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Maternal diet and exposure susceptibility of offspring

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Increasing evidence indicates that nutrition of the mother during gestation and/or lactation may increase, in the offspring, the vulnerability to environmental factors, certain diseases and, e.g., the prevalence of (over)weight. Somewhat conflicting results are reported and precise mechanisms underlying the findings in the offspring are unknown.

In humans, it is difficult to discriminate between prenatal and postnatal phases; animal studies with cross-fostering, however, may mimic this to some extent. Therefore, we studied the impact of maternal diet on vulnerability to environmental exposure (methylazoxy methanol (MAM) / methylmercury (MeHg)) in the offspring. Three groups of female Wistar rats (n=28-32) were kept on different diets during 6 weeks pre-mating, throughout gestation and lactation. F1-animals were studied until PN 70. Maternal influences during gestation and lactation were studied separately by cross-fostering the F1-animals immediately after birth.

Results offspring: 1) No differences in birth weight between groups, 2) poor growth of pups fostered to dams on a low caloric diet during gestation, 3) increased growth of low caloric pups fostered to high-caloric dams (catch-up growth) and decreased growth of high-caloric pups fostered to low-caloric dams (used to western style diet).

Results offspring after exposure: 1) Increased vulnerability of catch-up growers to environmental exposure early in life in male pups exposed to MAM (reduced body weight). 2) Delayed early development (landmarks) in pups fostered to dams with restricted diet during lactation, gestation, or both. 3) Reduced performance in pups on low caloric diet during lactation or both.

Conclusion: Maternal diet may enhance in the offspring the vulnerability for environmental toxicity with life lasting consequences for neurological development.