MICRO WAVE NEWS

A Report on Non-Ionizing Radiation

EMF Exposures in the Womb Can Lead to Childhood Obesity

Kaiser's De-Kun Li Second Prospective Study

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De-Kun Li is the last man standing. Not long ago, many of the leading environmental epidemiologists in the U.S. were working on EMFs of one kind or another. They've all moved on —all except De-Kun Li, and he continues to break new ground in one study after another.

Li, a senior researcher at Kaiser Permanente in Oakland, CA, has now shown that EMF exposures in the womb are linked to an increased risk of childhood obesity.

"Maternal exposure to high [magnetic fields] during pregnancy may be a new and previously unknown factor contributing to the world-wide epidemic of childhood obesity/overweight," Li writes in a paper posted today by *Scientific Reports,* a peer-reviewed, open access journal owned by the group that publishes *Nature*.

Last year at this time, Li published a paper that pointed to an association between prenatal magnetic field exposure and childhood asthma (see also our posts on August 1 and August 17, 2011). The obesity study, like the one on asthma, has a prospective design —both began during the California EMF program in the 1990s (see *MWN,* M/J01, p.1 and J/A02, p.1). At the time, Li measured the EMF exposures of the women while they were pregnant for a study of EMFs and miscarriages. He then monitored the weight of their children up through their 13th birthday. These are the only two prospective epidemiological studies ever done on EMFs.

Li has now documented an association between two major public health problems among children: Obesity affects about one-fifth of all American children and asthma is the most prevalent chronic childhood disease. Four years ago, Li found that the long-term decline in the quality of human sperm could also, at least partially, be attributed to magnetic field exposures. A decade ago, Li showed

that pregnant women exposed to EMFs above a certain threshold (16 mG) had higher rates of miscarriages (see *MWN,* M/J01, p.1).

"We should definitely not be ignoring the potentially serious health impacts of exposure to EMFs," Li told *Microwave News.*

In Some Cases, the Risk of Obesity Is More Than Six Times Higher

In this new study, Li found that children of women who were exposed to magnetic fields of more than 2.5 mG (0.25 μT) for at least 10% of the day (2.4 hours) while pregnant had close to twice the risk of becoming overweight or obese compared to those exposed to 1.5 mG or less. This is a statistically significant finding.

When Li limited the analysis to those children with the most detailed follow-ups (11 years or more), the risk rose to close to three times the expected rate of obesity (also significant). And for those children that were "persistently" obese —that is, children who were overweight most of the times they were checked— the risk was even greater: five times higher for maternal exposures above 1.5 mG and more than six times higher above 2.5 mG, both compared to those women who were exposed to 1.5 mG or less.

For all these associations, Li saw a dose-response relationship. That is, the risk got bigger as EMF exposure increased. Li calls the dose-response for the risk of persistent obesity as being particularly "strong."

Sam Milham, a veteran EMF epidemiologist now officially retired but still very active in the field, is not surprised by Li's new finding. "I predicted this," he said in an interview from his home in Olympia, WA. "Childhood obesity is unheard of among the Amish and I believe that at least part of the reason is that they don't have electrical service in their homes, they don't drive cars and don't use cell phones," Milham said. "Amish children also have very little asthma and diabetes," he added.

When asked about a possible link to diabetes, Li replied that, "The number of children [in our study] with diabetes so far is too small to examine, but we intend to follow up on this."

In the paper, Li notes that these findings, taken as a whole, make "biological sense" and point to an "underlying association." No one should be surprised that an environmental exposure during pregnancy could lead to adverse effects on multiple organ systems, he told us: "This applies not only to magnetic fields but to many other agents, for example, some chemical exposures during pregnancy can cause multiple birth defects."

An EMF effect on the developing fetus gained credibility earlier this year when a team at Yale medical school, led by Hugh Taylor, showed that mice exposed *in utero* to high frequency EMFs —from cell phones— developed neurological and behavioral problems by the time they became adults.

In his paper, also published in *Scientific Reports,* Taylor wrote:

> "During critical windows in neurogenesis the brain is susceptible to numerous environmental insults, common medically relevant exposures include ionizing radiation, alcohol, tobacco, drugs and stress. … Even small exposures during periods of neurogenesis have a more profound effect than exposure as an adult."

In an interview, Taylor told *Microwave News* that he did not see obesity in the mice he exposed to RF radiation. "It could be because we used a different frequency and, of course, we used a different species," he said. On the other hand, he added, "It makes a lot of sense theoretically because one of the areas we saw affected in the brain —the hypothalamus— leads to changes in appetite and eating behavior."

Prospective vs. Retrospective Epidemiological Studies

Paradoxically, as Li has attributed a growing number of health conditions to magnetic field exposures, a number of leading epidemiologists who have themselves linked magnetic fields to childhood cancer have put distance between themselves and their own findings.

David Savitz is a case in point. Savitz has spent much of his career working on EMF epidemiology. Twenty-five years ago, he was the first to repeat Nancy Wertheimer and Ed Leeper's landmark study showing that children living near power lines had higher rates of leukemia (see *MWN,* N/D86, p.1). A decade later, in a major study of utility workers for EPRI, Savitz saw an increased risk of brain tumors (see *MWN,* J/F95, p.1). But he later repudiated most of those findings. Last year when Li's asthma study was published, Savitz said that he doubted that magnetic fields could cause "any health effects at any reasonable levels."

When we asked Li about this, he replied that the answer probably lies in the differences between prospective and retrospective epidemiological studies. In a prospective study, the population is followed in real time and exposures are measured as they occur. In a retrospective study, epidemiologists attempt to estimate exposures and conditions that occurred in the past, sometimes many years later. The Wertheimer-Leeper and Savitz studies used a retrospective design, as have all the others except Li's on asthma and obesity.

"EMF health effects can probably only be examined effectively with a prospective design," Li told us. "Although Nancy Wertheimer was lucky enough to discover a health effect using crude retrospective measures of EMF levels, luck can't easily be repeated. EMF exposures are very hard to measure retrospectively. Grossly inaccurate measures of exposure tend to mask an underlying association. This is just Epidemiology 101."

"In addition, most studies of EMF health effects have focused on cancer and cancer usually has a long latency period, " Li said. "To retrospectively measure EMF exposure 10-20 years before the diagnosis of cancer is extremely difficult, if not impossible."

De-Kun Li, obesity, asthma, Sam Milham, David Savitz, childhood leukemia, Hugh Taylor, Nancy Wertheimer, Ed Leeper, fertility,

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