Teaching neurons to respond to placebos as potential treatment for Parkinson's

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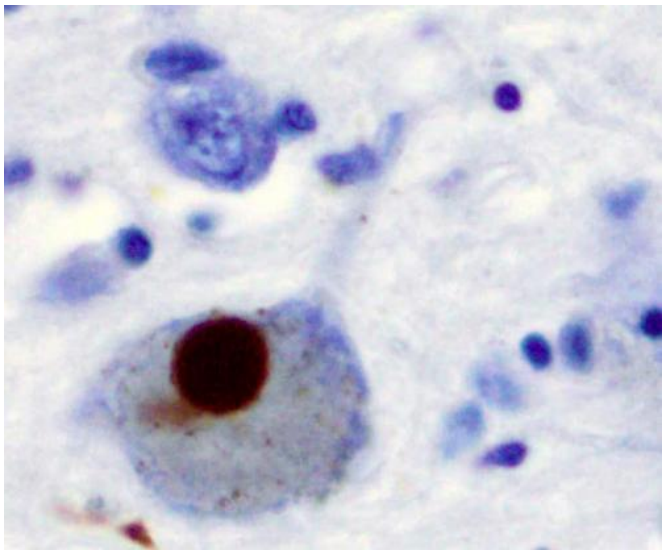

Immunohistochemistry for alpha-synuclein showing positive staining (brown) of an intraneural Lewy-body in the Substantia nigra in Parkinson's disease. Credit: Wikipedia

They found that it is possible to turn a neuron which previously hasn't responded to placebos (placebo 'non-responder' neuron) into a placebo 'responder' by conditioning Parkinson patients with apomorphine, a dopaminergic drug used in the treatment of Parkinson's disease (PD).

When a placebo (saline solution) was given for the first time, it induced neither clinical benefit nor associated neuronal changes in the thalamus, a brain region known to be involved in PD. However, if repeated administrations of apomorphine were performed before placebo administration, a placebo was capable of increasing thalamus neuronal activity along with clinical improvement (reduction of muscle rigidity). Interestingly, the higher the previous administrations of apomorphine was, the larger the neuronal changes and the clinical improvement. When apomorphine was administered for 4 days in a row, the subsequent administration of a placebo induced a response that was as large as the one induced by apomorphine. These changes lasted for 24 hours.

The researchers administered apomorphine, either 1, 2, 3 or 4 days before the surgical implantation of electrodes for deep brain stimulation, which is an effective treatment for PD. During surgery, they replaced apomorphine with a placebo and recorded from single neurons in the thalamus along with the assessment of muscle rigidity of the arm.

Fabrizio Benedetti, from the Department of Neuroscience at University of Turin Medical School, Italy and first author of the study, explained,'These findings show that is possible to teach neurons in the thalamus to respond to placebos, so that a placebo non-responder can be turned into a placebo responder. These findings may have profound implications and applications, because we can reduce drug intake by exploiting these learning mechanisms. Since this study shows that there is a memory for drug action, the alternate administration drug-placebo-drug- placebo etc. means people would need to take less medication but yet obtain the same clinical benefit.

'If a placebo is given after four previous administrations of apomorphine, the placebo response can be as large as the drug response, and this effect lasts up to 24 hours. Therefore, a future challenge will be to see whether this effect can be extended beyond 24 hours.'

More information: Benedetti F et al (2016) Teaching neurons to respond to placebos. DOI: 10.1113/JP271322 , onlinelibrary.wiley.com/doi/10.1113/JP271322/full

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