



Universidad de Granada

Researchers identify area of the amygdala involved in taste aversion

03/04/2018

Research news

Researchers from the University of Granada, together with scientists from the Autonomous University of Baja California (UABC), have identified the area of the brain that is directly involved in our aversion to toxic, spoiled or poisonous foods. The results, obtained from experiments on laboratory rats, lay the foundations for new studies on the development of taste and eating behaviours. Moreover, the study opens the door to potential therapeutic applications for the treatment of alterations that commonly occur after chemotherapy, as well as other therapies for eating disorders such as anorexia and obesity.



The rejection of foods that our brain associates with gastric toxicity and poisoning is characteristic of what experts call **taste aversion learning**. Its impact on eating behaviour is well documented, but the brain connections involved in each stage of the development of taste aversion are still unknown, particularly with regard to the development of taste memory and its association with stomach problems.

Building on previous studies that pointed towards the involvement of the amygdala in taste aversion, the UGR researchers focused on this small structure located in the limbic region of both hemispheres which is involved in learning and memory, as well as emotional processing.

Both vertebrates and invertebrates have the ability to recognise potentially toxic flavours, thereby avoiding poisoning. In humans, not only is this essential for survival; it can also form part of the mechanisms that lead to diverse eating disorders. The researchers describe the experiments conducted on the rats, designed to identify the area of the amygdala involved in the process of taste learning and memory associated with toxic effects, in a paper titled 'Effects of lesions in different nuclei of the amygdala on conditioned taste aversion', published recently in the <http://www.ugr.es/>

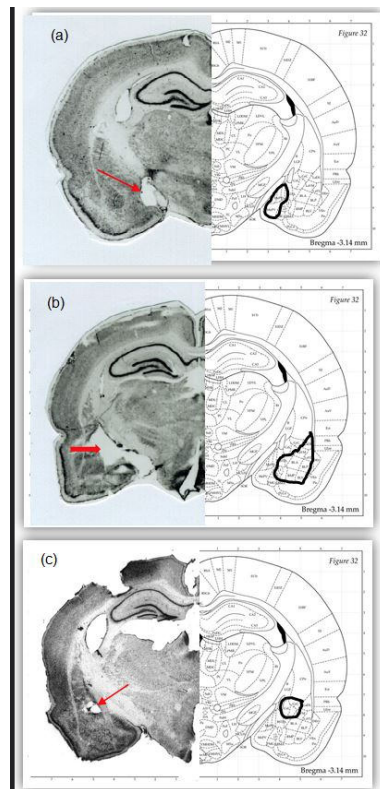
prestigious international journal *Experimental Brain Research*.

The taste aversion learning model is widely used in animal research to explore learning and memory. The experiment involves exposing the animal to a new non-toxic taste and, a few minutes later, inducing gastrointestinal upset by administering an injection of a harmful substance. The animal thereby learns to associate the taste with stomach upset. This taste aversion not only induces rejection and avoidance, but also loss of appetite.

During the study, the researchers intentionally damage the three main nuclei of the amygdala to determine which region is responsible for the acquisition of conditioned taste aversion (CTA). Using this method, the researchers were able to determine the specific area that regulates the magnitude of taste aversion, called the basolateral complex.

The amygdala is part of the limbic system, a brain region associated with emotions and learning involved in negative emotional processing, such as fear and disgust, as well as in the processing of memories that contain emotions. The structure of the limbic system is composed of a series of groups of neurons including central, medial and basolateral nuclei, among others.

Of the four groups of animals under study, a reduction in aversion was only observed in the group with lesions in the basolateral complex of the amygdala. As Andrés Molero, co-author of the paper, explains: "We have confirmed that taste aversion in the group with lesions in the basolateral complex of the amygdala was reduced, in other words; although these groups also learn to reject taste, they consume higher quantities compared with the groups without lesions or with lesions in the other amygdaloid nuclei."



Lesions in the medial, basolateral and central amygdala (a,b,c, respectively)

Tastes to remember

Preferences for certain tastes can either be innate or learnt. If learnt, the corresponding preferences depend on whether the consequences of eating certain foods are positive (pleasure or satiety), or on the contrary, negative (discomfort or sickness). The natural response is to reject a taste when it is recognised as unpleasant or disgusting. For example, if something tastes like bleach, we are more likely to reject it.

According to the researchers, when a particular taste is accompanied by sickness attributable to the food with the taste, such as is the case with poisonous mushrooms, a conditioned taste aversion (CTA) arises following a single experience of consuming the substance. This association between taste and symptoms of poisoning also arises even if the stomach upset occurs several hours after having eaten. This is because the time needed to digest the food causes a delay in the association between the stimuli.



The results of the study open the door to possible therapeutic applications in the treatment of common alterations arising after chemotherapy treatment

This peculiar ability to associate stimuli that are not related concurrently is especially important with regard to the aversions acquired during chemotherapy treatments, since the food intake is associated with nausea which is actually induced by the chemicals administered at different stages. Patients may therefore develop taste aversion, even if they have not consumed food immediately after the treatment session. “Conditioned taste aversion (CTA) may form part of the mechanisms involved in anorexia and other similar disorders, particularly if associations arise between food and discomfort, or even with negative emotions”, the author concludes.

The researchers believe other complementary studies are necessary to improve our understanding of the respective interactions between the various components of the brain mechanism involved in the acquisition of conditioned taste aversion.

The study was conducted as part of the research project titled ‘Cambios inducidos por el envejecimiento en los mecanismos neurales de aprendizaje y memoria’ (English: Changes induced by the ageing of neural learning and memory mechanisms) funded by the Spanish Ministry of Economy, Industry and Competitiveness.

Bibliographical reference:

Andrés Molero Chamizo y Guadalupe Nathzidy Rivera Urbina. ‘Effects of lesions in different nuclei of the amygdala on conditioned taste aversion’, *Experimental Brain Research*. 2017.



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