

# A comparison of alpha-chloralose and propofol as anaesthetic regimes for BOLD-fMRI

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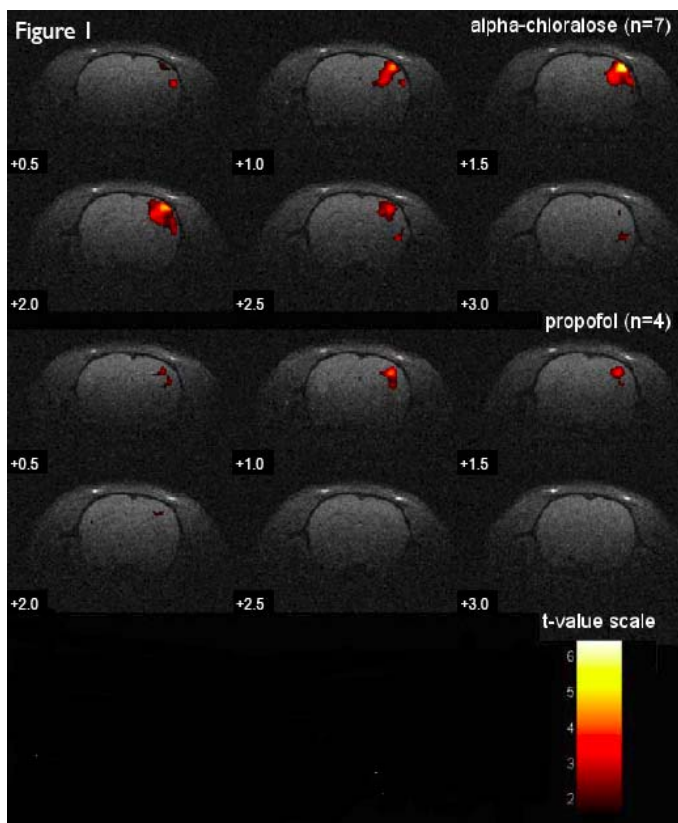
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## Introduction

Most BOLD-fMRI protocols in pre-clinical research require measurement of neuronal activity under anaesthesia. Alpha-chloralose is the agent most frequently used for this purpose. However, side-effects including acidosis and involuntary excitement prevent recovery [1]. An alternative recovery anaesthetic is propofol. The aim of this study was to measure the BOLD response to whisker stimulation in rat, using the two different anaesthetic regimes. The extent and intensity of the fMRI response were assessed and compared.

## Materials and Methods

MRI was performed in a 9.4 T magnet controlled by a Varian console. Male SD rats (180-220g) were briefly induced for anaesthesia with isoflurane, tail vein cannulated and given a bolus of either: 65mg/kg alpha-chloralose followed by an infusion of 30mg/kg/hr (n=7), or a bolus of 10mg/kg propofol followed by 0.7-0.8mg/kg/min (n=4). Rats were positioned in a home-built head-holder and whiskers 1-4 of rows B to E placed in a comb that performed a rostro-caudal motion at 5 Hz. Images were acquired using a surface coil and a multi-echo GE sequence with TR=340ms, TE=4, 8, 12, 16, 20ms and a 96x96 matrix, 100 brain volumes of 10 slices 0.5 mm thick, acquisition time=32.64s. Each rat was stimulated on the left side of the snout (whisker movement) or rested (control) for a period of 32.64s 50 times in a random order. Individual animals were analyzed using a GLM in SPM99.



## Results

Statistical group maps of the response to whisker stimulation under the two different anaesthetics are presented in the figure. As expected, the response with both anaesthetics was centred in the contralateral (right) whisker barrel cortex. However, the change in signal intensity was larger in the alpha-chloralose group  $0.91 \pm 0.2\%$  when compared to the propofol group  $0.49 \pm 0.2\%$  (t-test  $P=0.035$ ). Furthermore, the extent of response was larger in alpha-chloralose group  $130 \pm 47$  voxels when compared to the propofol group  $19.5 \pm 8$  voxels (Mann-Whitney U test  $P=0.035$ ).

## Discussion

We have shown that BOLD responses can be obtained with both both anaesthetics, but the intensity and extent were different. There was a reduction in % signal under propofol anaesthesia compared to alpha-chloralose, which matches observations from previous experiments involving propofol and BOLD-fMRI [2,3]. However, the reduction in both extent and % signal change is not so much as to render propofol redundant, since the ability to recover an animal can be a crucial advantage for many studies.

## References

- [1] Flecknell P "Laboratory Animal Anaesthesia" 2<sup>nd</sup> ed. (1996)
- [2] Scanley et al, MRM 32:969 (1997)
- [3] Kennan et al, MRM 40:840 (1998)