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Effects of deep brain stimulation of the cerebellothalamic pathways on the sense of smell



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Author(s): Kronenbuerger M (Kronenbuerger, M.)¹, Zobel S (Zobel, S.)¹, Ilgner J (Ilgner, J.)², Finkelmeyer A (Finkelmeyer, A.)³, Reinacher P (Reinacher, P.)⁴, Coenen VA (Coenen, V. A.)^{4,5}, Wilms H (Wilms, H.)⁶, Kloss M (Kloss, M.)⁶, Kiening K (Kiening, K.)⁷, Daniel C (Daniel, C.)⁸, Falk D (Falk, D.)⁹, Schulz JB (Schulz, J. B.)¹, Deuschl G (Deuschl, G.)⁸, Hummel T (Hummel, T.)¹⁰

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Abstract: The cerebellum and the motor thalamus, connected by cerebellothalamic pathways, are traditionally considered part of the motorcontrol system. Yet, functional imaging studies and clinical studies including patients with cerebellar disease suggest an involvement of the cerebellum in olfaction. Additionally, there are anecdotal clinical reports of olfactory disturbances elicited by electrical stimulation of the motor thalamus and its neighbouring subthalamic region. Deep brain stimulation (DBS) targeting the cerebellothalamic pathways is an effective treatment for essential tremor (ET), which also offers the possibility to explore the involvement of cerebellothalamic pathways in the sense of smell. This may be important for patient care given the increased use of DBS for the treatment of tremor disorders. Therefore, 21 none-medicated patients with ET treated with DBS (13 bilateral, 8 unilateral) were examined with "Sniffin' Sticks," an established and reliable method for olfactory testing. Patients were studied either with DBS switched on and then off or in reversed order. DBS impaired odor threshold and, to a lesser extent, odor discrimination. These effects were sub-clinical as none of the patients reported changes in olfactory function. The findings, however, demonstrate that olfaction can be modulated in a circumscribed area of the posterior (sub-) thalamic region. We propose that the impairment of

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the odor threshold with DBS is related to effects on an olfactomotor loop, while disturbed odor discrimination may be related to effects of DBS on short-term memory. (C) 2009 Elsevier Inc. All rights reserved.

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Reprint Address: Kronenbuerger, M (reprint author), Rhein Westfal TH Aachen, Univ Hosp Aachen, Dept Neurol, Fac Med, Pauwelsstr 30, D-54074 Aachen, Germany

Addresses:

- 1. Rhein Westfal TH Aachen, Fac Med, Dept Neurol, D-52074 Aachen, Germany
- 2. Rhein Westfal TH Aachen, Fac Med, Dept Otorhinolaryngol, D-52074 Aachen, Germany
- 3. Rhein Westfal TH Aachen, Fac Med, Dept Psychiat & Psychotherapy, D-52074 Aachen, Germany
- 4. Rhein Westfal TH Aachen, Dept Neurosurg, Fac Med, D-52074 Aachen, Germany
- 5. Univ Bonn, Dept Neurosurg, Stereotaxy & MR Based OR Tech, D-53127 Bonn, Germany
- 6. Univ Heidelberg, Dept Neurol, Heidelberg Med Ctr, D-69120 Heidelberg, Germany
- 7. Univ Heidelberg, Dept Neurosurg, Heidelberg Med Ctr, D-69120 Heidelberg, Germany
- 8. Univ Med Ctr Schleswig Holstein, Dept Neurol, D-24105 Kiel, Germany
- 9. Univ Med Ctr Schleswig Holstein, Dept Neurosurg, D-24105 Kiel, Germany
- 10. Univ Dresden, Sch Med, Dept Otorhinolaryngol, Smell & Taste Clin, D-01307 Dresden, Germany

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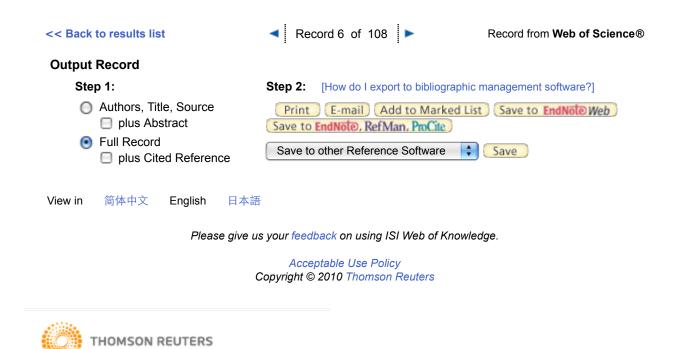
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