Pregnant women who exercise protect their offspring against long-term neurodegenerative diseases

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If you are pregnant, here's another reason to work out: you will reduce the chances of your new baby developing neurodegenerative diseases, such as Alzheimer's, later in life. A new research report published online in The *FASEB Journal* shows that mice bred to develop a neurodegenerative disease roughly equivalent to Alzheimer's disease showed fewer signs of the disease and greater brain plasticity later in life when their mothers exercised regularly than those whose mothers did not exercise.

"This research provides an experimental rationale for the effects of beneficial behavioral stimuli experienced by the pregnant mother affecting the disease status of an as yet-unborn child. Epigenetic alterations (alterations in gene and protein expression caused by mechanisms other than changes in the underlying DNA sequence) provide a most probable mechanism by which mothers could have transferred their own behavioral experience to their progeny," said Kathy Keyvani, M.D., a researcher involved in the work from the Institute of Pathology and Neuropathology at the University Hospital Essen in Essen, Germany. "A better understanding of the underlying pathways may provide novel treatment and/or prevention strategies for Alzheimer's disease and bring more insight into the fascinating link between brain and behavior."

To make this discovery, Keyvani and colleagues mated male mice that

express a mutant form of the APP gene found in some Alzheimer's patients with healthy female wild-type mice. After weaning, healthy and "Alzheimer-diseased" offspring were kept in standard cages for five months. Mouse brains were examined for signs of disease shortly thereafter. The "Alzheimer-diseased" mice whose mothers ran on a exercise wheel during pregnancy had fewer Beta-amyloid plaques, smaller plaque size, less inflammation, less oxidative stress, and a better functioning vascular network than those whose mothers did not run. Additionally, the mice whose mothers ran on the wheel also showed an up-regulation of plasticity-related molecules, which are indicators for more and better connections between the nerve cells.

"No one is resistant to the health benefits of exercise," said Gerald Weissmann, M.D., Editor-in-Chief of The FASEB Journal, "and this research confirms that reasonable workouts can have a lifetime of benefits for your offspring. Whether you work out at home or go to the gym, you should do it for the sake of your health and that of your offspring."

More information: Arne Herring, Anja Donath, Maksym Yarmolenko, Ellen Uslar, Catharina Conzen, Dimitrios Kanakis, Claudius Bosma, Karl Worm, Werner Paulus, and Kathy Keyvani. Exercise during pregnancy mitigates Alzheimer-like pathology in mouse offspring. FASEB J. doi:10.1096/fj.11-193193

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