Radiofrequency radiation: Deciding what is a safe exposure

It's hard to escape exposure to radiofrequency (RF) radiation. After all, if your radio or television can pick up a clear broadcast signal, your body can too. The Environmental Protection Agency (EPA) has just completed a critical review of more than 5,000 health-effects studies involving RF radiation, including the microwave band. And according to radiation biologist Daniel F. Cahill, one of the review's editors, the data are now strong enough to allow — and in fact to justify — federally enforced protection of the public from hazardous levels of RF radiation.

RF radiation represents the nonionizing portion of the electromagnetic spectrum. Its frequencies include those used for AM, FM and short-wave radio; for ultra-high frequency (UHF) and very-high frequency (VHF) television; for radar; for satellite communications; and for microwave relay links. The human-resonance frequencies, for which the body serves most effectively as an antenna, are 30 megahertz (MHz) to 300 MHz — primarily the FM and VHF bands.

Growing electronics use has increased the ambient RF environment to which the general public is exposed. Health effects — most notably body heating and effects one might associate with fever (including brain damage, miscarriage and death) — have been observed in many species, including humans, after prolonged or high-level RF exposures. It was concern that there might be related hazards posed by low-level exposures — omnipresent in modern, industrialized society — that prompted Canada, Czechoslovakia, Great Britain, Poland and the Soviet Union to set their RF-exposure standards.

The United States has no comparable standard for limiting human exposures to RF radiation. However, EPA's new survey of RF's biological effects, publicly unveiled in draft form this week, is a first step toward development of such a standard. Explains David E. Janes, who directs analysis and support for EPA's Office of Radiation Programs, "This report is the biological basis from which we're moving."

That report was also the basis for the public-exposure limit — of 0.04 watts per kilogram of body tissue — which Cahill, recently retired from EPA, proposes in the July HEALTH PHYSICS. Cahill's figure translates into a power density of roughly 200 microwatts per square centimeter ($\mu W/cm^2$) for the human resonance frequencies. At frequencies outside that range, higher power densities are required to deposit the same energy into body tissue.

Based on his reading of the data just surveyed by EPA, Cahill believes that the exposure limit he is proposing would not cause any observable health effects. His figure is 50-fold lower than the Occupational Safety and Health Administration's former "advisory" ceiling (a limit which OSHA stopped enforcing last year). A new OSHA standard for workers should be forthcoming, though not immediately. If it mirrored the 1,000 $\mu W/cm^2$ limit for human-resonance frequencies being recommended by the American National Standards Institute, it would still be five times higher than Cahill's.

Perhaps as early as September, EPA intends to issue a proposed limit for public exposures. Though EPA would have no direct authority to enforce these guidelines, Janes said they would be binding on federal agencies. He noted that the Federal Communications Commission has indicated it would enforce the standard in its regulation of commercial-broadcast signals. And the National Telecommunications and Information Administration — which regulates federally owned radio transmitters — has also agreed to adopt the EPA guidelines, Janes said. As such, the major sources of RF exposures to the public would be controlled.

Cahill notes that the agency will have more than just health effects to consider when deciding on its public-exposure limit, most notably economics and politics. Even so, he believes EPA's final figure will resemble his own.

Intellectual satisfaction was one factor that motivated Cahill to derive the RF-exposure limit he advocates in HEALTH PHYSICS, but not the only one. "Having been with the federal government for 20-some years, I know that they have a propensity for dragging their feet before taking a stand," he said. Moreover, he felt that by putting a "reasonable" number in the scientific domain, the public and courts — in the absence of a federal standard — would still have some scientific basis for making decisions on siting RF sources (such as satellite relay stations) and on health compensation. —*J. Raloff*

Divesting a hormone of its secrets

It has been 20 years since scientists reported the identification of the hormone that switches on the production of white blood cells called granulocytes. The purported hormone is called granulopoietin. The maddening thing about human granulopoietin extracts that have been tested, though, is that while they have stimulated granulocyte production in tissue culture with great gusto, they have done it only half-heartedly, if at all, in experimental animals. This discrepancy has raised the dark possibility that granulopoietin isn't the hormone that induces granulocyte production.

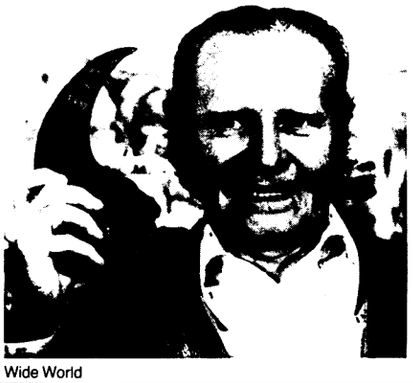
Now granulopoietin's reputation appears to have been exonerated by a team of blood cell scientists at Wright State University School of Medicine in Dayton, Ohio. They report that they have found the reason why past extracts have been active in the test-tube milieu, yet not in animals: The extracts (from human urine) probably haven't contained a compound — naturally active in humans — that the hormone needs to be active in animals.

As Martin J. Murphy Jr. and co-workers at Wright State report in the PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (Vol. 80, No. 12), they first managed to isolate an extract of granulopoietin from a group of persons with a rare blood disease that was much more active than any tested before. They found out that this extract was so active because it contained sialic acid. They thus suspect that previous extracts haven't been very active in animals because they had lost their sialic acid, perhaps via the extraction process.

The challenge now, says John D. Lutton, an experimental hematologist doing related research at New York Medical College in Valhalla, N.Y., is to see whether granulopoietin extracts containing sialic acid also induce granulocyte production in humans. Murphy agrees.

—*J.A. Treichel*

Claw leads to discovery of 'new' dinosaur



Wide World

Bill Walker, a 55-year-old plumber who hunts for fossils in his spare time, unearthed this foot-long dinosaur claw last January in Surrey, Great Britain. The finding is reported by the British Museum of Natural History, which in May dispatched workers to the site to complete the excavation. The claw belonged to a new species of dinosaur that stood 10 to 15 feet tall, and lived 125 million years ago. The animal no doubt used its claws, nearly twice the size of those wielded by Tyrannosaurus Rex, *in procuring its meals — the plant-eating dinosaurs that also lived then in southern England.*

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