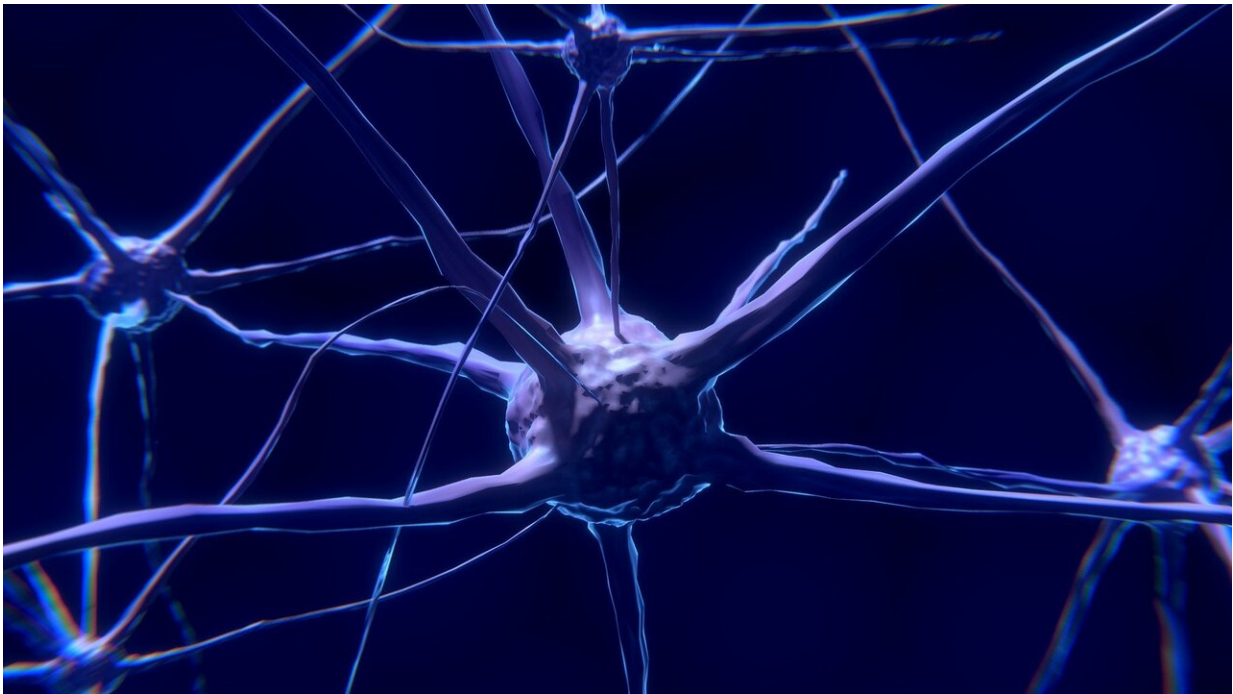


# Molecular switch plays crucial role in learning from negative experiences

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Neurobiologists at KU Leuven have discovered how the signalling molecule Neuromedin U plays a crucial role in our learning process. The protein allows the brain to recall negative memories and, as such, learn from the past. The findings of their study on roundworms have been published in the journal *Nature Communications*.

If a certain type of food or drink has made you ill in the past, you will avoid it on future occasions. Similarly, you will avoid an uncomfortable situation that made you anxious before. This [learning process](#), which is based on unpleasant or negative memories, is extremely important. It has fascinated researchers for years, but the molecular basis remains incompletely understood.

A new study carried out by the Division of Animal Physiology and Neurobiology of KU Leuven now sheds new light on the matter. The researchers studied the roundworm *C. elegans* and found that the protein Neuromedin U plays a key role in recalling negative memories. It acts as a signalling molecule allowing the neurons to communicate with each other.

## Roundworms as a model organism

"The communication between [brain](#) cells is surprisingly similar between worms and humans," explains Professor Isabel Beets. "While *C. elegans* worms only have about 300 neurons, their brains produce many signalling [molecules](#) that are similar to those in the human brain. So, by studying *C. elegans* we can also learn more about the human brain."

Moreover, the worm is able to learn from past experiences, says Professor Beets. "Worms are intrinsically drawn to [salt](#) because they associate it with the presence of food. However, if they come into contact with salt when there is no food present, this results in a negative association. In other words, the worm will prefer to avoid salt."

## Recalling negative memories

Inactivating the gene responsible for Neuromedin U changes the worms' behaviour, says doctoral student Jan Watteyne, lead author of the study.

"We found that the protein plays a very specific role in the learning process: it ensures that the worm is able to learn from past experiences. If the worm encounters a salty environment without food, it will avoid the salt on future occasions. However, if we temporarily block Neuromedin U, the worm forgets this first experience and will be drawn to the salt again. This means that the protein doesn't help to make the association, but it does help to recall it."

"It's clear that the signalling molecule Neuromedin U plays a crucial role in learning and [memory](#), and more specifically the retrieval of negative memories. This leads us to suspect that other similar molecules, so-called neuropeptides, also perform these specific functions."

## Starting point

"Our findings in [worms](#) are a good starting point for further research into the cognitive functions of other animals. We know that Neuromedin U is also found in many other organisms and in the human brain," says Professor Liliane Schoofs. "A good knowledge of these basic mechanisms is, therefore, crucial to better understand the complex processes in the human brain."

**More information:** Jan Watteyne et al, Neuromedin U signaling regulates retrieval of learned salt avoidance in a *C. elegans* gustatory circuit, *Nature Communications* (2020). [DOI: 10.1038/s41467-020-15964-9](#)

Provided by KU Leuven

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