



# ARCTIC HEALTH

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## A comparison between blood oxygenation level-dependent and cerebral blood volume contrast in the rat cerebral and cerebellar somatosensory cortex during electrical paw stimulation.

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Abstract: PURPOSE: To implement and optimize cerebral blood volume (CBV)-weighted functional magnetic resonance imaging (fMRI) in the rat cerebral and cerebellar cortex during electrical paw stimulation. MATERIALS AND METHODS: fMRI of the cerebral and cerebellar cortex was performed during electrical paw stimulation on a 7-T MRI system (MRRS, Guilford, UK) comparing the blood oxygenation level-dependent (BOLD) and CBV-weighted contrast with different ultrasmall particles of iron oxide (USPIO) contrast doses (NC100150, 30 mg Fe/mL; Amersham Health, Oslo, Norway) and different TE. RESULTS: Doses of 15 and 20 mg/kg USPIO at TE = T\*2 or TE = 14 msec almost doubled the contrast-to-noise ratio (CNR) of the activated areas in the cerebral cortex without affecting the overall signal-to-noise ratio (SNR) or the incidence of activation (100%). In the cerebellum the SNR decreased significantly with an increasing contrast dose. At a dose of 15 mg/kg, the CNR was slightly smaller than the CNR measured in the BOLD images, but the activation incidence seemed to be doubled. At 20 mg/kg, the CNR was slightly increased, but the activation incidence was lower. At both contrast doses the venous artifacts disappeared. CONCLUSION: A USPIO contrast dose of 20 mg/kg proved to be beneficial for fMRI in the rat, even though it affected the CNR and SNR in the cerebral and the cerebellar cortex differentially.

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