

Psychotherapy for depressed rats shows genes aren't destiny

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Genes are not destiny in determining whether a person will suffer from depression, reports a new Northwestern Medicine study. Environment is a major factor, and nurture can override nature.

When [rats](#) genetically bred for [depression](#) received the equivalent of rat "psychotherapy," their depressed behavior was alleviated. And, after the depressed rats had the therapy, some of their blood biomarkers for depression changed to non-depressed levels.

"The environment can modify a genetic predisposition to depression,"

said lead study investigator Eva Redei, a professor of psychiatry and behavioral sciences at Northwestern University Feinberg School of Medicine. "If someone has a strong history of depression in her family and is afraid she or her future children will develop depression, our study is reassuring. It suggests that even with a high predisposition for depression, psychotherapy or behavioral activation therapy can alleviate it."

The study also found genetic influences and environmental influences on depression likely work through different molecular pathways. Rats bred for depression and rats that were depressed due to their environment showed changes in the levels of entirely different blood markers for depression. Being able to differentiate between the two types of depression eventually could lead to more precise treatment with medication or psychotherapy.

The study will be published March 29 in *Translational Psychiatry*.

The rats in the Northwestern study had been bred for depression-like behavior for 33 generations and showed extreme despair.

"You don't have people who are completely genetically predisposed to depression the way the rats were," Redei said. "If you can modify depression in these rats, you most certainly should be able to do it in humans."

The genetic rat model of depression is biologically similar to human depression, which Redei reported in previous research on blood biomarkers for depression.

In the Northwestern study, Redei and colleagues wanted to see if they could alter the rats' genetically caused depression by changing their environment. They took the depressed rats and put them in large cages

with lots of toys to chew on and places for them to hide and climb - sort of a Disneyland for rats. The rats were kept in the playground for one month.

"We called it rat psychotherapy," Redei said, "because the enrichment allows them to engage with the environment and each other more." The results of a month in the playground: the rats' depressive behavior was dramatically reduced.

After the playground psychotherapy, the rats were placed in a tank of water. Their behavior in the tank is a measure for depression. The control rats will swim around, looking for a way to escape. Depressed rats will simply float, showing despair behavior. After the month in the playground, the genetically depressed rats energetically paddled around the tank, looking for an exit.

"They did not show despair," Redei said.

Northwestern scientists also wanted to see if environmental stress could trigger depression in rats bred to be the non-depressed control group of the experiment. These rates did not show despair behavior originally. The control rats underwent a psychologically stressful situation, which involved being restrained two hours a day for two weeks. After the two weeks, the stressed, control rats displayed depressed behavior when placed in a tank of water. They simply floated—despair behavior—and didn't try to escape. After the environmental stress, some of the blood biomarkers for depression changed from non-depressed levels to levels seen in genetically depressed rats.

The next step is to find out if the biomarkers actually cause behavioral changes in response to the environment. "If so, then perhaps we can find novel drugs to change the level of biomarkers in depressed rats to those of the non-depressed controls and, thus, discover new antidepressant

medications," Redei said.

More information: *Translational Psychiatry*,
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