cancer epidemic, questions remain about which radioactive isotopes are responsible and whether other factors—such as industrial pollution or a genetic predisposition to thyroid cancer—might help explain why the children have been so susceptible to the disease. "That's the challenge, to retrospectively reconstruct what the relative contributions of those [factors] are," says Bruce Wachholz, chief of the radiation effects branch of the U.S. National Cancer Institute (NCI).

Researchers originally suspected that the heavy contamination by cesium-137 caused the thyroid cancer increase. But they are currently focusing most of their attention on radioactive iodine, because the geographical distribution of the cancers most closely matches the pattern of fallout from this element. If iodine is indeed the main culprit, the finding could be significant for public health: Based on what is already known, WHO recommended last August that iodine tablets, which would saturate the thyroid and prevent it from taking up large amounts of radioactive iodine, be made available to all schoolchildren in Europe, where there are many nuclear power plants, in case of an accident.

Although it may make little difference for such preventive measures, knowing which iodine isotopes are at fault could help explain why the Chernobyl cancer epidemic is so virulent. I-131 has the longest half-life (8 days), but it's never been shown to cause thyroid cancer in humans, says Shigenobu Nagataki, dean of the Nagasaki University medical school. And this despite the fact that I-131 has been extensively used as a diagnostic tool and for therapy in such maladies as Graves' disease.

Nevertheless, says NCI's Wachholz, an effect in humans could have been missed, because these earlier studies were restricted to adults and adolescents. Little or no data exists for young children, who may be especially sensitive to I-131's effects. Other radioactive iodine isotopes, such as I-132, I-133, and I-135, might also be responsible, although their half-lives are counted in minutes or hours and their carcinogenic potential is poorly understood.

Even if most of the blame is pinned on radioactive iodine, other factors—including environmental pollution—may help explain why the thyroid cancer epidemic in children has been so explosive. "I am mostly convinced that the sharp increase is due to the radiation," says Nikolai Tronko, head of the Institute of Endocrinology and Metabolism in Kiev, "but we have to consider that the ecological situation is very poor in the Ukraine, so this could be a factor."

And Elisabeth Cardis, head of the program on radiation and cancer at the International Agency for Research on Cancer in Lyons, France, suspects that a possible genetic predisposition in some affected families may help explain why children have been so sensitive to the effects of radiation. Cardis notes that a preliminary survey she carried out with scientists in Belarus showed that a small but possibly significant number of children with thyroid cancer also had brothers or sisters with the disease. She is now planning a case control epidemiological study to further investigate the contribution that genetic factors might be making to the surprisingly high cancer toll.

Cardis's proposed study is just one of some two dozen studies of childhood thyroid cancer currently under way in the three republics. But even though the information that comes out of these studies will be too late to help the children already exposed to the Chernobyl radiation, it could prove valuable in case of future accidents. As WHO's Baverstock points out, "We are seeing [thyroid cancer] 500 kilometers from Chernobyl." And in Europe everyone lives within 500 kilometers of a nuclear power station.

–Michael Balter

* "Health Consequences of the Chernobyl and Other Radiological Accidents," sponsored by the World Health Organization, Geneva, Switzerland, 20 to 23 November.

ASTRONOMY

Just Another Billion-Sun Black Hole

It's time, says Holland Ford, for astronomers to stop worrying about whether black holes exist at the centers of galaxies and start worrying about how they got there. Using the Hubble Space Telescope, the Johns Hopkins University astronomer and his colleagues looked into the heart of the galaxy NGC 4261 and saw a maelstrom that they say could only be stirred by an outsized black hole, more than a billion times as massive as the sun. The finding, announced last week, would bring to three the number of galaxies, all identified in the past 2 years, that seem to host black holes.

The clinching evidence for NGC 4261, like that for two other black hole candidates, is the speed at which a disk of material is whirling around an unseen center point. Three years ago, when Douglas Richstone, a theorist at the University of Michigan, saw a picture of the same disk without the velocity measurements, he said it looked enough like what he'd expect of a black hole that he'd bet $10 on it but not his car. Now, he says, "it's probably time to bet the car."

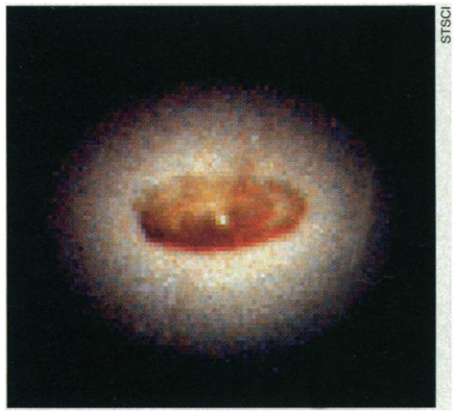
Theorists will also be putting heavier bets on their picture of active galaxies, the galaxy type to which all three black-hole hosts belong. Active galaxies give off far more radiation than expected from their population of stars. Theorists have speculated that the source of this radiation must be matter being torn apart in the vicinity of a black hole. The process has never been seen directly, but what the Space Telescope revealed at the center of NGC 4261 is powerful indirect evidence.

Within its bright nucleus is a dark disk of dust, 800 light-years across. The spectrum of the disk shows that it is rotating at up to 1.5 million kilometers an hour, implying that it is in the grip of a mass 1.2 billion times that of our sun. The rotational velocity of the dust increases toward the center, adds Laura Ferrarese, Ford's co-discoverer, which suggests that the mass is concentrated there. If so, the ratio of mass to light at the center of the disk is about 1000 times greater than in a normal elliptical galaxy. According to Ferrarese, Ford, and their colleague, Walter Jaffe at the Netherlands' Leiden Observatory, the combination of evidence all but mandates a black hole.

No one knows how a black hole could grow to the enormous size implied by these observations, but a peculiarity about NGC 4261 may suggest one answer. The dark disk is offset from the center of the galaxy, and its axis is perpendicular to the galaxy's axis. "That tells you that the disk was formed separately," says Ford, "and may have originated when NGC 4261 captured another small galaxy." Such captures, says Richstone, "are efficient ways to feed black holes. It seems plausible."

But so far, plausible is as good as it gets. Says Ford, "We really have no idea how black holes get this large. We're just beginning to learn what the facts are."

–Ann Finkbeiner



Heart like a wheel. A dusty disk in nucleus of NGC 4261 betrays the black hole at its center.

Ann Finkbeiner's forthcoming book is on the effects of parental bereavement.