Smoking, sperm quality and testosterone level

Dear Sir,

Trummer et al. reported on the semen parameters of 1154 infertile men. These authors divided their sample into smokers and non-smokers, and concluded that smoking does not affect conventional semen parameters (Trummer et al., 2002). However, this study (like most such studies) was cross-sectional. I want to suggest that had the authors conducted a longitudinal study on normal fertile men, they would have reached a different conclusion.

Vine reviewed the literature relating smoking to male reproduction (Vine, 1996), and found reports variously suggesting that in smokers, testosterone (T) may be unchanged, or significantly elevated or decreased. Among the possible reasons for this chaos, he suggested inadequate control of potential confounders. I have offered the general proposition that the gonadal hormones, T and estrogen, frequently act as confounders in cross-sectional studies of the associations between some behavioural risk factors (such as smoking) and some hormone-dependent pathological conditions (such as poor sperm quality) (James, 2001). This follows from the facts that gonadal hormones cause or mark many forms of human behaviour and cause or mark many forms of pathology.

In considering the relation between T level and smoking, the possibility of confounding arises as follows. The human character trait known as ‘sensation-seeking’ has been the subject of intensive study for more than 30 years. This work has been summarized (Zuckerman, 1994) and that book is the basis for the following observations. Sensation-seeking is the tendency to seek novel, varied, complex and intense sensations and the willingness to take risks for the sake of such experience. The risky behaviours include physical risk (e.g. mountaineering), vocational risk (test-pilot), health risks (alcohol and smoking), social, marital and sexual risks, gambling, drug abuse and many forms of criminal activity. To varying extents all these risky behaviours are associated with high scores on psychological scales of sensation-seeking: thus conceptualized, sensation-seeking is a relatively stable character trait and has a substantial genetic component. The crucial point for the present purpose is that men scoring high on these scales: (i) have significantly higher T levels on average than controls and (ii) are significantly more likely to smoke than controls.

Thus there is a strong suspicion that at the time of initiation of smoking, male smokers have higher T levels than control non-smokers. This suspicion is strengthened by the results of the only longitudinal study known to me on this topic (Zmuda et al., 1997). These workers found that across time, T declined faster in male smokers than non-smokers, and that greater pack-years of smoking were associated with greater declines in T in men. Moreover, other authors (Bauman et al., 1989) found that in early adolescence, male and female smokers had higher T levels than non-smokers. If I am correct, Trummer et al. found similar T levels in smokers and non-smokers because an initially high T level in smokers had subsequently (by the time of the study) been lowered by the smoking (Trummer et al., 2002). The point could be tested by assaying steroid hormone levels of those who self-select for smoking and of control non-smokers at the time of this self-selection.

It would be odd if smoking had no effect on conventional human semen parameters when it is accepted that smoking is associated both with reduced fecundability (the probability of conceiving in a month at risk) (Zinaman et al., 2000) and with sperm carrying an extra chromosome 1 and with diploid sperm as well as with the aggregate frequency of aneuploid sperm (Harkonen et al., 1999). Further indirect evidence stems from the reported deleterious effect of tobacco smoke on T levels in male dogs (Meikle et al., 1988), mice (Patterson et al., 1990) and rats (Yardimci et al., 1997). Writers have been eloquent in denying a related proposition, namely that there has been a secular decline in human sperm counts in some places and at some times (Handelsman., 1998). But (admittedly in hindsight) it is becoming difficult to find merit in these denials.

References


Letters to the Editor


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