

# NCBS scientists expose PTSD, fear

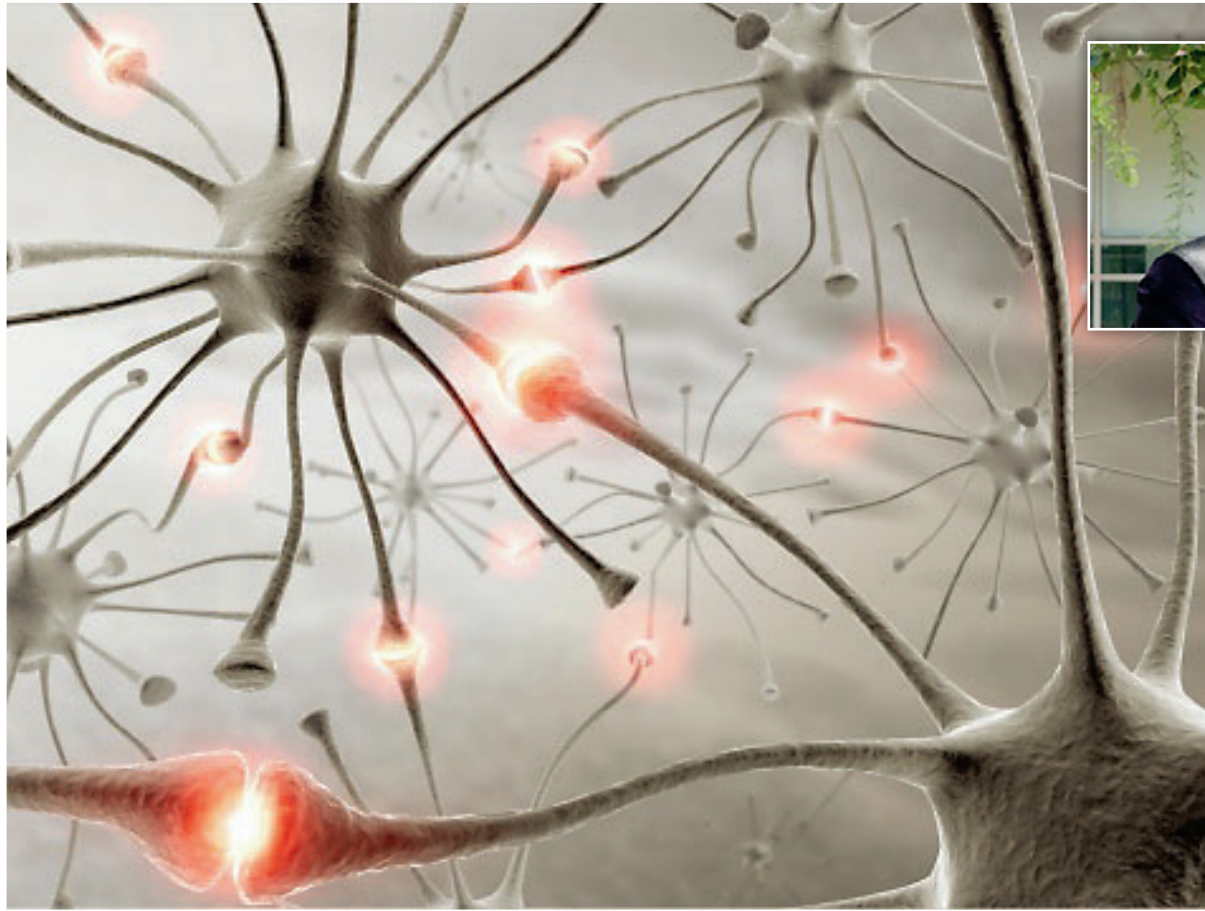
In a world's first, city neuroscientists determine how Post-Traumatic Stress Disorder (PTSD) occurs, pave way for drugs

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■ Sarita Rao (name changed), in her early 30s, experiences palpitation, sweating and panic attacks whenever a man is close to her. She shuns male company; shrinks into a corner if men, even relatives, are in the room; and experiences symptoms featuring extreme panic and lack of sleep out of fear of being attacked. A series of sessions with a psychiatrist helped her reveal the truth in her past – when in college she had been sexually assaulted by a group of men. The traumatic experience and the fear of social reprisal pushed her to keep it to herself, even if it meant continuing to suffer extreme anxiety disorder and a phobia for men in general.

■ Twenty-five-year-old Chandan Kumar (Name changed) was a regular victim of violence at home. His cobbler father, an alcoholic, regularly beat him up whenever his mother refused to give him money to buy liquor. He was just five then. Today, although his father died four years ago, he experiences panic attacks and a state of extreme anxiety and confusion whenever he hears a man shout in anger or beats someone.



Prof Sumantra Chattarji, NCBS neuroscientist and director, Centre for Brain Development & Repair (CBDR)



Supriya (pronounced Supriyo) Ghosh, Prof Chattarji's student who was part of the amygdala neuron research

one before had got to the heart of it.

Now, for the first time in the history of neuroscience, two scientists from National Centre for Biological Sciences (NCBS) in Bengaluru have conducted a detailed study on why and how one suffers from PTSD. They have pinpointed precise roles played by certain neurons in the part of the brain called amygdala, an almond-shaped structure located deep inside the brain, which acts as the centre that controls emotions and stores memories of fearful experiences.

In doing so, they have unravelled the so-far mysterious reasons behind the fear and precisely how that fear develops to make way for PTSD.

The research, published online on *Nature Neuroscience* website on December 1, has

paved the way for scientists the world over to study ways to reverse PTSD or even develop medical aids to cure the condition – a boon for many victims of sexual or child abuse, accidents, or soldiers/combatants who are commonly afflicted by this condition.

## HOW PTSD IS TRIGGERED

NCBS neuroscientist, Professor Sumantra Chattarji who is also the director of the newly founded Centre for Brain Development & Repair (CBDR), and his student Supriya Ghosh, discovered that PTSD sets in when individual neurons in the amygdala lose their capability to discriminate between dangerous and safe stimuli. They found that this happens when the danger stimuli is particularly intense, as in a life-threatening situation.

In normal circumstances, they found, most of the neurons are able to detect the safe signals; but when the danger levels are much increased they lose their capability to discriminate between danger and safety. This results in such neurons sending danger signals even when faced with a safe stimulus. Prof Chattarji cites the example of an American soldier who is a Vietnam War veteran. He gets terrified at the sight of a doormat or an oriental person, only because he found his friend's severed head on a doormat when he opened the door on morning in Vietnam. The shock was so huge that long after the incident took place, the soldier's neurons in the amygdala started firing danger signals even when a harmless doormat was presented before him. He experienced the same symptoms on

seeing any oriental person because his mind was conditioned to connect his friend's decapitation with any person with oriental features.

They also identified the precise biochemical signalling mechanism inside the amygdala neurons which caused this generalized fear and PTSD – cyclic adenosine monophosphate (cAMP)/protein kinase A (PKA) signalling. This potentially serves as a target for designing new treatments against PTSD, said Prof Chattarji.

He and Ghosh conducted experiments on live rats, the amygdala and the neural functioning of which are similar in humans.

Prof Chattarji has particularly warned that this process could be more pronounced among children – as in the case of Chandan Rao mentioned above. “The young

brain being ‘plastic/malleable’ is more vulnerable to trauma/abuse. These early life experiences can often leave an indelible mark in the brain that can last a lifetime,” he told BANGALORE MIRROR.

He has however pointed out that not every individual faced with dangerous situations will suffer from PTSD. “Two factors can contribute to it depending on genetics and life experiences — nature versus nurture. The relative contribution of the two factors will vary from individual to individual,” he explained.

## THE WAY FORWARD

The two neuroscientists now plan research on the mechanism of reversing PTSD, apart from hoping that researches are undertaken to develop drugs, having identified the precise biochemical signalling mechanism that causes PTSD.

Both Sarita and Chandan, like a million unfortunate others in the world, have been scarred for life due to traumatic experiences. Basically, they are suffering from Post-Traumatic Stress Disorder (PTSD), a condition of persistent mental and emotional stress occurring as a result of injury or severe psychological shock, typically involving disturbance of sleep and constant vivid recall of the experience, with dulled responses to others and to the outside world.

Although PTSD is known especially after many American soldiers kept returning home with the condition during the protracted Vietnam War (1954-1975), no