

“The more emotional an event, the better it will be remembered”. Stress hormones such as corticosteroids are crucial for this link between emotion and cognition. The hormones enhance motivation, mood and emotions, and have a profound influence on cognitive processes. This is of evolutionary advantage and promotes health, but dysregulated cognitive-emotional functioning can precipitate into stress-related diseases like Post-Traumatic Stress Disorder (PTSD) [1;2]. Why only some individuals experience the detrimental effects of stress, while others remain healthy under similar conditions is a key question in cognitive neurobiology [1].

The objective of this research is to identify the contribution of corticosteroids and their receptors to the integration of emotional and cognitive processes.

## MATERIAL AND METHOD

### Modulation of corticosteroid levels and its receptors

Corticosteroids are secreted from the adrenals in response to stress, and act in the brain via mineralo- (MR) and glucocorticoid receptors (GR). Mice with (i) genetically different MR and GR (C57BL/6j and BALB/c) or (ii) pharmacologically-induced differential activation of these receptors (subcutane or i.p. administration of corticosterone) were tested for emotion and cognition in several behavioural tests.

### Behavioural tests and assessment

Behaviour of the mice was assessed in a variety of behavioural paradigms specifically designed to study the integration between emotional and cognitive domains [3].



Above mentioned mice (3 months old) were individually placed for 5-10 minutes either in the modified holeboard, elevated plus maze or in a fear conditioning setup. Behaviours reflecting exploration, motivation and anxiety together with behaviours indicating learning and memory (table 1) were assessed on site and via video with the workabout and The Observer XT program. With the use of The Observer XT, a program per behavioural test was designed to optimize behavioural scoring and making it possible to asses fast alternations in mouse behaviour. After each testing day, the observations were transferred

**Table 1.** Emotional and cognitive behaviours measured with The Observer XT (Noldus) in the modified holeboard, elevated plus maze and during fear conditioning.

| Behavioural test   | Used to measure  | Specific behaviours observed with The Observer XT  |
|--------------------|--|--|
| Modified holeboard | Combined emotional and cognitive functioning   | Walking (%), sitting (%), rearing, stretched attend, time in center area, grooming, defecation.      |
| Elevated plus maze | Emotion  | Walking (%), sitting (%), time in open and closed arm, grooming, rearing, rim dip, stretched attend. |
| Fear conditioning  | Learning and memory of fearful, emotional event. (Rodent model for Post traumatic stress disorder) | Walking (%), sitting (%), scanning (%), freezing (%), jumping, grooming, rearing, stretched attend   |

from the workabout to the computer and further analysed with the The Observer XT program.



In addition to the assessment of specific behaviours with The Observer XT, walking patterns of the mice were determined with EthoVision XT. Together, these programs allowed the in depth behavioural and locomotor testing necessary for this type of research.

#### RESULTS AND CONCLUSION

By in depth behavioural analysis we found that:

- Emotional arousal and cognitive performance are optimally integrated in mice with predominant MR- and additional moderate GR activation.
- The stress-susceptible BALB/c mice have an emotionally biased superior memory performance as compared to the resistant C57BL/6J mice; cognitive performance correlates with MR and GR expression in limbic brain areas.
- BALB/c mice generalize their fear responses to context and cue while C57BL/6J mice discriminate between context and cue.

In conclusion, corticosteroids modulate the integration of emotional arousal and cognitive performance via a combined MR- and GR-mediated central action [4]. It is proposed that C57BL/6J mice provide an animal model for PTSD.

#### REFERENCE LIST

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