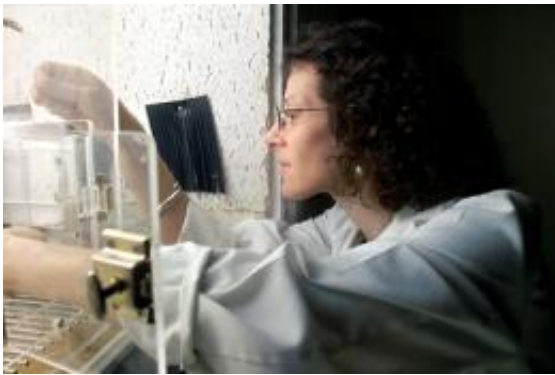


More choline reduces Down syndrome dysfunction

June 2 2010, By Ted Boscia



Barbara Strupp, professor of nutritional sciences and of psychology.

(PhysOrg.com) -- In a mouse model of Down syndrome, pregnant and lactating mice that received additional choline had offspring that fared much better than those whose mothers did not receive choline, a new study finds.

More choline during pregnancy and nursing could provide lasting cognitive and emotional benefits to individuals with Down syndrome and protect against neurodegenerative conditions such as Alzheimer's disease, suggests a new Cornell study of mice.

The findings, published June 2 in [Behavioral Neuroscience](#), could help lead to increasing the maternal dietary recommendations for choline (currently 450 milligrams a day during pregnancy, 550 milligrams for

lactation), a nutrient found in egg yolks, liver, nuts and such vegetables as broccoli and cauliflower.

"We found that supplementing the maternal diet with additional choline resulted in dramatic improvements in attention and some normalization of emotion regulation in a [mouse model](#) of Down syndrome," said lead author Barbara Strupp, professor of nutritional sciences and of psychology. The researchers also found evidence for "subtle, but statistically significant, improvement in learning ability in the non-Down syndrome littermates."

In addition to mental retardation, Down syndrome individuals often experience dementia in middle age as a result of brain neuron atrophy similar to that suffered by people with Alzheimer's disease. Strupp noted that the improved mental abilities found in the Down syndrome mice following maternal choline supplements could indicate protection from such [neurodegeneration](#) "in the population at large."

Strupp and her co-authors tested Down syndrome model mice born from mothers fed a normal diet and those given choline supplements during their three-week pregnancy and three-week lactation period, as well as normal mice born from mothers with and without additional choline. The choline-supplemented mothers received approximately 4.5 times more choline (roughly comparable to levels at the higher range of human intake) than unsupplemented mothers.

At six months of age, the mice performed a series of behavioral tasks for about six months to assess their impulsivity, attention span, emotion control and other [mental abilities](#).

In addition to dramatic improvements in attention, the researchers found that the unsupplemented Down syndrome model mice became more agitated after a mistake than normal mice, jumping repeatedly and

taking longer to initiate the next trial, whereas the choline-supplemented Down syndrome model mice showed partial improvement in these areas.

"I'm impressed by the magnitude of the cognitive benefits seen in the Down syndrome model mice," Strupp said. "Moreover, these are clearly lasting cognitive improvements, seen many months after the period of choline supplementation."

Strupp noted that the results are consistent with studies by other researchers that found increased maternal choline intake improves offspring cognitive abilities in rats. However, this is the first study to evaluate the effects of maternal choline supplementation in a rodent model of [Down syndrome](#). This is also one of the few studies that has evaluated offspring attentional function and effects in mice, rather than rats, Strupp noted.

Previous studies of humans and laboratory animals have shown that supplementing the diets of adults with choline has proven to be largely ineffective in improving cognition. "Although the precise mechanism is unknown, these lasting beneficial effects of [choline](#) observed in the present study are likely to be limited to increased intake during very early development," Strupp said.

Provided by Cornell University

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