GAO: Low microwave levels may harm

Electronic smog is on the increase, and that is probably bad news. The General Accounting Office, Congress's investigative agency, has reviewed Environmental Protection Agency efforts to guard the public from harmful effects of non-ionizing radiation, such as radio and television waves, satellite communication signals and radar. The GAO report states that research programs have not generated sufficient data for setting sound radiation protection standards. Yet preliminary evidence from animal studies has led EPA to believe that the limits will probably be necessary.

Although researchers agree that high levels of microwave radiation damage tissue by heating it, the effects of low levels have long been a subject of controversy (SN: 6/29/74, p. 418). Eastern European scientists report that microwave radiation causes a variety of temporary effects on the nervous system, such as headache and emotional instability, and also cardiovascular, biochemical and respiratory changes. The Soviet Union, Czechoslovakia and Poland have set limits on environmental levels. The United States currently has no standard for environmental exposure, and the occupational limit is 1,000 times higher than the Soviet Union's standard.

U.S. scientists generally have not accepted the European reports of harmful effects from low-level non-ionizing radiation. However the GAO reports, "EPA is finding preliminary results that such exposures may affect the immune system; create anomalies in mouse litters, such as hernias of the brain; and produce a trend toward lowered behavioral performance." More effort in animal, epidemiological and clinical investigations will be needed to develop standards, the researchers say.

The radiofrequency and microwave sources of radiation are increasing 15 percent annually, EPA estimates. A survey of 11 cities, using a measurement system housed in a van, has shown that more than 98 percent of the population is exposed to levels so low they meet the strict Soviet standard (1 microwatt per square centimeter). However, the highest levels measured were 150 times that standard. The greatest concern is for workers around strong sources of radiation. On an FM tower, the surveyors measured more than 180,000 microwatts per square centimeter.

Many different government agencies are responsible for non-ionizing radiation problems. Currently their efforts are coordinated by the Office of Telecommunications Policy. A proposed federal reorganization plan would abolish that office. The GAO reports that loss of federal coordination could hamper radiation control activities.

The GAO report was undertaken at the request of Rep. Elizabeth Holtzman (D-N.Y.). New York City has shown growing concern over the effects of radiation. Last month it rejected a Coast Guard application for a microwave transmission tower to monitor harbor traffic. City agencies have agreed to study the economic impact of a moratorium on new microwave transmission facilities. □

Finding an immune fighter in the blood

In its effort to ward off germs and other "foreign" substances, the body's immune system recruits various cells and molecules. Among these minuscule but mighty warriors is the complement brigade. Composed of 17 proteins, it helps other immune fighters, such as T cells, antibodies and macrophages, attack an encroaching enemy. And the first complement protein to leap into the fray and rally other complement proteins to the cause is called the "C1 complement component."

In the past, medical researchers had a tough time measuring levels of C1 in human blood. Now a rapid measuring technique is becoming available, thanks to Robert J. Ziccardi and Neil R. Cooper of the Scripps Clinic and Research Foundation in LaJolla, Calif. Unlike the old assay, this procedure can also detect whether C1 has been activated by an enemy or not, because it actually measures C1's breakdown products, not C1. (It is also C1's metabolism into breakdown products that fires the rest of the complement proteins into action.) Thus the test should help clarify the role of C1 and other complement fighters in bacterial and viral infections, autoimmune diseases, cancer, organ transplants and other states where complement proteins play a role.

The method used before to measure levels of C1 in human blood — a so-called hemolytic titration test — requires at least two hours of a technician's full attention, plus specialized techniques and reagents (substances added to a solution of another substance to participate in a chemical reaction). The test designed by the Scripps scientists, in contrast, can be carried out overnight in a simple laboratory setting and requires no special chemical reagents or sleight-of-hand efforts. Described in detail in the March 10 SCIENCE, it works essentially like this: A blood sample is put in a lab dish that contains antibodies (antisera) to the three breakdown products of C1 — C1q, C1r and C1s. If the breakdown products are present in the blood, distinct bands, visible to the naked eye, form where each product encounters the antiserum specific to it.

Both the assay's simplicity and ability to detect C1 breakdown products should make the test valuable to medical researchers. For instance, the Scripps investigators are now using it to measure levels of C1 products in blood from patients with purported autoimmune diseases (where immune fighters confuse the body's own tissue for an enemy and attack it) — rheumatoid arthritis, systemic lupus erythematosus, myasthenia gravis and multiple sclerosis. This way the researchers can determine whether C1 is activated in any of these diseases, and if so, to what degree. Because the test can be used in hospital labs, while the old one could not, it should also provide clinicians with a new diagnostic tool. For instance, a physician might use it to see whether a patient has an infection or not, because if C1 breakdown products are in the patient's blood, then an infectious agent must have provoked the metabolism of C1. C1 products are not present in the blood of healthy subjects. □