

RESEARCH HIGHLIGHT

Dietary fats may impact semen quantity and quality

Jørn Olsen and Cecilia Høst Ramlau-Hansen

Asian Journal of Andrology (2012) 14, 511–512; doi:10.1038/aja.2012.52; Published online: 28 May 2012

This recently published cross-sectional study that included 99 men from Massachusetts General Hospital Fertility Center, Boston, MA, USA, reports that a high intake of saturated fats was inversely associated with sperm concentration and total sperm count and a high intake of omega-3 polyunsaturated fats (PUFAs) was positively associated with sperm morphology. Although the study is based upon a highly selected group of males and is of cross-sectional nature, the findings are of interest, since poor semen quality is a frequent problem in some parts of the world and identification of modifiable risk factors is highly wanted.

A recently published small study reports that a high intake of saturated fats was inversely associated with sperm concentration and total sperm count.¹ Since poor semen quality is a frequent problem, at least in some parts of the world,² and only few causes of poor semen quality are known, these new result is interesting. The study reports further that higher intake of omega-3 polyunsaturated fats (PUFAs) was positively associated with sperm morphology, supporting a previous finding.³ Most of the research so far has focused on environmental and occupational exposures including body composition, and studies on dietary factors in general have somehow been largely neglected both for males and females.

The cross-sectional study included men who attended Massachusetts General Hospital Fertility Center, Boston, MA, USA for evaluation of couple infertility between December 2006 and August 2010. Only men without a history of vasectomy and men from couples that used their own gametes for insemination or assisted reproduction technologies were eligible for the study. About 60% of men attending the fertility center were invited to

participate in a study of environmental factors and fertility, corresponding to 173 men. Only 99 men (57% of the invited) had complete data on diet, semen quality and critical covariates and were available for this study. Participants were between 18 and 55 years, mostly Caucasians (89%) with a body mass index (BMI) above 24.9 kg m⁻² (71%) who had never smoked (67%). Information on diet was assessed by use of a 131-item food frequency questionnaire (FFQ) that previously has been validated.⁴ In the FFQ, participants were asked to report how often they on average had consumed specified amounts of each food item, beverage and supplement during the previous year, and intakes of total fat and major types of fat are expressed in the study as a percentage of the energy consumed. Furthermore, fatty acid levels were measured in sperm and seminal plasma of 23 participants.

Participants were divided into three groups according to tertiles of total fat intake and major fat categories, and mean differences in measures of semen quality (sperm concentration, total sperm count, sperm morphology and sperm motility) were calculated, using the group with the lowest intake as the reference exposure group. Tests for linear trends were performed in models with the exposure variable groups entered as continuous variables. The results were: 1, not adjusted; 2, adjusted for total energy intake, age, abstinence time, BMI, caffeine intake, alcohol consumption and smoking status; and 3, adjusted for protein intake and remaining fatty acids in addition to the covariates mentioned in level 2.

The study reports that men with a high total fat intake had lower sperm concentration and total sperm count in a dose-dependent manner in crude analyses. Each 5% increment in total fat intake was associated with an 18% (95% confidence interval (CI): 30%–4%) lower total sperm count, and men in the highest tertile of total fat intake had 43%

(95% CI: 62%–14%) lower sperm counts than men in the lowest tertile. The authors point out that these trends appeared mainly driven by levels of saturated fats. In crude analyses, a higher intake of PUFAs was associated with higher percentages of sperm with normal morphology. Men in the highest tertile of omega-3 fatty acid intake had a 2.2% (95% CI: 0.7%–3.4%) higher percentage of normal morphology sperm than men in the lowest tertile. Adjustment for total energy intake, age, abstinence time, BMI, caffeine intake, alcohol consumption and smoking status (second level of adjustment) strengthened the inverse associations between intake of saturated fats and sperm concentration and total sperm count, and a higher intake of omega-3 PUFA was still positively associated with sperm morphology. Total fat intake was still inversely associated with sperm concentration and total sperm count after further adjustment for protein intake and remaining fatty acids (third level of adjustment), but the linear trends between saturated fats and sperm concentration and total sperm count were attenuated. However, men in highest tertile of saturated fat intake had in this model also a lower sperm concentration than men in the lowest tertile. Also, the positive association between omega-3 PUFA and sperm morphology remained in the model with full adjustment.

The study reports no or only modest correlations between dietary fatty acids (obtained by the FFQ) and fatty acids measured in sperm and seminal plasma among 23 participants. According to the authors, this is not an unexpected finding, since some of these fatty acids are produced in the body, but it limits the value of dietary data and does not explain the low correlation with the essential PUFAs. Sperm levels and seminal plasma levels of saturated fatty acids were inversely correlated to sperm concentration and motility, whereas sperm levels seminal plasma levels of omega-3 PUFAs were positively correlated to sperm concentration and motility.

Department of Public Health, Section of Epidemiology, Aarhus University, 8000 Aarhus C, Denmark
Correspondence: Associate Professor CH Ramlau-Hansen (chrh@soci.au.dk)

The results on the associations between habitual dietary intake and measures of semen quality support previous results from a Spanish case-control study of 61 men attending a fertility clinic⁵ but not results from a Dutch cross-sectional study of 161 men from infertile couples undergoing *in vitro* fertilization treatment.⁶

Although the study is based upon a highly selected group of males and is of cross-sectional nature, the findings are of interest. However, a high intake of saturated fats correlates with many other life-style factors and also environmental pollutants, and better control for confounding is needed. A study based on biomarkers of fat intake at the time of spermatogenesis

would also be of interest. The study should be done in healthy males and, moreover, at best include maternal dietary habits in prenatal life at the time of organogenesis and include vitamins and minerals.

Advising infertility patients to eat a healthy, prudent diet is always a good idea in spite of limited evidence of its effect on sperm quality.

-
- 1 Attaman JA, Toth TL, Furtado J, Campos H, Hauser R *et al.* Dietary fat and semen quality among men attending a fertility clinic. *Hum Reprod* 2012; **27**: 1466–74.
 - 2 Jorgensen N, Asklund C, Carlsen E, Skakkebaek NE. Coordinated European investigations of semen

quality: results from studies of Scandinavian young men is a matter of concern. *Int J Androl* 2006; **29**: 54–61.

- 3 Safarinejad MR. Effect of omega-3 polyunsaturated fatty acid supplementation on semen profile and enzymatic anti-oxidant capacity of seminal plasma in infertile men with idiopathic oligoasthenoteratospermia: a double-blind, placebo-controlled, randomised study. *Andrologia* 2011; **43**: 38–47.
- 4 Rimm EB, Giovannucci EL, Stampfer MJ, Colditz GA, Litin LB *et al.* Reproducibility and validity of an expanded self-administered semiquantitative food frequency questionnaire among male health professionals. *Am J Epidemiol* 1992; **135**: 1114–26.
- 5 Mendiola J, Torres-Cantero AM, Moreno-Grau JM, Ten J, Roca M *et al.* Food intake and its relationship with semen quality: a case-control study. *Fertil Steril* 2009; **91**: 812–8.
- 6 Vujkovic M, de Vries JH, Dohle GR, Bonsel GJ, Lindemans J *et al.* Associations between dietary patterns and semen quality in men undergoing IVF/ICSI treatment. *Hum Reprod* 2009; **24**: 1304–12.