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Study investigates the effect of the anesthetic isoeugenol on fish

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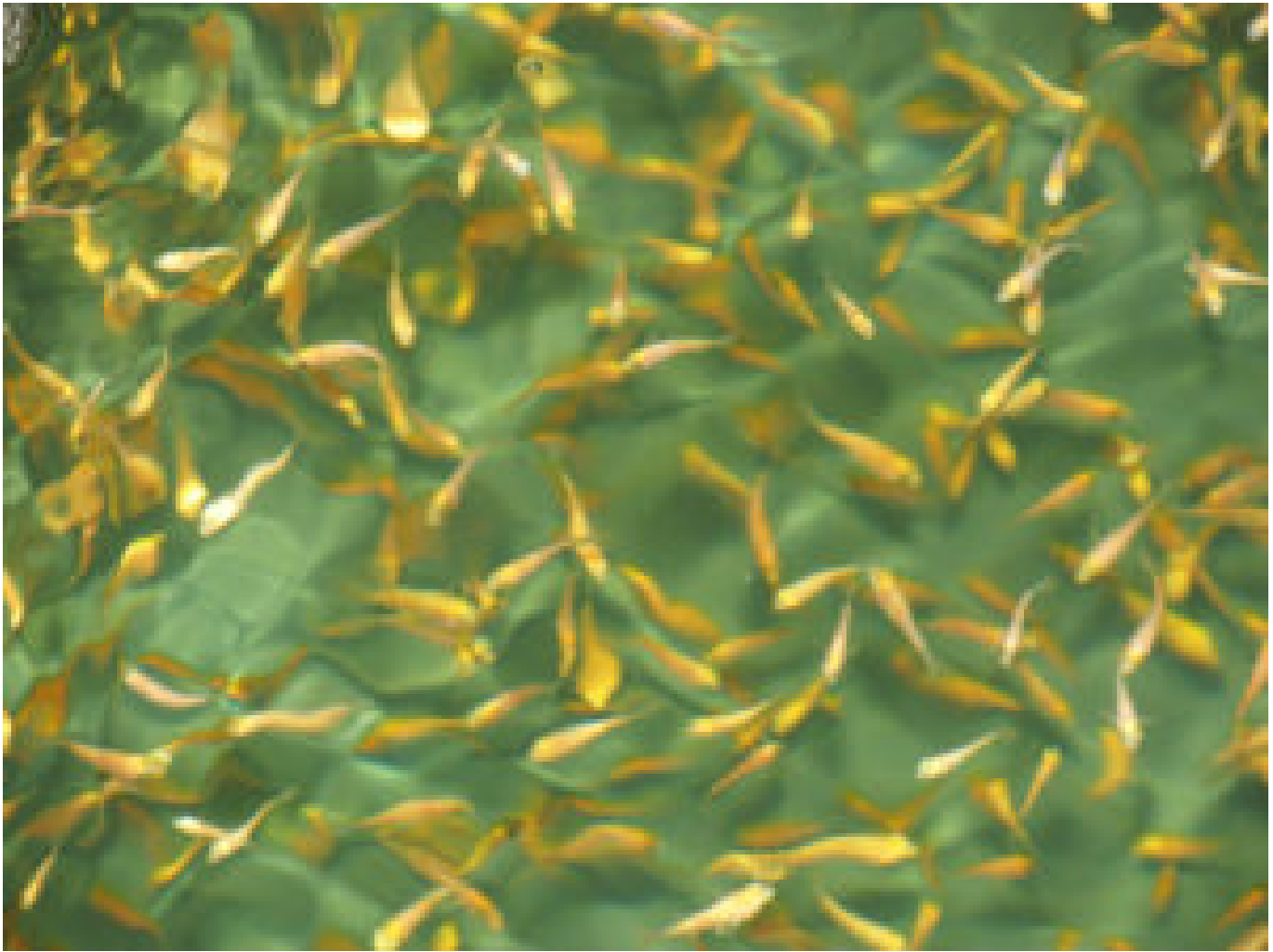
By Responsible Seafood Advocate

Findings to enable 'informed and more targeted application' of isoeugenol anesthesia in the interest of animal welfare

A research team at the University of Bayreuth has investigated the mode of action of isoeugenol in fish and whether the anesthetic impairs the sensory systems of fish or blocks the transmission of sensory information taken up from the environment to the brain – or whether it prevents the processing of this information in the brain.

“Isoeugenol is a very effective anesthetic in fish, used for example during the treatment of fish against parasites,” said Dr. Peter Machnik, first author and a research associate at the school’s department of animal physiology. “However, it was previously unclear what the anesthetic effect of isoeugenol is based on.”

The study, published in *Communications Biology* (<https://www.nature.com/articles/s42003-023-04695-4>), shows how and in what doses the active ingredient affects the perception and transmission of sensory stimuli and their processing in the brain of fish. The findings will enable the informed and more targeted application of isoeugenol anesthesia in the interest of animal welfare.



A new study could enable the “informed and more targeted application” of isoeugenol anesthesia on fish, with animal welfare implications.

“We were able to demonstrate that isoeugenol mainly affects the sensory systems of fish (i.e., it prevents them from taking up information from the environment),” said Machnik. “Even comparatively small amounts of isoeugenol massively reduce vision, significantly higher doses are required to switch off hearing. However, all sensory systems recover quickly and completely after isoeugenol administration.”

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The new findings do not support the assumption that isoeugenol blocks sodium channels in the central nervous system of fish, thereby preventing the processing of sensory information in the brain. Primarily, the active ingredient acts as a local anesthetic. The researchers detected an effect on central neurons only when high doses were administered, but this effect was not reconciled with the idea of a blockade of sodium channels.

The researchers consider isoeugenol to be an anesthetic that, when used in an aimed manner, is suitable for reducing stress and pain in fish, both in scientific research and in fish farming. It has not only an anesthetic but also a sedative effect on the fish.



Clove oil, eugenol effective anesthetics for silver catfish

Clove oil and eugenol have been recommended and used as anesthetics for several fish species. Moreover, these products have received the attention of researchers because of their chemo-preventive effects, as well as their anti-inflammatory and antioxidant properties.



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Isoeugenol has proven unsuitable as an anesthetic during invasive procedures or for calming fish while their sensory systems are being studied, for example in studies on sensory systems – if only because the present study has shown that the same dosage has very different effects on different fish and the desired reducing effect is not always guaranteed.

“We recently presented the study at the meeting of the German Neuroscience Society in Göttingen. Our results on the effects of isoeugenol met with a great deal of scientific interest,” said Dr. Stefan Schuster, Chair of Animal Physiology at the University of Bayreuth. “They were seen as a valuable contribution to future animal welfare because isoeugenol is now used in many fish farms worldwide without precise knowledge of its effects and of the necessary dosages.”

[Read the full study here \(https://www.nature.com/articles/s42003-023-04695-4\)](https://www.nature.com/articles/s42003-023-04695-4).

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