

**The olfactory function is affected by exposure to glucocorticoid: stressed animals might perceive smells differently.**

### **Olfaction and stress**

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The welfare and health of farm animals are of critical importance for sustainable use of our environment. Paradoxically, while food quality impacts human health, modern rearing practices can be stressful for animals and affect the quality of animal production. The perception of smells and the olfactory environment have been linked to animal welfare and health (e.g. anxiety or depressive-like symptoms). There is evidence that the olfactory epithelium and bulb are responsive to stress hormones (glucocorticoids). However, the actions of glucocorticoids in these two tissues are still not fully explained. We have received seed funding (Credits Incitatifs PHASE) to evaluate those links in our model species (rat). Do glucocorticoids affect olfactory tissue and function in rat stress model?

The initial step was to evaluate the potential for hormone response in the tissues of interest, by confirming the presence and localisation of the glucocorticoid receptor (GR). Immunohistochemistry showed the expression of GR is restricted to olfactory ensheathing cells (OEC), glial cells involved in processing of the olfactory signal propagation and neurone regeneration. We tested the functional significance of this observation *in vitro* using primary OEC cultures treated with a synthetic GR agonist (dexamethasone). The expression of various genes was affected, including ion transporters (ATP1B1), a macrophage chemoattractant (MCP1) and elements of the endothelin signalling pathways (the ET<sub>B</sub> receptor gene is repressed). We are currently exploring the significance of this latter observation by measuring endothelin response in our cells using calcium imaging. *In vivo*, acute administration of dexamethasone altered gene expression patterns in the OM and OB, as well as electrical activity induced by odorant exposure (measured by ElectroOlfactoGram, EOG). EOG signal recovery was delayed post-odorant stimulation in dexamethasone treated animals, this suggests olfactory neurone repolarisation might be slower. In addition to these acute stress models, we have developed a chronic unpredictable stress model in rats and we are assessing its impact on EOG and gene expression patterns.

Our data shows stress hormones clearly affect olfactory response in the olfactory epithelium, at the first step of odorant detection. We currently do not know whether these changes affect smell perception in animals. To address this issue, we are in the process of developing olfactory learning tests in rats in order to study the impact of glucocorticoids on behavioural aspects of odour detection. This might allow us to determine whether stress-induced changes in olfactory function can affect animal welfare and physiology.