Scientists find hormone activity explains adolescent mood swings

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The "raging hormones" of puberty are known to produce mood swings and stress for most teenagers, making it difficult to cope with this period of life. Until now, the specific causes of pubertal anxiety have not been identified, making it harder to understand and treat adolescent angst.

In the current edition of the journal Nature Neuroscience, researchers led by Sheryl S. Smith, PhD, professor of physiology and pharmacology at SUNY Downstate Medical Center, report findings demonstrating that a hormone normally released in response to stress, THP, actually reverses its effect at puberty, when it increases anxiety.

This hormone normally acts like a tranquilizer, acting at sites in the brain that "calm" brain activity. In the adult, this stress hormone helps the individual adapt to stress, with a calming effect produced half an hour after the event.

Specifically, the GABA-A receptor is the target for steroids, such as THP (or allopregnanolone), which reduce anxiety. GABA-A receptors calm activity in the brain. As such, they are the targets for most sedative, tranquilizing drugs.

One sub-type, GABA-A receptors containing the delta subunit, such as alpha4-beta2-delta, has the highest sensitivity to steroids. In order to study its role in puberty, the researchers used a mouse model that reliably predicts the human condition. In this rodent model, the alpha4-beta2-delta receptor normally has very low expression, but

increases dramatically at the onset of puberty in the part of the brain that regulates emotion. Paradoxically, THP reduced the inhibition produced by these alpha4-beta2-delta GABA-A receptors, increasing brain activity to produce a state of increased anxiety. Stress also increased anxiety at puberty, due to the paradoxical effects of this hormone that is released by stress.

Dr. Smith and colleagues identified the site on human recombinant alpha4-beta2-delta GABA-A receptors that produced the anxiety response, and were able to mutate the site to prevent the novel effect of the stress hormone. In contrast, neither the receptor nor the necessary conditions exist for this anxiety-producing effect of the stress hormone before puberty, because the expression of the receptor is dependent upon hormonal transitions, such as those that occur at puberty. This new finding of a change in the effect of a stress hormone sheds new light on the "mood swings" of puberty.

Source: SUNY Downstate Medical Center