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Slime mould absorbs substances to memorise them

In 2016, CNRS scientists demonstrated that the slime mould *Physarum polycephalum*, a single-cell organism without a nervous system, could learn to no longer fear a harmless but aversive substance and could transmit this knowledge to a fellow slime mould. In a new study, a team from CNRS and the Université Toulouse III – Paul Sabatier has shown what might support this memory and in fact it could be the aversive substance itself! These results were published in a special issue of the *Philosophical Transaction of the Royal Society B* on 22 April 2019.

Physarum polycephalum is a complex single-cell organism that has no nervous system. It can learn and transfer its knowledge to its fellow slime moulds via fusion. How it did so was a mystery. Researchers at the Centre de Recherches sur la Cognition Animale (CNRS/UT3 Paul Sabatier)¹ have recently demonstrated that slime moulds learn to tolerate a substance by absorbing it.

This discovery stems from an observation: slime moulds only exchange information when their venous networks fuse. In that case, does knowledge circulate through these veins? Is it the substance that the slime mould gets used to that supports its memory?

First the team of scientists forced the slime moulds to cross salty environments for six days to habituate them to salt. Then they evaluated the salt concentration inside the slime moulds: they contained ten times more salt than “naive” slime moulds. The researchers then placed the habituated slime moulds in a neutral environment and observed that they excreted the salt absorbed within two days, losing the “memory”. This experiment therefore seemed to show a link between the salt concentration within the organism and the “memory” of the habituation.

To go further and confirm this hypothesis, the scientists introduced the “memory” into naive blobs by injecting a salt solution directly into the organisms. Two hours later, the slime moulds were no longer naive and behaved like slime moulds that had undergone a six day training

When the environmental conditions deteriorate, slime moulds can enter into a dormant stage. The researchers demonstrated that slime moulds habituated to salt stored the salt absorbed before entering the dormant stage and could store the knowledge for up to a month.

The results of this study prove that the aversive substance could be the support of the slime mould's memory. The researchers are now trying to establish whether if the slime moulds can memorise several aversive substances at the same time and to what extent they can get used to them.



¹ The Centre de Recherche sur la Cognition Animale is part of the Centre de Biologie Intégrative (CNRS/UT3 Paul Sabatier)



Fusion of venous network of two blobs

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Bibliography

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