

Enriched environment improves wound healing in rats

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Improving the environment in which rats are reared can significantly strengthen the physiological process of wound healing, according to a report in the online, open-access, peer-reviewed journal *PLoS ONE*.

Researchers from the Benson-Henry Institute for Mind Body Medicine at Massachusetts General Hospital (MGH) and Shriners Burns Hospital found that giving rats living in isolation the opportunity to build nests led to faster and more complete healing of burn injuries than was seen in isolation-reared rats without nest-building materials. The study also found evidence that this effect was associated with altered [gene expression](#) in stress-associated structures in the brain.

"These findings are consistent with other animal studies that show how stress and [social deprivation](#) reduce physical well being, but our study is novel in showing that the detrimental effects on physical health can be reversed by environmental stimulation" says John B. Levine, MD, PhD, of the MGH Department of Psychiatry, senior author of the paper.

Previous research indicates that a more stimulating environment improves maternal behavior in rats - probably through the effects of oxytocin, a hormone involved with maternal attachment and bonding - and that stress reduces [wound healing](#) in both animals and humans. An earlier study by members of the MGH/Shriners research team found that rats raised in isolation had both poor wound healing and changes in the activity of stress-associated brain structures. The current study was designed to examine whether environmental enrichment can reduce the

impact of stress on wound healing and to investigate associated changes in [brain activity](#) and behavior.

Young rats that had just been weaned were placed either in cages shared with other rats or into isolation cages. Along with standard bedding materials, some of the isolated animals also received small squares of cotton called Nestlets that they would tear up and arrange into nests. The nesting materials were replaced twice a week, and each time the rats built themselves new nests. An experiment designed to test wound healing found significant difference among these groups. Four weeks after a burn injury was administered under anesthesia, 92 percent of the group-reared rats had healed well, compared with only 12 percent of the isolation-reared rats without nesting materials. But among the isolation-reared rats given nesting materials, 64 percent were determined to have healed well.

Another experiment showed that a daily dose of oxytocin had the same effect on wound healing as did access to nest-building materials. A third experiment showed that the opportunity to build nests reduced the hyperactive behavior typically seen in isolation-reared rats and also had effects in the hippocampus - a brain structure known to be key to the stress network - increasing the expression of genes previously shown to be underexpressed in isolation-reared animals.

"The fact that giving these animals a behavioral intervention changed not only their behavior but also their physical health raises important mind-body questions that require further investigation in humans as well as animal models," says Gregory Fricchione, MD, director of the Benson-Henry Institute and co-corresponding author of the *PLoS ONE* report. "It sets the stage for further studies to identify the mechanism accounting for this phenomenon."

[More information:](#) Vitalo A, Fricchione J, Casali M, Berdichevsky Y,

Hoge EA, et al. (2009) Nest Making and [Oxytocin](#) Comparably Promote Wound Healing in Isolation Reared [Rats](#). [PLoS ONE](#) 4(5): e5523.
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