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In search of oestrus odours across mammalian species: the role of sexual experience on behavioural responses of rats to natural odours and odorants



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- Sexually experienced male rats are able to detect the smell of oestrus in faeces from females of different species (Rampin et al., 2006), indicating a degree of commonality in oestrus odours across species
- Three experiments were conducted to investigate *i*) if sexual experience affects the behavioural response of male rats to natural oestrus odours, and *ii*) if we can identify (some of) the constituent odorants

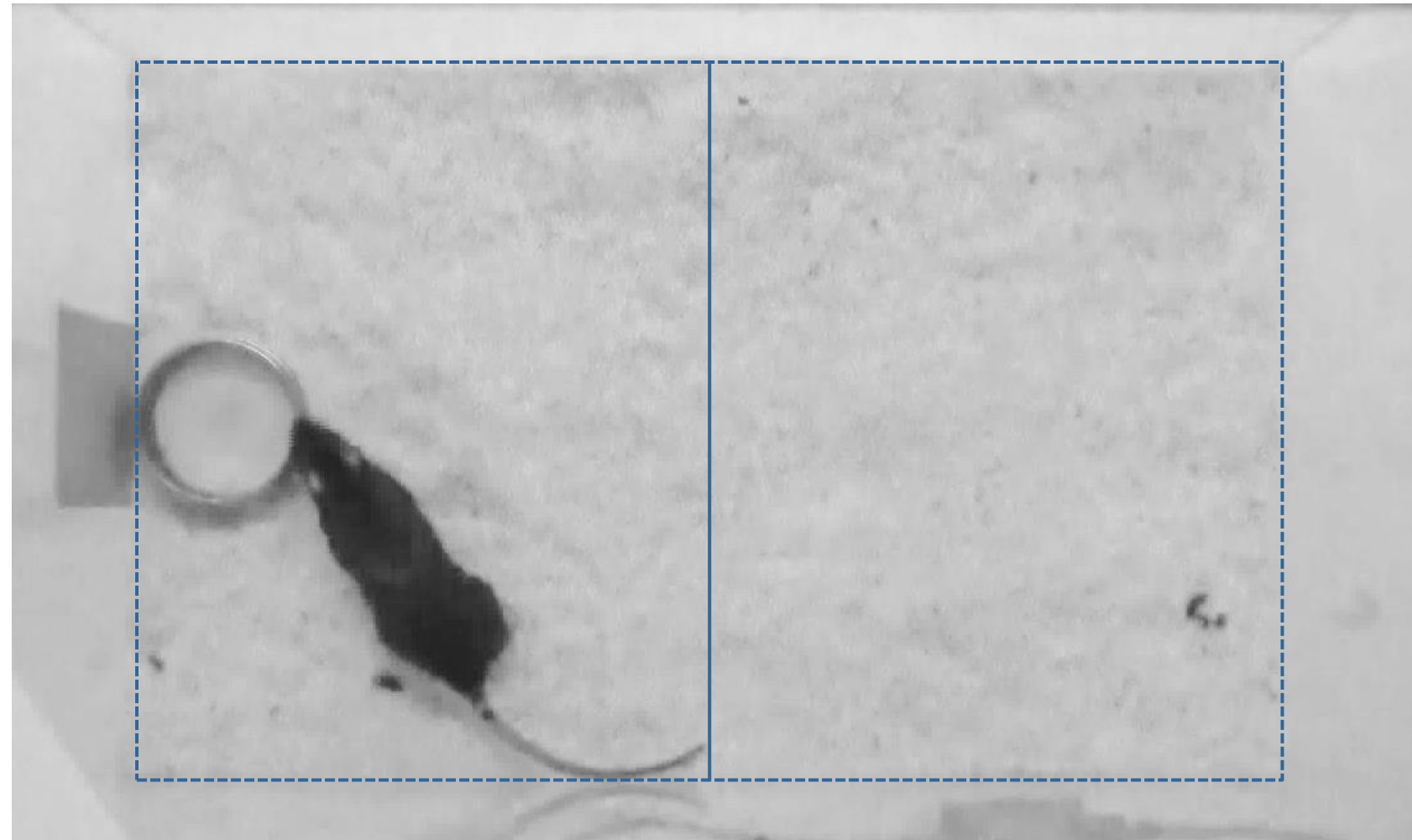


Figure 1. Male Brown Norway rats (n=16) were exposed before and after sexual training to 4 odours (1-hexanol (herb odour), a 2-ketone mixture[‡], and faeces from mares and rats in oestrus) presented one at a time to individual rats during a 30-min test.

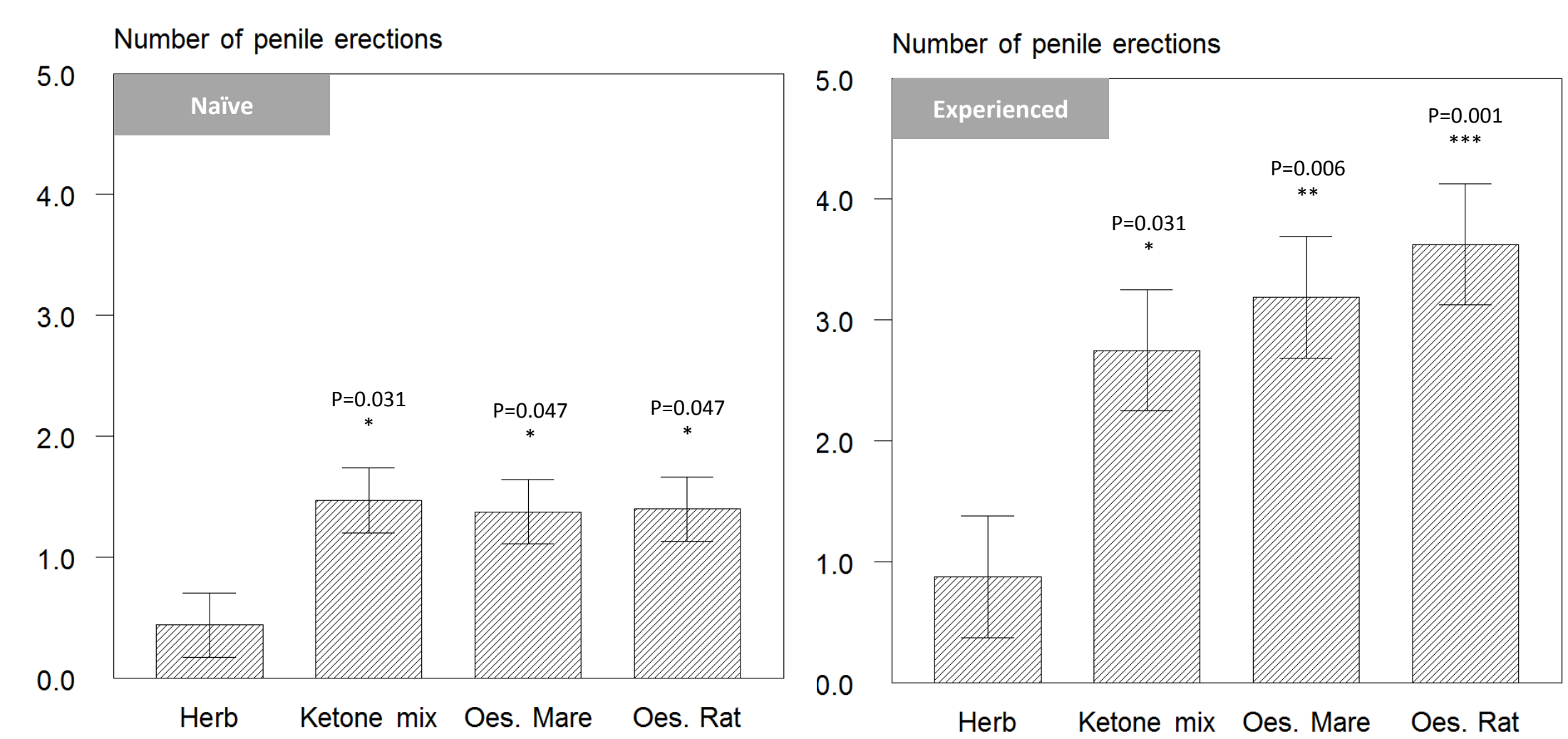


Figure 2. More penile erections were observed during tests when rats were exposed to the two types of faeces as well as the 2-ketone mixture[‡] compared to 1-hexanol (herb), both when sexually naïve ($F_{3,40}=3.3$; $P = 0.032$) and experienced ($F_{3,42}=5.8$; $P = 0.002$).

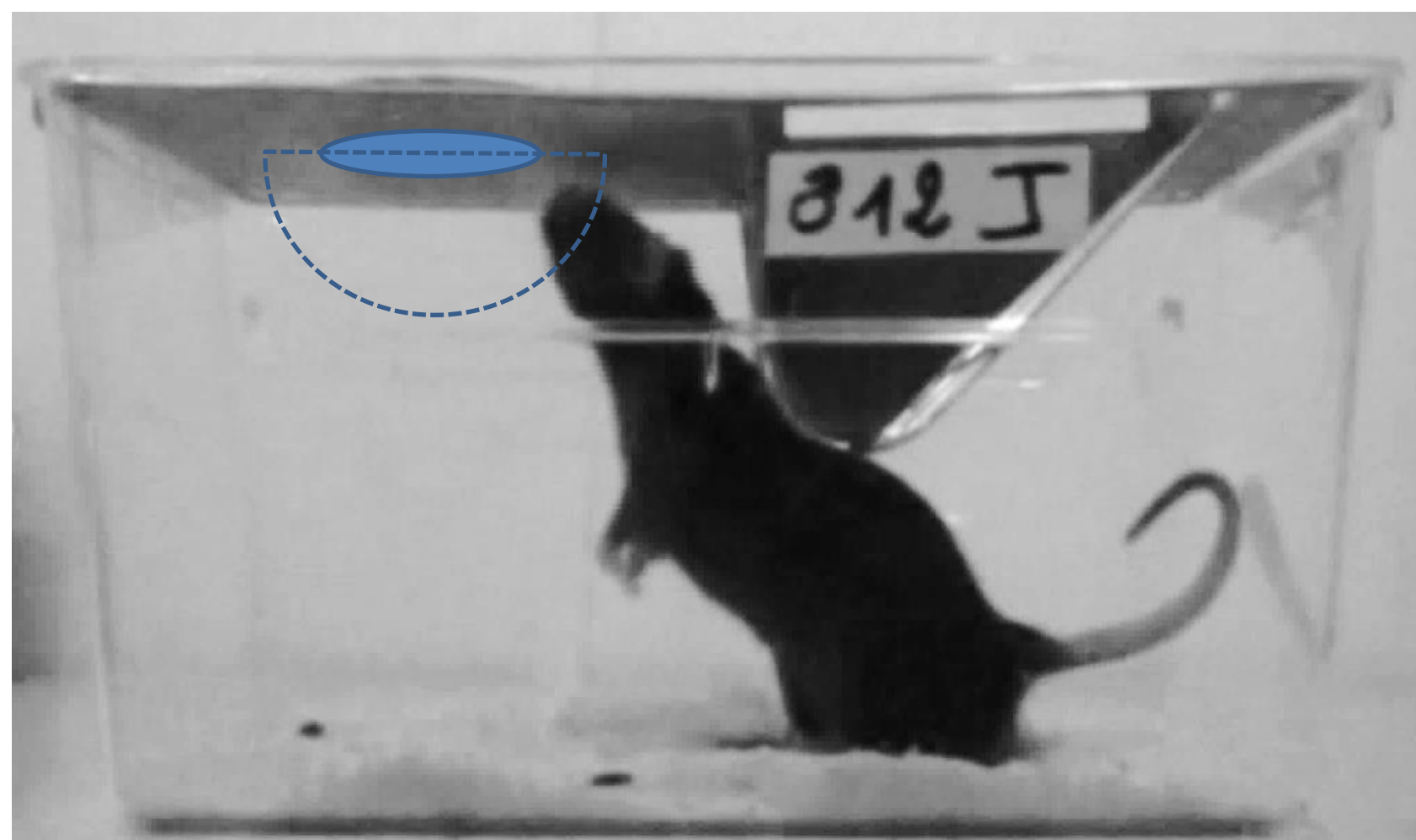


Figure 3. Male Brown Norway rats (N=44) were tested using a habituation/dishabituation protocol, where 4 odour samples were placed on the lid each for 2 min, interspersed by 45s, and the duration of sniffing odour (nose within 5cm radius of source) was registered.

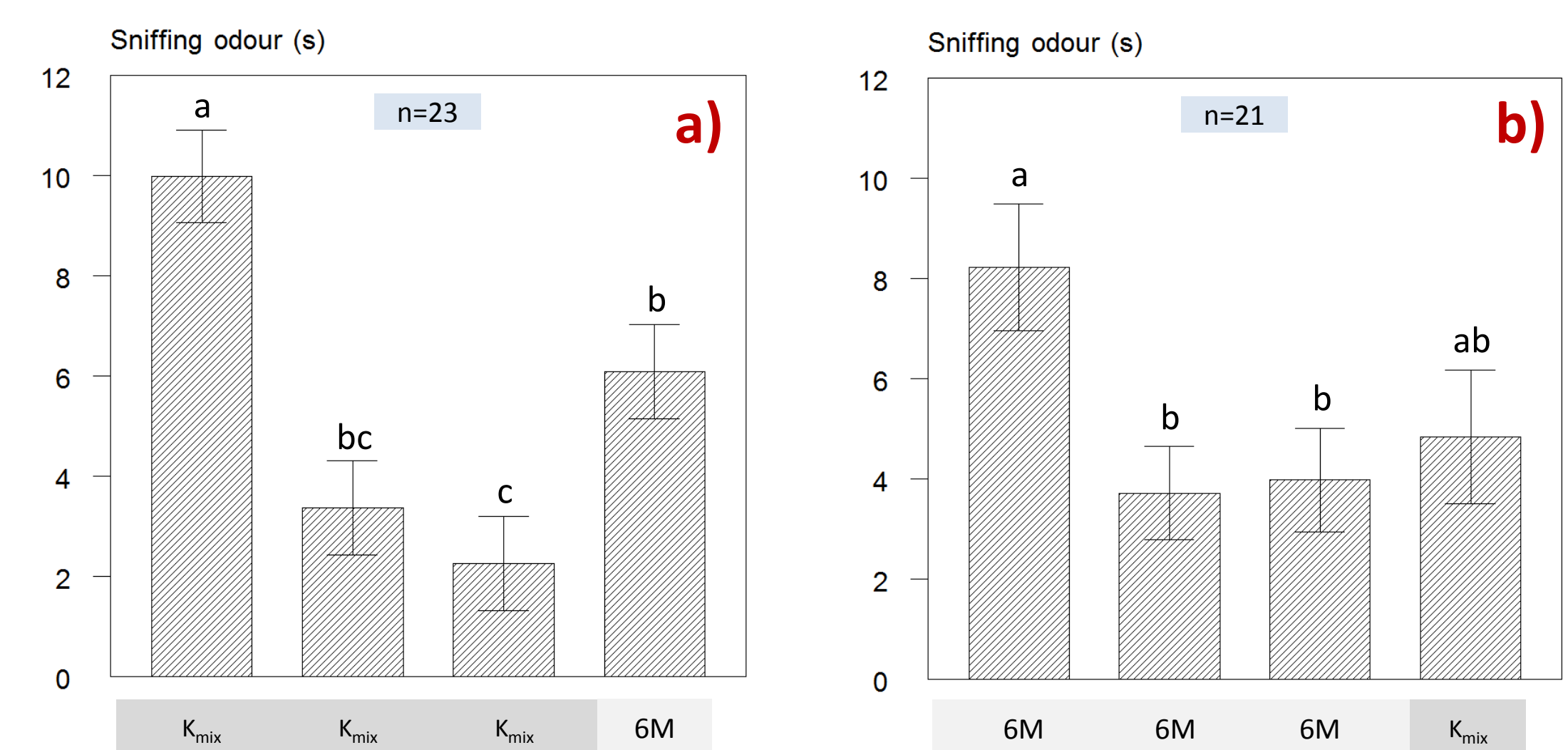


Figure 4. a) The rats were able to distinguish a single-molecule ketone (6M; 6-methyl-5-hepten-2-one, which has previously been found to elicit erections in male rats) from the 2-ketone mixture[‡] (K_{mix}) used in exp. 1. **b)** This was not evident when odours were reversed.

[‡] 2-butanone and 3-hydroxy-2-butanone

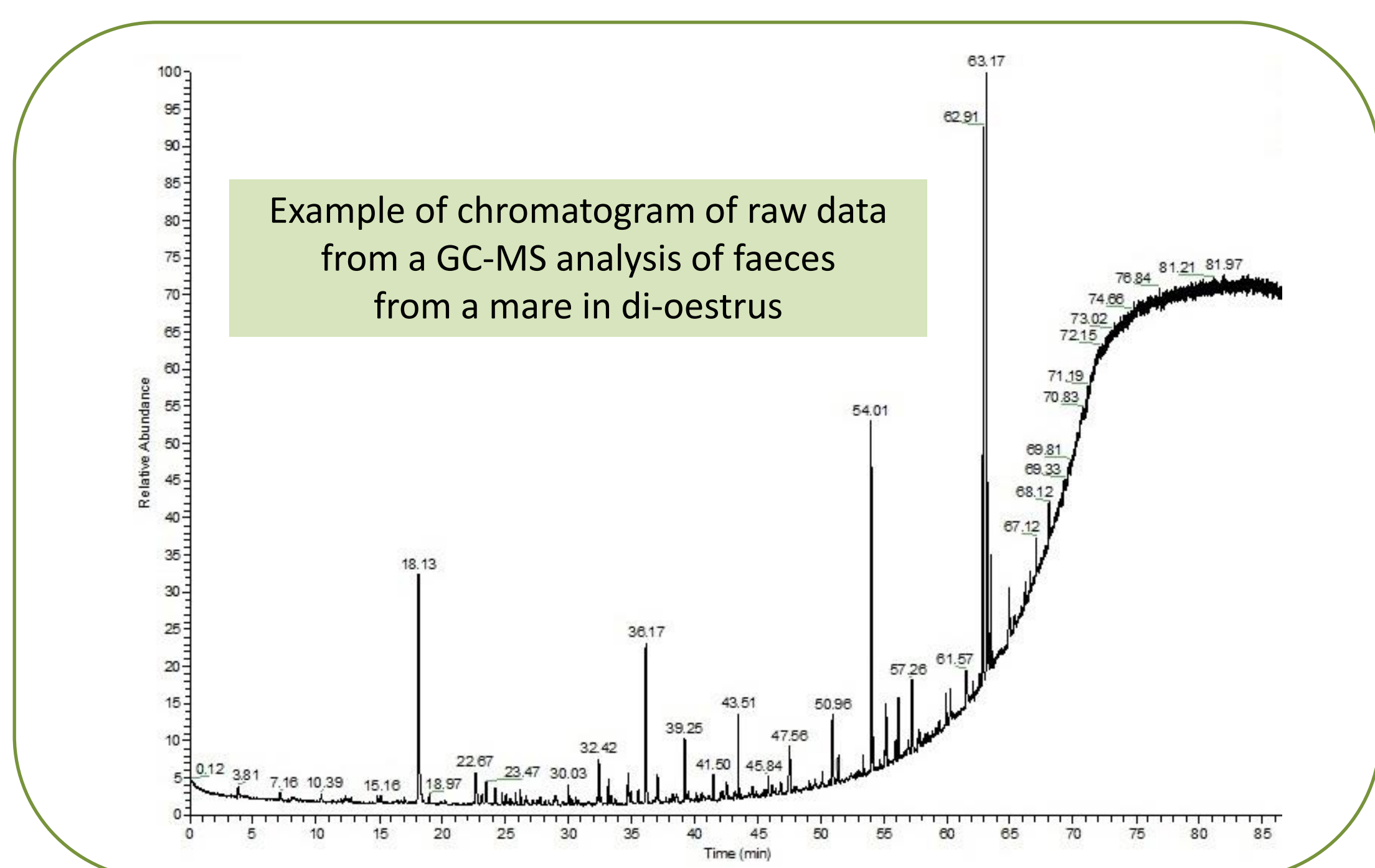


Figure 5. Faeces samples (n=5 each) from male, oestrous and di-oestrous rats and horses (N=30) were analysed using gas chromatography-mass spectrometry (GC-MS) for the presence of three ketones and 1-hexanol using menthol as an added calibrating compound. 1-hexanol was present in all six faeces types. Although significant intra-species differences in ketone composition were found between faeces from males and females in oestrus and di-oestrus, these differences were dissimilar across species.

Conclusions

- Sexually naïve rats are able to detect the smell of oestrus in faeces from mares
- A mix of two ketones elicits penile erections in sexually naïve and experienced rats
- Oestrus faeces from rats and mares did not have unique amounts or ratios of these ketones
- The ketones used were therefore not specific oestrus odorants
- However, as a molecular group, ketones are likely to play a significant role in oestrus odours

These results are published in *Applied Animal Behaviour Science* (2016), doi: 10.1016/j.applanim.2016.01.014

References and further reading

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