Medical Xpress

Fighting phobias involves creation of 'competing' memories

October 22 2012

Credit: AI-generated image (disclaimer)

Most people have a fear of something but for 1 in 10 people, fear can turn into a phobia. The most common phobias being a fear of spiders, snakes, heights, the dark, being in crowds or tight spaces, animals and people. Then there are the more unusual fears: Coulrophobia (fear of clowns), Nomophobia (fear of being without a mobile phone),

Socerophobia (fear of the in-laws) and, probably the most ironic, Hippopotomonstrosesquippedaliophobia - a fear of long words.

But what causes a phobia and is there a cure?

Experiments (part funded by the European Commission) have been conducted to determine the answers by scientists from the Nencki Institute of Experimental Biology of the Polish Academy of Sciences and The International Institute of Molecular and Cell Biology in Warsaw.

Extinguishing fear does not consist of erasing the memory of the fear-provoking stimuli, but creating new, competitive memory traces. It has been suspected for some time that neuronal brain circuits responsible for extinguishing fear differ from circuits involved in reoccurrence of the fear. This assumption has finally been experimentally confirmed.

Dr Ewelina Knapska, head of the Laboratory of Emotions Neurobiology at the Nencki Institute said: 'Research has been carried out using a special, genetically modified strain of rats developed in the Nencki Institute. As a result we were able to observe the connections between neurons activated in the brains of animals experiencing fear.'

Fear, a strong, spontaneous reaction of the organism to a given stimulus, is significant in evolutionary terms. An animal experiencing fear has a better chance of survival in an unfriendly environment. However, excessive fear causes anxiety disorders, which can significantly hinder functioning of the organism, hence the development of phobias.

There are many reasons as to what causes phobias; for example, genes - some of us seem to be born more anxious than others. These problems can be inherited through our genes. Other reasons can be a traumatic experience which can make someone nervous or anxious for months or

years after the event. This is known as post-traumatic stress disorder. Then there is life experience, such as bad experiences in the past, big changes in life and the present. Many phobias tend to develop in childhood or adolescence and may lessen over time.

A true phobia is described as an intense and persistent fear that is recognised as irrational but one that you cannot ignore. A fear becomes a phobia when it makes you avoid the thing you fear and fills you with terror when you can't avoid it. To be a phobia it has to interfere with your life in some way.

But there is good news. Anxiety disorders in humans and animals can be treated with behavioural therapy. It involves exposure to the fear-triggering stimulus or stimuli in a safe environment. Multiple exposures to such stimuli can ensure the individual does not react with fear in response to them.

Brain structures responsible for learning and extinguishing fear have developed early in the evolution process and therefore can be studied experimentally in animals, such as rats. To do this scientists have developed a method for tracing the reaction of individual neurons to fear stimulus or the lack of it by modifying the rat genome.

Genetically modified rats exhibiting the desired reaction to the stress stimulus were then exposed to situations of high or low level of fear. The procedure was designed in such a way to ensure that the fluorescence marker would accumulate only in the cells which react to the fear-triggering stimulus.

As a result of these research methods, scientists will be able to guide the search for pharmacological agents, which could precisely target individual neuronal networks responsible for fear and its inhibition. This would constitute important progress in phobia treatment. For compounds

developed to date impact not the individual neuronal circuits but entire brain structures. This means that once applied they could erase memory traces in an uncontrolled manner.

Provided by CORDIS