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► **To cite this version:**

Fouzia El Mountassir, Christine Belloir, Marie-Louise Miller, Loïc Briand, Anne-Marie Le Bon. Interactions between octanal and citronellal at the receptor level. 20. Congress of the european chemoreception research organisation (ECRO), Sep 2010, Avignon, France. Oxford University Press, Chemical Senses, 36, pp.E60-E61, 2011, Chemical Senses. <hal-01191136>

HAL Id: hal-01191136

<https://hal.science/hal-01191136v1>

Submitted on 3 Jun 2020

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Interactions between octanal and citronellal at the receptor level

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Most odorants present in the environment are complex mixtures of tens, even hundreds, of components. Psychophysical and behavioral studies have shown that odorant mixtures are perceived as different (synthetic perception) from or like (analytic perception) their components, indicating that the perception to odorant mixtures is not always a simple function of the responses to its individual components. Olfactory perception of mixtures can arise from interactions occurring at the peripheral level, in the olfactory bulb or at the central level. Some studies suggest that interactions at the level of olfactory receptors (ORs) can affect strongly the perception of odorant mixtures. Several types of interactions (such as inhibition, suppression or synergy) have been described in rat olfactory receptor neurons. In addition, using *in vitro* approaches, it has been shown that some odorants can act both as agonists or antagonists.

In the present study, we investigated the responses of ORs to a binary mixture of octanal and citronellal, a mixture which has been shown to induce a synthetic perception in rat. For this purpose, a heterologous functional expression system (HEK293 cells), in which ORs were transfected, was used. The effects of octanal-citronellal mixture were investigated at different concentration levels and at different ratio. When comparing the responses of ORs to odorants delivered singly or in combination, several types of effects were observed: depending on concentration and OR, the mixture was found to elicit responses lower or higher than, or equivalent to, that induced by single components. These effects can be likened to those observed in electrophysiological and psychophysical studies (inhibition, synergy, suppression and hypo-addition). Our results demonstrate that various types of interactions can occur at the peripheral olfactory stage. Given that several ORs can be

activated by the same mixture, each of them responding to different extent, our observations also highlight the complexity of the processes which may rise at the receptor level.

Acknowledgements: this work was supported by INRA and by the Burgundy council (France).