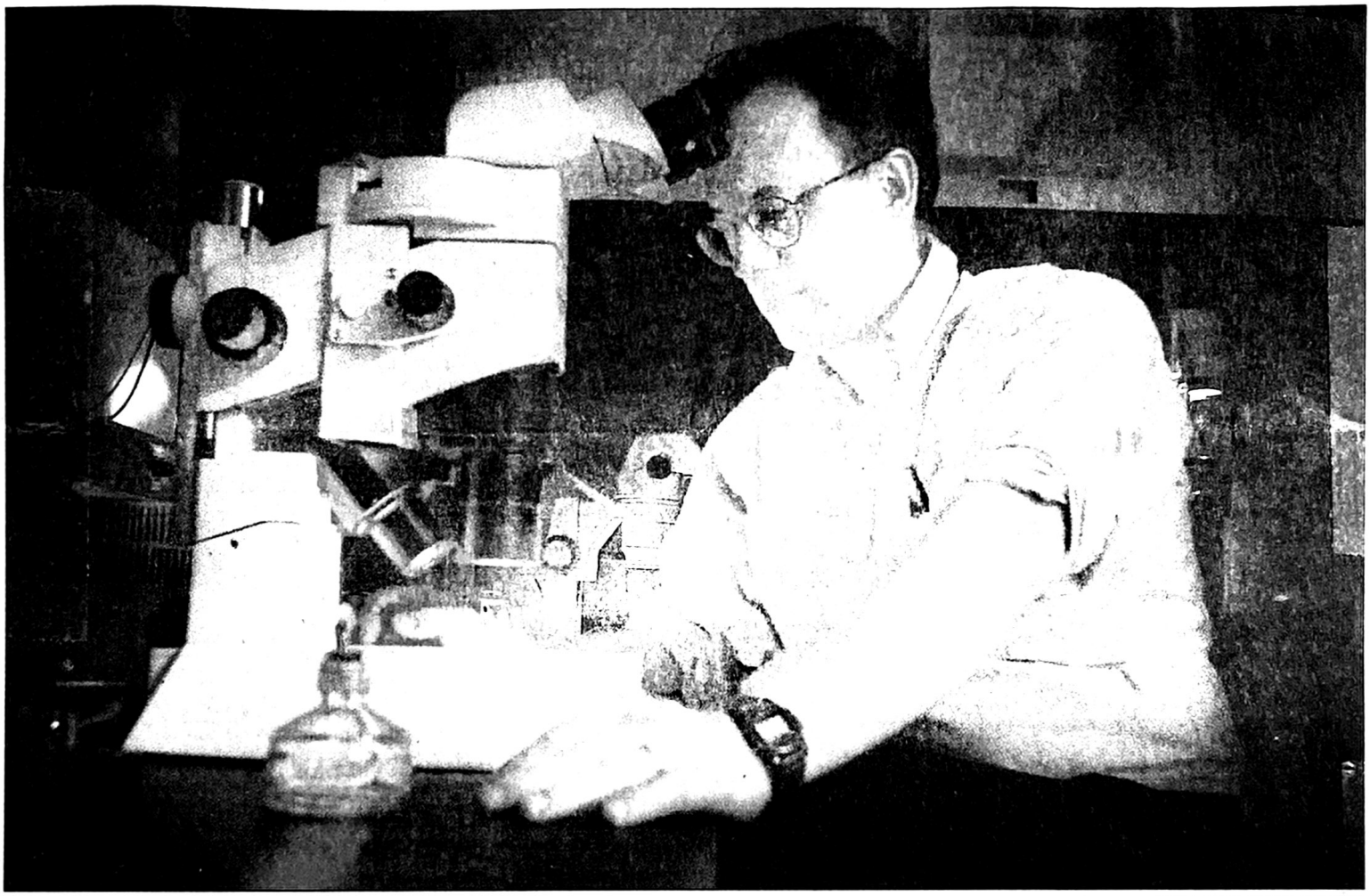
KINDRED CREATURES



MIKE ELIASON / NEWS-PRESS

Joel Rothman views microscopic worms. "We are so much more like all other animals than we would care to believe," he says.

Worms uncoil genetic secrets

By ANN GRIFFITH
NEWS-PRESS STAFF WRITER
e-mail: agriffith@newspress.com

Biologists at UCSB have learned more about a creature that could help researchers better understand human genes: worms.

Ultimately, research could lead to cures for genetic birth defects and the ability to grow needed organs in the lab by using a small amount of tissue from a patient who needs a transplant, according to the UCSB scientists.

The subjects of this research aren't the fat earthworms that cover sidewalks after a rainy day.

Called nematodes, the tiny creatures look like snaking pieces of lint in a petri dish.

"We are so much more like all other animals than we would care to believe," said Joel Rothman, UCSB professor of molecular, cellular and developmental biology. A team of more than five scientists worked on the project.

Morris Maduro, a post doctoral fellow working in Rothman's lab, and the group discovered that at least some genes in a species of nematode worms called Caenorhabditis elegans behave the same way as genes in humans.

As in humans, two control genes work together in the earliest stages of development to instruct cells to become a specific set of organs: muscle, intestine and a feeding organ, which is the worm equivalent of a heart, the team of researchers found.

This similarity will enable scientists to use worms to study how human genes work. To learn about the causes of birth defects and a possible cure, scientists can manipulate genes in parent C. elegans and see how those changes affect their offspring. Researchers can translate their findings to humans to help work on a cure. In fact, the March of Dimes helped pay for the project.

News-Press
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Science of worms could help humans

UCSB

Continued from Page B1

The discovery also shows a stronger evolutionary relationship between C. elegans and humans than previously thought.

"Though the development of embryos looks vastly different in distantly related creatures, such as nematode worms and humans, the regulatory blueprints can be virtually identical," Rothman said.

Nematodes are an efficient tool for genetic research because they reproduce in three days compared with several months for some other research animals. Using the worms speeds the pace of discovery and cuts the cost.

The UCSB research represents a growing appreciation among scientists for C. elegans and their usefulness in genetic research. The creatures can be used to study ways to block genes that kill cells in diseases such as Parkinson's disease and Alzheimer's or in aging.

"Our goal was to have a larger understanding of a very central problem in biology," Maduro said. "In publishing in a lead journal, it contributes to the body of science."

The team's discovery, based on more than two years of research, was published as the cover story this month in Molecular Cell, a leading journal in the field. It builds on two important discoveries a few years before he started.

Scientists determined the sequence of all 19,000 genes in the worms. Another group found that by injecting the worms with RNA, which controls certain chemical processes in the cells, it would neutralize the corresponding gene, a process used in the research at UCSB.

Among other experiments, Maduro, Rothman and the other scientists studied the functions of worms' genes by neutralizing them in the parents and observing the changes in their offspring.

Maduro likened the practice to learning what an ignition coil does in a car by pulling it from the engine and seeing what happens next.

'Though the development of embryos looks vastly different in distantly related creatures . . . the regulatory blueprints can be virtually identical.'

Joel Rothman,

UCSB professor

The worms that lacked certain control genes lacked the corresponding organs they produced.

The article was accepted for publication after review by fellow scientists, including the journal's Assistant Editor Daniel Wainstock, who said the work "may represent an important step in our understanding of every early events in embryonic development." He said that the UCSB team's discovery, while useful, doesn't lead to an instant understanding of genetic illnesses.

"I think that the implications for that aren't clear yet and would be very far down the road," Wainstock said. "That doesn't mean that we don't need this kind of information as background in order to make progress on problems with more immediate medical applications."

Maduro and Rothman both recognize that genetic research is often controversial.

"If a patient knows the risks and the science is good, I would hate to see that blocked," Rothman said. "I hate to see policy being made without the policy-makers understanding the science."

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