they assembled and disassembled tools. Four-letter words punctuated the drama.

"I hate to say it, but we ain't going to do it with the tools we got," an exasperated Weitz said after ground control finally got their attention. During the force of launch, the angle iron had in effect become riveted to the solar panel. "It is so frustrating to see such a tiny thing hold that baby on there," Conrad said.

Their frustrations were far from over. At least five attempts to redock with the space station after the futile repair work failed. The crew finally hard-docked late the first night by hot wiring the retract mechanism of the docking probe with a cable. This involved donning their spacesuits again, depressurizing the spacecraft and removing the forward hatch to work on the probe and drogue. Engineers at Houston this week were planning alternate ways to undock the command module. "The normal undocking method will probably not be used," Schneider said.

Day 2 in the space station went easier, highlighted by a relatively successful deployment of the orange umbrella to shade the two-story workshop. Although NASA proclaimed the parasol a success, the shade actually did not pop out as predicted. The larger end of the rectangular skirt maintained some folds and dropped at an angle about 30 degrees lower than the plane of the smaller section. Nevertheless, temperatures inside the workshop, which had been over 130 degrees F. at times, began dropping immediately. By midweek interior temperatures were stabilizing in the high 80's.

Day 3, while temperatures in the workshop were still in the 100's, the crew began getting their new house in order, activating the trash airlock and waste management, water and environmental systems.

One vexing problem to ground control—finding the sun—was solved once the men began working inside the workshop on day 3. To make the most of the available power, the solar panels on top of the telescope mount had to point directly toward the sun. "Have you found the sun yet?" Conrad quipped as ground controllers maneuvered the station around. To turn the spacecraft toward the sun ground controllers fired the thruster attitude control system (TACS). Once the astronauts located the sun, the firing stopped. "Since we've got this bird squared away in solar inertial, we haven't used any TACS. We did a double cheer," Conrad said, "because I'll tell you there's nothing that gives you a bigger fright than be standing down here in the wardroom [the kitchen] and have that TACS go off. It sounds like somebody's banging on the bottom of this thing with a sledge hammer."

By the fourth day in space the men were adapting to their weightless living. After asking how many washcloths a day they should use, Conrad quipped, "You can tell we're starting to live in here now."

The astronauts competed to see which one could get through the tunnel connecting the two stories the fastest without touching anything. Somersaults were the exercise of the day. "We are exercising our muscles more than I thought we would," Conrad reported.

"Time and again in the last two days," added Kerwin, "we've told each other that except for the view out the window, it's just like the one-gravity trainer. You do have a sense of up and down and you can change it in two seconds wherever it's convenient to you. You say to your brain, 'Brain, I want that way to be up,' and the brain says, 'Okay, then that way is up.' And if you want to rotate 90 degrees and work that way, your brain will follow you. I don't think it's vestibular at all."

There were some annoying problems. The water system, for example, had air in it. "You've got to let air out and mess around with it," Conrad said. "So food handling I think is taking a little longer than normal." They ate food from the command module for four days, and began eating food stored on the Skylab the fifth day. "I think we've got some learning curves to go yet, here in zero g," said Conrad.

Moving heavy things around from their launch position to their working position was not difficult, however. "All that big gear is no problem at all to handle." Moving the water tanks, Conrad said, "was a piece of cake."

In spite of a loss of power from the workshop solar panels, NASA was planning this week to proceed with a full 28-day mission. The crew concurred. "We're in good shape," Conrad said about the prospects. By midweek, activity in the space laboratory had settled into a near-normal routine. The major experiments—solar astronomy, earth resources photography and biomedical—had been turned on and put through trial runs.

During the first day of operation of the cluster of instruments in the 10-ton telescope mount, Kerwin photographed three regions of the sun considered active and made observations of the full solar disk and the solar corona. Scientists at Houston reported that the "telescopes were functioning extremely well." The astronomers were described as enthusiastic about the operation of the telescope mount. □