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Brain region central to placebo effect identified

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Researchers have pinpointed a brain region central to the machinery of the placebo effect—the often controversial phenomenon in which a person's belief in the efficacy of a treatment such as a painkilling drug influences its effect.

The researchers said their findings with human subjects offer the potential of measuring the placebo effect and even modulating it for therapeutic purposes. They also said their findings could enable measurements of brain function that "would help determine dysfunctions in cerebral mechanisms that may impair recovery across a number of conditions."

Jon-Kar Zubieta and colleagues published their findings in the July 19, 2007, issue of the journal *Neuron*, published by Cell Press.

Their studies concentrated on a brain area known as the nucleus accumbens (NAC), a region deep in the brain, known to play a role in expectation of reward. Earlier studies had hinted at involvement of the NAC in the placebo effect, but the nature of that role was unknown, said the researchers.

In their experiments, the researchers told volunteers that they were testing the effects of a new pain-killing drug and that the subjects might receive the drug or a placebo. However, in the experiments, the researchers gave only a placebo injection of a salt solution. The experiments involved asking the subjects to rate their expectation of the

pain-killing effects of the “drug” and also the level of pain relief with or without the “drug” that they felt from a moderately painful injection of salt solution into their jaw muscle.

In one set of experiments, the researchers used a molecular tracer scanning technique known as Positron Emission Spectroscopy to measure release from the NAC of the neurotransmitter dopamine—a chemical trigger of the brain’s reward response. They found that the greater subjects’ anticipation of the pain-killing benefit of the placebo, the greater the dopamine release from the NAC. Also, subjects who reported greater relief from the placebo when they did experience pain showed greater NAC activity when they received the placebo before the pain.

In separate experiments, the researchers studied whether activation of subjects’ NAC during reward processing correlated with the magnitude of their placebo effect. They told subjects to expect monetary rewards of different amounts, as their brains were scanned using functional magnetic resonance imaging. The researchers found that the people who showed greater activation of the NAC during this reward-expectation task also showed a greater anticipation of effectiveness of a placebo.

The researchers concluded that “These findings are consistent with the hypothesis that this system is involved in the encoding of the ‘incentive value’ of the placebo, possibly acting as a gate or permissive system for the formation of placebo effects.”

They wrote that “The placebo effect then emerges as a resiliency mechanism with broad implications that, given its activation of specific circuits and mechanisms, can be both examined and modulated for therapeutic purposes.”

Source: Cell Press