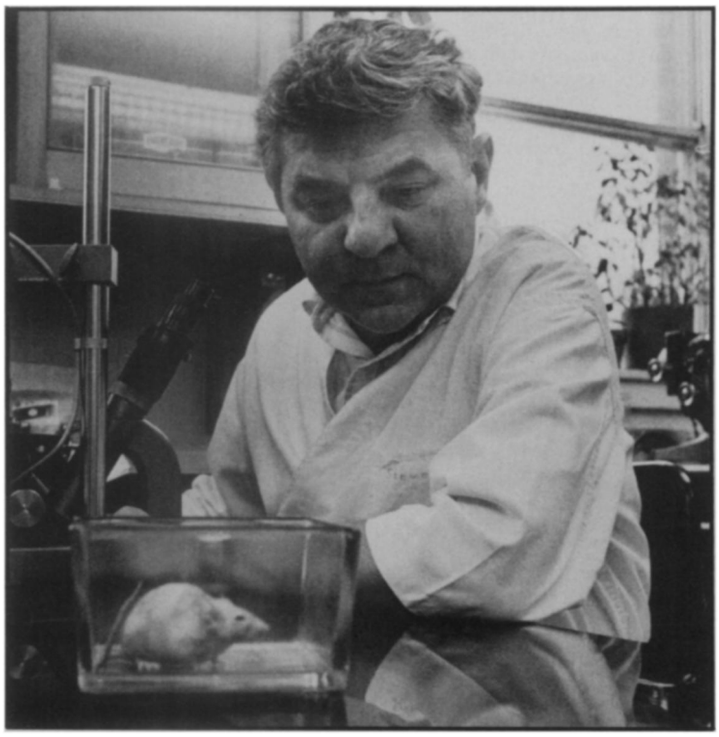
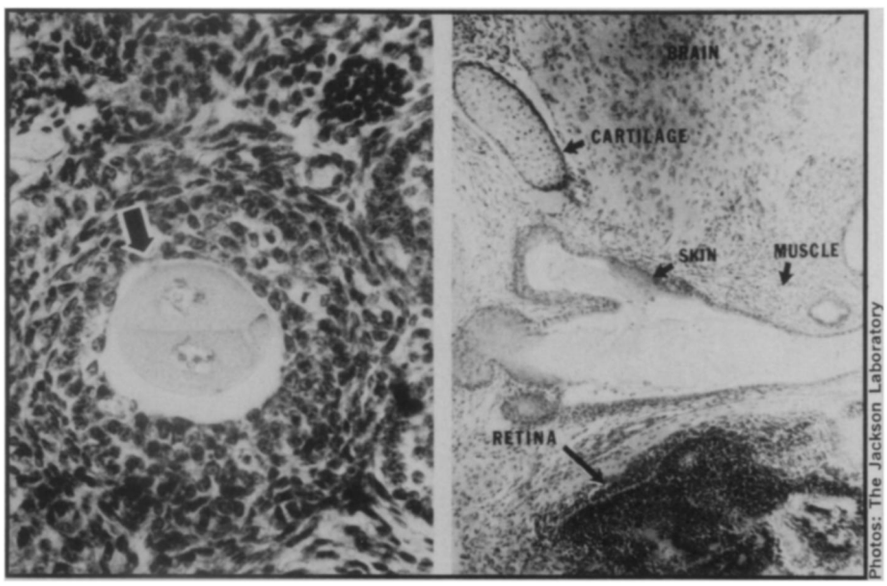
Tumors by Virgin Birth

Embryos and tumors are intriguingly alike

Embryos and tumors are known to share some characteristics. Both start out as one cell that divides into many cells. Both are considered foreign by their hosts. Enzymes and antigens that are present in embryo tissues but not in healthy adult tissues have been found in tumors. But embryos and tumors tend to part company when embryo cells become recognizable tissues—brain, heart, muscle and so forth. Tumor cells continue to proliferate as anonymous, undifferentiated cells.



Stevens found by accident that mice have malignant ovarian cysts. He then discovered that the cysts result from ovarian eggs that start developing without fertilization.



Two-cell "virgin birth" egg divides like a normal embryo (l). Then it becomes a tumor. The tumor, atypically, consists of recognizable (differentiated) tissues.

Some striking evidence underscoring the provocative—and to some people, disturbing—relationship between embryos and tumors is reported in the current issue of DEVELOPMENTAL BIOLOGY by Leroy C. Stevens, a biologist at the Jackson Laboratory in Bar Harbor, Maine. Stevens has found that mice eggs can spontaneously divide without prior fertilization—the first step toward virgin birth (parthenogenesis). After a week or so, some of the eggs implant themselves in uteri, as normally fertilized eggs do. The eggs develop some more, but then the uteri reject them. The other eggs stay in the ovaries, develop some more, then turn into tumors—specifically, into malignant ovarian cysts.

Stevens' evidence that mice eggs can naturally develop parthenogenetically is apparently a first, although guinea pig eggs and rabbit eggs can also do it. The turkey is the highest animal that is known to have parthenogenic eggs result in living offspring. And no one, it seems, had previously found that parthenogenic eggs can become tumors.

Ovarian cysts are common in both women and in female mice. Usually they are benign. Stevens accidentally found that a female mouse in the Jackson Laboratory had an ovarian tumor. He bred several of her relatives and built up a small colony of mice. He found that about half of the females in the colony developed ovarian tumors. He then found that the tumors originated from parthenogenic eggs.

First he observed healthy-looking two-cell eggs in the ovaries of the mice. Some of the eggs traveled into uteri to implant themselves, just as healthy fertilized eggs would. The implanted eggs developed further as normal embryos would for about a week. Then, says Stevens, "apparently the uteri knew that something funny was going on and aborted them." The other eggs stayed in the ovaries and developed until they resembled normal mouse embryos at seven-and-a-half days after normal fertilization. But after that they became disorganized and then turned into tumors, specifically, into ovarian cysts that could survive indefinitely in the ovaries. Unlike most tumors, ovarian cysts consist of recognizable rather than undifferentiated tissues.

The embryo-turned-tumor discovery should provide a good research model for better understanding the link between embryos and tumors, Stevens believes, and also for zeroing in on the genes and other features of ovarian cysts. □