Ritalin may ease early iron deficiency damage

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Ritalin may help improve brain function in adolescent rats that were iron deficient during infancy, according to a team of Penn State neuroscientists. This may have implications for iron-deficient human infants as well.

The researchers found that low doses of Ritalin can help improve the focus of iron-deficient rats. Higher doses proved to hurt rather than help the control animals' focus, making them hyperactive. The control rats that were not iron deficient but received low doses of Ritalin showed no positive or negative change in performance.

When children are deprived of iron at any point during the last trimester of pregnancy or the first six months of life -- a critical period of brain development -- they suffer brain damage at least through early adulthood, and possibly beyond. In particular, their motor function can be impaired as well as their ability to focus.

Children with iron deficiency can exhibit attention problems, attachment issues and motor problems, said Byron C. Jones, professor of biobehavioral health.

Iron-deficient adults often have restless leg syndrome. People who become iron deficient after three years of age can recover by taking iron supplements.

According to the Centers for Disease Control and Prevention, iron

deficiency ranks in the top 10 causes of global disease and affects more than 2 billion children.

Iron-deficient adolescent rats were treated with methylphenidate, commonly known as Ritalin, to see if the drug would help the animals overcome the deficit, as reported in this quarter's issue of *Behavioural Brain Research*.

"Most of the research community knows that iron deficiency has a major hit on dopamine systems," said Jones. "Why hasn't anybody tried a dopamine drug to repair or at least rescue some of what's lost?" Ritalin is a drug that helps regulate levels of dopamine in the brain. Most often it is prescribed to patients with attention-deficit/hyperactivity disorder. Dopamine is important in controlling many important functions of the brain, like being able to sustain attention and shift it.

The researchers made half the rats in the test group iron deficient beginning four days after birth, mimicking a human infant deprived of iron during brain development. Once weaned, the rats were put on iron-sufficient diets.

At 45 days, when the rats reached adolescence, the researchers tested the rats' ability to remember, respond, sustain attention and then shift attention. For every test, they gave the rats two different bowls to dig in. In each case only one bowl contained food, but the bowls were filled with either coarse or fine gravel. Before receiving any Ritalin, each rat had time to explore the bowls and find the food.

The researchers then broke the rats into four groups, with control and iron-deficient rats in all four groups. One group served as the control, receiving no Ritalin. They gave the other three groups different amounts of Ritalin. After 15 days on the medication, the researchers retested the rats, seeing if the rats could find the food in either filler. The test was

complicated by the addition of either mint or strawberry scents.

"Ritalin may not be the best drug -- but it's shown that we can in fact treat some of the effects" of early-life iron deficiency, Jones said.

According to Jones, these were the first experiments with Ritalin and iron deficiency. The team plans to conduct further research.

"We're looking now to see if in fact their brains are going to show any recovery, but there's no evidence so far in terms of (recovery of) the dopamine receptors," Jones said.

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