

Rat fathers' diets may affect offspring's breast cancer risk

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The dietary habits of rat fathers may affect their daughters' breast cancer risk, a study in 60 male rats and their offspring has found. The study is published in the open access journal *Breast Cancer Research*.

Researchers at the University of Sao Paulo showed that the female offspring of male rats which had been fed a diet rich in animal fats had an increased risk of breast cancer. A diet that was rich in vegetable fats reduced the offspring's risk of breast cancer.

Thomas Ong, the corresponding author, said: "Although in recent years, interest in the fathers' role in their offspring's health has grown,

information concerning the influence of paternal factors on their daughters' [breast cancer](#) risk is very limited. In this study we have used a [rat model](#) to compare the impact of the consumption of high levels of animal or vegetable fat by fathers before conception on their daughters' risk of breast cancer."

The researchers fed 60 male rats (3 groups, 20 rats per group) either a lard-based or corn-oil based high-fat diet (60% of energy derived from fat) or a control diet (16% energy derived from fat). The rats were then mated with female rats that had been fed a standard laboratory diet. Female offspring were fed a standard laboratory diet and induced with mammary tumors at 50 days of age. The researchers sought to determine the time it took for tumors to appear (latency), the number of animals with tumors (incidence) and the number of tumors per animal (multiplicity), as well as tumor volume, as indicators of breast [cancer risk](#).

Female offspring of male rats on both high-fat diets showed reduced tumor cell death compared to controls. However, offspring of corn oil-fed male rats showed decreased tumor growth compared to the offspring of male rats that had been fed a lard-based or a control diet. Offspring of corn-oil fed rats also had longer tumor latency - it took tumors longer to start growing - and fewer tumors compared to the offspring of male rats fed a lard-based diet.

Thomas Ong said: "Because the consumption of high levels of fat is considered bad for health, the decreased breast cancer risk in the female offspring of fathers that consumed corn oil was surprising. Lard contains high levels of saturated fat whereas corn oil is rich in n-6 polyunsaturated fat. This suggests that the type of dietary fat consumed by fathers is an important factor influencing their daughters' breast cancer risk."

The researchers also collected sperm from male rats and mammary glands from their female offspring to investigate changes in microRNA and protein expression. They showed that both male rats and their female offspring exhibited changes in microRNAs and proteins that could affect processes including cell growth, cell survival or cell death.

The findings suggest that diet-induced changes in paternal germ cells even before conception can influence the breast cancer risk of female offspring, according to the researchers.

Thomas Ong said: "If this is confirmed in human studies, potential breast cancer prevention strategies could be developed focusing on fathers' diets during preconception."

Since fathers, mothers and their daughters often share the same nutrition habits, further research is needed on how the fat intake of mothers and their female offspring may affect breast cancer risk, according to the researchers. As changes in microRNAs in male rodents can be normalized through exercise and dietary intervention, the researchers propose that the effect of similar interventions on female offspring's [breast cancer risk](#) should also be investigated.

More information: Camile Castilho Fontelles et al, Paternal programming of breast cancer risk in daughters in a rat model: opposing effects of animal- and plant-based high-fat diets, *Breast Cancer Research* (2016). [DOI: 10.1186/s13058-016-0729-x](https://doi.org/10.1186/s13058-016-0729-x)

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