

MOTHERISK UPDATE

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Exposure to electromagnetic fields during pregnancy

ABSTRACT

QUESTION Several of my patients quote recent media coverage claiming that working with home appliances could increase the risk of miscarriages. What is your advice?

ANSWER Two recent epidemiologic studies from California have suggested an increased risk of miscarriages associated with exposure to magnetic fields. Even if the threshold associated with such risk is a biologic and true risk (and not just an association), it does not appear to arise from typical use of hair dryers, microwave ovens, vacuum cleaners, and similar home appliances.

RÉSUMÉ

QUESTION Plusieurs de mes patientes font référence à des articles dans les médias qui maintiennent que le fait de travailler avec des appareils ménagers pourrait accroître le risque d'avortement spontané. Quels sont vos conseils?

RÉPONSE Deux récentes études épidémiologiques réalisées en Californie ont fait valoir un risque accru d'avortement spontané associé à l'exposition à des champs magnétiques. Même si le seuil associé à de tels risques est un risque biologique et réel (pas seulement une association), il ne semble pas y avoir de tels risques posés par l'utilisation habituelle de sèche-cheveux, de fours micro-ondes, d'aspirateurs et d'appareils ménagers semblables.

We are all surrounded by the magnetic fields of scores of appliances and other electric devices we use routinely. Currently, there is no strong biologic indication or study result to suggest that electromagnetic fields encountered in day-to-day life affect our reproductive systems adversely.¹ During the 1980s, when video display terminals became part of life, there were high levels of anxiety among pregnant women, some of whom were told to wear lead aprons at work 8 hours a day for 9 months. This issue was put to rest by the low levels of electromagnetism shown to be emitted by video display terminals and the negative results of epidemiologic studies.^{2,3}

Studies of exposure

In a similar manner in 2000, Lee and colleagues⁴ showed that users of electric bed heaters did not have more spontaneous abortions than those who did not use them. This was true for both electric blankets and waterbeds.

In 2002, the same authors reported results of a nested case-control study of the measured effects of residential and personal

magnetic fields on rates of miscarriage.⁵ Data on exposure were gathered from retrospective reports, and electromagnetic fields were measured to validate the retrospective reports. The study claimed to have detected an odds ratio of 3.1 (95% confidence interval [CI] 1.6 to 6) for miscarriages when the highest quartile of electromagnetic exposure was compared with the lowest. In this study, however, history of exposure at 12 weeks' gestation correlated poorly with direct measurement of exposure at 30 weeks' gestation.

A study from California, published in the same issue of *Epidemiology*, had the benefit of prospective collection and validation of cases.⁶ In addition to collecting information from

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participating women, 24-hour dosimetry of electromagnetic field exposure was carried out. Women were recruited if they intended to carry their pregnancies to term. Through interviews and medical records, the authors also collected data on confounders (other causes of miscarriage), such as previous miscarriages and smoking.

Of all measures of electromagnetic fields used by the researchers, only peak-per-day levels above 16 milligauss (mG; gauss is the unit used to measure electromagnetic energy) were associated with adverse outcomes. Cumulative exposure did not yield a similar association. Ambient electromagnetic fields were measured 24 hours a day by dosimeter.

Amount of exposure depends on how far the body is from the source. Close exposure was associated with an 80% increased risk of miscarriage. This association was robust after controlling for 30 known risk factors or potential confounders. Using other dose parameters, such as quantities, duration, or number of times above the threshold (≥ 16 mG) gave similar results.

Fetuses at an early gestational age were more susceptible to electromagnetic exposure than fetuses at a later stage. Risk of miscarriage associated with electromagnetic fields was higher before 10 weeks' gestation (relative risk 2.2, 95% CI 1.2 to 4.0).

Problems with study results

At least two issues were not addressed appropriately in the study. As discussed by Savitz in an accompanying editorial,⁷ women with nausea and vomiting of pregnancy (NVP) are known to be less susceptible to miscarriages. Because of their condition, they perhaps move less, use appliances less, and might thus be less exposed to electromagnetic fields. If this is the case, then the study merely associated NVP with

less likelihood of miscarriage, an association known for a long time.

A second issue is when the women were recruited. While this study compared "exposed" women and "unexposed" women on numerous factors and found them to be similar (eg, age, medical and obstetric history) it does not tell us whether they were recruited at the same gestational stages. Here is how it works: women recruited earlier in pregnancy (eg, at 4 weeks' gestation) will report on miscarriages that occurred, say, between 4 and 12 weeks. In contrast, women recruited at 9 weeks' gestation will not include any who miscarried before 9 weeks. Hence, if the two groups are not at identical gestational age at recruitment, results can be badly skewed.

So, what should we tell patients who are afraid to dry their hair or make toast for their children? How do we interpret an apparently optimal prospective study showing associations between peak level electromagnetic fields and miscarriage?

Let us assume a worst-case scenario (ie, that the data are biologically true, and that a peak level of 16 mG is the threshold for risk for expectant women). Now, consider the following: when used normally, hair dryers aimed at the head are at least 60 cm from the uterus. At this distance, peak uterine exposure to an electromagnetic field is so small one cannot detect it. Microwave ovens are typically at least 70 to 80 cm from the body of someone pushing the buttons. At that distance, the electromagnetic dose to the skin is <10 mG, and the dose that will reach the uterus is much lower. Vacuum cleaners are typically at least 60 cm from a user's abdomen, and the dose is similar for typical use: <10 mG and probably much lower.⁸

When we interpret the evidence, we understand that it is reasonable to expect more and better controlled data, but in the meantime, we can

reassure women that it is safe for them to continue regular use of home appliances. ❖

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