

# Researchers discover RNA repair system in bacteria

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In new papers appearing this month in *Science* and the *Proceedings of the National Academy of Sciences*, University of Illinois biochemistry professor Raven H. Huang and his colleagues describe the first RNA repair system to be discovered in bacteria. This is only the second RNA repair system discovered to date (with two proteins from T4 phage, a virus that attacks bacteria, as the first).

The novelty of the newly discovered bacterial [RNA](#) repair system is that, before the damaged RNA is sealed, a methyl group is added to the two-prime hydroxyl group at the cleavage site of the damaged RNA, making it impossible to cleave the site again. Thus, the repaired RNA is "better than new."

This discovery has implications for protecting cells against ribotoxins, a class of toxins that kills cells by cleaving essential RNAs involved in protein translation. Because the enzyme responsible for methylation in the newly-discovered RNA repair system is the Hen1 homolog in bacteria, the finding has also implications for the understanding of [RNA interference](#) and [gene expression](#) in plants, animals, and other eukaryotes. The eukaryotic Hen1 is one of three enzymes (along with Dicer and Argonaute) essential for the generation of small noncoding RNAs of 19-30 [nucleotides](#) in RNA interference.

While the *Science* paper describes the mechanism of the entire RNA repair process, the article in PNAS focuses on the chemistry of the methylation reaction, specifically the [crystal structure](#) of the

methyltransferase domain of bacterial Hen1. Because the eukaryotic Hen1 carries out the same chemical reaction, the study should further understanding of RNA interference in eukaryotic organisms.

"Hen1 is one of three essential enzymes in generating small noncoding RNAs for RNA interference in eukaryotes," Huang said. "We found out that Hen1 homologs exist in bacteria, but bacteria have no RNA interference. Therefore, we were very curious to find out what bacterial Hen1 is used for."

"Our studies demonstrated that bacterial Hen1 carries out the same chemical reaction as its counterpart in eukaryotes, which was not surprising," he said. "What surprised us was that, instead of involvement in RNA interference, the bacterial Hen1 is part of a RNA repair and modification system. And Hen1 is responsible for producing the repaired RNA that is 'better than new.'"

Source: University of Illinois at Urbana-Champaign ([news](#) : [web](#))

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