

## *Sex ratio of offspring of female physiotherapists exposed to low-level high-frequency electromagnetic radiation*

Larsen et al (1) reported that Danish physiotherapists exposed to low levels of electromagnetic radiation produce a highly significant, dose-related excess of daughters. The result needs replicating, but I would like to offer a provisional explanation.

I have gathered substantial quantities of data to support the hypothesis that the sex of mammalian (and among them, human) offspring is partially controlled by the hormone levels of both parents at the time of conception, high levels of gonadotrophin and progesterone being associated with the subsequent births of daughters and high levels of estrogen and testosterone with sons (2).

In mammals, the endocrine responses to acute microwave exposure are similar to the responses to nonspecific stressors such as heat (3). However this sort of response only occurs above a threshold. Below the threshold, exposure seems not to act as a stressor. For instance, rats exposed to low levels of radiation (with no increase in colonic temperature) showed inhibition of the normal circadian elevation of corticosterone (4). Various glucocorticoids suppress basal luteinizing hormone (LH) secretion (5, 6), and indeed a significant increase in LH has been reported in the pituitary of rats exposed to long-term low-level radiation (7). Therefore it seems that such exposure may also result in high gonadotrophin levels in women. If so, the phenomenon would explain the excess of daughters among physiotherapists exposed to low levels of electromagnetic radiation. To test this suggestion, it would certainly be worth assaying the hormone levels of female physiotherapists exposed to low levels of radiation.

Workers in occupational medicine might consider using the sex ratios (proportion of males) of offspring as a criterion of reproductive risk. Unusual sex ratios of offspring are characteristic of several diseases, for example, prostatic cancer (8), hepatitis (9), multiple sclerosis (10), otosclerosis (11), and non-Hodgkin's lymphoma (12). Moreover there is evidence that the reported low sex ratios for offspring of professional male divers (13, 14) and pesticide applicators (15) are caused by high levels of paternal gonadotrophin (16). Since high levels of gonadotrophin in men are associated with subfertility, there are grounds for concern over these occupations. However, an excess of daughters born to women is not equally suggestive of pathology. High levels of gonadotrophin in women are associated, for instance, with the births of dizygotic twins and may be a sign of well-being rather than otherwise. The idea that low-level microwave radiation may be beneficial should at least be considered.

### *Acknowledgments*

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