"More Than a Coincidence"

New Large Animal Study, Like NTP's, Links RF to Schwannoma of the Heart

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It's happened again.

A second large study has found tumors in the Schwann cells — schwannomas— in the hearts of male rats exposed to cell phone radiation.

The new finding comes from the Ramazzini Institute in Bologna, Italy.

The malignant schwannomas of the heart seen in the Italian study are the same as those described by the U.S. National Toxicology Program (NTP) earlier this month as the basis for their concern that cell phone radiation, both GSM and CDMA, can lead to cancer. Ramazzini embarked on its RF project in 2005, about the same time as the NTP effort was taking off.

A paper detailing the Ramazzini experiment is expected to be published in *Environmental Research,* a peer-reviewed journal, within a week. [Update: Now available here.]

"It is a positive study and will buttress the findings from the NTP rat study," Tony Miller told *Microwave News.* Miller, an emeritus professor of epidemiology at the University of Toronto, is serving as the guest editor for a special issue of the journal, which will include the Ramazzini paper. Miller declined to offer any other details prior to publication.

Fiorella Belpoggi, the Ramazzini Institute's director of research, presented preliminary results of the study last fall. Speaking at the annual symposium of the Collegium Ramazzini, known as "Ramazzini Days," in late October, Belpoggi reported finding schwannomas in the heart of male rats exposed to GSM cell phone

radiation, according to a number of those who were at the meeting. (The abstract of Belpoggi's paper is available here.)

This is "more than a coincidence," was a typical response from close observers of cell phone toxicology studies who had heard or were told of the new results. No one wanted to speak for attribution until they had a chance to read the new Ramazzini paper. "It's amazing given that malignant schwannoma of the heart is a super rare cancer," said one of those interviewed.

In an e-mail exchange, Belpoggi confirmed that her paper would be available online within days. She would not comment further.

A total of 2,448 rats were exposed to 1.8 GHz GSM radiation for their entire lifetime in the Ramazzini study. The radiation used in the Ramazzini study was designed to mimic that transmitted by a cell phone base station. The rats were exposed to 5, 25, or 50 V/m for 19 hours per day from before birth until spontaneous death. Equivalent SARs are not provided in the abstract. As the rats grew larger, the SARs will have decreased. (The NTP exposures were at 900 MHz and were limited to two years.)

Schwann Cells at the Center of Attention

Schwann cells play a key role in the functioning of the peripheral nervous system. They make the myelin sheath, which insulates nerve fibers and helps speed the conduction of electrical impulses. There are Schwann cells just about everywhere there are peripheral nerve fibers. They are present in most organs of the body —whether mice, rats or humans. Schwann cell tumors are called schwannomas.

The NTP found schwannomas in many other organs, in addition to the heart, of rats chronically exposed to cell phone radiation. These included a variety of glands (pituitary, salivary and thymus), the trigeminal nerve and the eye. The NTP notes that the combined incidence of schwannoma in all organs was "generally higher" in the GSM-exposed male rats, but it was not "significantly different" from the unexposed controls. Still, the rate doubled at 3 W/Kg, the mid-exposure level, and was even higher at 6 W/Kg (Table A-2).

The NTP also saw schwannomas in the uterus, ovary and vagina of female rats.

"There are lots of nerve fibers wrapped in Schwann cells," David Carpenter told us by e-mail. "We are learning that if the exposure is focused at one place, like the head, the schwannomas occur in the auditory nerve, whereas if it is a whole-body exposure they occur elsewhere, such as in the heart." Carpenter, a medical doctor who trained as a neurophysiologist, is the director of the Institute for Health and the Environment at the University of Albany in upstate New York.

"It is also striking that other tumors occurred in organs such as the prostate, pancreas, thyroid and liver in the NTP study," Carpenter added, "These observations suggest a much greater number of

sensitive organs than we have previously documented in humans to date."

Schwann Cells Are a Type of Glial Cell

The brain has no Schwann cells —the brain is part of the *central* nervous system. There, glial cells play a similar function. In fact, Schwann cells are a type of glial cell. Here's part of what the NTP wrote in its report on the RF–exposed rats:

> "Schwann cells are similar to glial cells in the brain in that they are specialized supportive cells whose functions include maintaining homeostasis, forming myelin and providing support and protection for neurons of the peripheral nervous system."

Tumors of the glial cells are called gliomas. The NTP also saw an increase in glioma among the male rats exposed to GSM and CDMA radiation.

Higher rates of glioma have been reported in a number of epidemiological studies of cell phone users. The other tumor linked to cell phone radiation in human studies is acoustic neuroma, a tumor of the auditory nerve. This is a type of schwannoma, formally called a vestibular schwannoma.

While schwannomas and gliomas are commonly non-cancerous tumors, they can develop into malignant schwannomas or glioblastomas (they are malignant too). Both of these can spread and are thus true cancers.

Suddenly, it seems, a more coherent picture of the human and animal RF–cancer data is emerging with tumors of Schwann and glial cells at its center. The implication is that instead of searching for consistency in RF's ability to cause cancer in specific organs, the emphasis should now be on specific cell types —beginning with Schwann cells in the periphery and glial cells in the brain.

Power Line EMFs Also Linked to Schwannomas of the Heart

Interestingly, an earlier Ramazzini study looking at the combined action of a single dose of gamma radiation (ionizing radiation) and lifetime exposure to power-frequency (50 Hz) EMFs led to a statistically significant excess of malignant schwannoma of the heart among male rats —even at an exposure of only 20 μT (200 mG). Those results were published in the *International Journal of Radiation Biology* in 2016 and have not drawn widespread attention.

In that paper, the Ramazzini researchers commented that malignant schwannoma of the heart is "a rare tumor in rodents, as it is in humans." They noted:

> "Heart malignant schwannoma is not a frequent tumor among male Sprague-Dawley rats from our colony. Out of 2415 males, the overall incidence of heart malignant schwannomas is 0.7% (range 0–2%)."

Like Ramazzini, the NTP used Sprague-Dawley rats for its RF exposure studies.

Is It Time for IARC To Re-Evaluate RF Radiation?

In her talk last October, Belpoggi said that the NTP findings alone should lead the International Agency for Research on Cancer (IARC) to re-evaluate its 2011 designation of RF radiation as a "possible" human cancer risk —perhaps upgrading it to "probable." Belpoggi went on that if the Ramazzini study were to confirm the NTP findings, such a re-evaluation would become urgent.

Ramazzini now appears to have at least partially replicated the NTP results.

Historically, there have long been strong ties between the NTP and the Ramazzini Institute, leading a number of those interviewed to believe that the NTP might well have been aware of the Belpoggi's new findings for some time. John Bucher, the leader of the NTP RF–animal project, did not immediately respond to a request for comment.

The special issue of *Environmental Research* with the Ramazzini paper is devoted to presentations from a forum on *Wireless Radiation and Human Health* held in Israel in January 2017. Belpoggi spoke there and then again, nine months later, at the Ramazzini Days symposium. The Israeli meeting was organized by the Environmental Health Trust.

For more on the NTP RF project, follow this link.

For a detailed look at the Ramazzini's earlier animal study with power-frequency (50 Hz) EMFs, go here.

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