

Behaviour & Welfare

Mission

The B&W program strives to break new ground in animal welfare research. The research in the B&W program is based on the concept that the welfare of an animal depends upon its ability to adapt to the environment in order to achieve a state that it perceives as positive. These adaptive capacities are determined by adequate emotional and cognitive processes. Therefore, we investigate the emotional states and cognitive abilities that are crucial for an animal's adaptive capacity and their neural underpinnings.

Research Focus

The B&W program studies how emotional and cognitive processes contribute to animal welfare, i.e. the adaptive capacities of animals. These adaptive capacities are modulated through an interplay of internal (e.g. genetic background, health state) and external factors (e.g. life events, present environment, drug exposure).

Since the welfare of an animal strongly depends on its ability to adapt to the environment, adaptive capacities require that both positive and negative emotions are processed adequately. In other words, welfare is not dependent on the absence of negative and the presence of positive states, but on the animal's ability to make use of these states in an adaptive process. In order to deal with changeable environmental circumstances, and the emotional states that they evoke, adequate cognitive function is essential. In fact, we think that emotional and cognitive processes work in concert to generate appropriate behavioural courses of action. The B&W program therefore investigates cognitive functions such as learning, memory, attention, impulse control, and decision making, as well as emotional processes such as reward, motivation, anxiety, fear, and pain.

The knowledge gathered in this program can be readily translated to veterinary practice, in order to identify and control risk factors that compromise animal welfare, in an evidence-based manner. In addition, the scientific insight gained allows for the development of innovative translational animal models of

(neurobehavioural) diseases in animals and humans. To this end, a broad range of species, from rodents (mice, rats), companion animals (dogs), to farm animals (pigs, chickens) are used as model animals.

Key objectives:

- Investigate how the interaction between the genetic background and/or health state of an animal on the one hand, and positive and negative influences during pre- and postnatal development on the other hand, modulates the animal's its adaptive capacities
- Investigate the neural mechanisms underlying emotional and cognitive processes that contribute to animal welfare
- Translate our results into evidence-based and societally accepted concepts of animal welfare and actions to improve/safeguard animal welfare
- Contribute to the understanding of adaptive and maladaptive behaviour, as relevant for veterinary practice and mental health in humans

Program organization

The program combines research efforts of the Departments of Animals in Science and Society and Farm Animal Health, with links to the Department of Clinical Sciences of Companion Animals. The senior investigators of B&W are affiliated partners of the Brain Center Rudolf Magus, and participate in the UU strategic theme Dynamics of Youth, and the focus areas Sport & Society, Future Food and Game Research.

- Prof. dr. L.J.M.J. Vanderschuren (program coordinator)
- Prof. dr. L.J.M.J. Vanderschuren (leader research line Positive Emotions and Cognitive Control)
- Prof. dr. F. Ohl (leader research line Negative Emotions and Adaptation)
- Dr. F.J. van der Staay (leader research line Ontogeny of emotion/cognition)

Key publications:

Group Vanderschuren:

Achterberg EJM, Van Kerkhof LWM, Damsteegt R, Trezza V, Vanderschuren LJM (2015) Methylphenidate and atomoxetine inhibit social play behavior through prefrontal and subcortical limbic mechanisms in rats. *Journal of Neuroscience* 35:161-169

Baarendse PJJ, Counotte DS, O'Donnell P, Vanderschuren LJM (2013) Early social experience is critical for the development of cognitive control and dopamine modulation of prefrontal cortex function. *Neuropsychopharmacology* 38:1485-1494

Hopf FW, Lesscher HMB (2014) Rodent models for compulsive alcohol intake. *Alcohol* 48:253-264

Limpens JHW, Schut EHS, Voorn P, Vanderschuren LJM (2014) Using conditioned suppression to investigate compulsive drug seeking in rats. *Drug and Alcohol Dependence* 142:314-324

van Kerkhof LWM, Trezza V, Mulder T, Gao P, Voorn P, Vanderschuren LJM (2014) Cellular activation in limbic brain systems during social play behaviour in rats. *Brain Structure and Function* 219:1181-1211

Vanderschuren LJM, Trezza V (2014) What the laboratory rat has taught us about social play behavior: role in behavioral development and neural mechanisms. *Current Topics in Behavioural Neuroscience* 16:189-212

Group Ohl:

Boleij H, Salomons AR, van Sprundel M, Arndt SS, Ohl F (2012) Not all mice are equal: welfare implications of behavioural habituation profiles in four 129 mouse substrains. *PLoS One* 7:e42544

Boleij H, Willems J, Leijten M, Klooster JV, Lesscher H, Kirchhoff S, Lavrijsen M, Arndt SS, Ohl F (2014) Chronic social stress does not affect habituation in male CD1 mice. *Behavioural Brain Research* 273:34-44

Ohl F, van der Staay FJ (2012) Animal Welfare – at the interface between science and society. *The Veterinary Journal* 192:13-19

Ohl F, Putman RJ (2014) Animal Welfare at the group level: more than the sum of individual welfare? *Acta Biotheoretica* 62:35-45

Salomons AR, Arndt SS, Lavrijsen M, Kirchhoff S, Ohl F (2013) Expression of CRFR1 and Glu5R mRNA in different brain areas following repeated testing in mice that differ in habituation behaviour. *Behavioural Brain Research* 246:1-9

Salomons AR, Bronkers G, Kirchhoff S, Arndt SS, Ohl F (2010) Behavioural habituation to novelty and brain area specific immediate early gene expression in female mice of two inbred strains *Behavioural Brain Research* 215:95-101

Group van der Staay:

Antonides A, Schoonderwoerd AC, Nordquist RE, van der Staay FJ (2015) Very low birth weight piglets show improved cognitive performance in the spatial cognitive holeboard task. *Frontiers in Behavioral Neuroscience*, 9:43

Gieling ET, Antonides S, Fink-Gremmels J, ter Haar K, Kuller WI, Meijer E, Nordquist RE, Stouten JM, Zeinstra E, van der Staay FJ (2014) Chronic allopurinol treatment during the last trimester of pregnancy in sows: effects on low and normal birth weight offspring. *PLoS ONE*, 9:e86396

Gielsing ET, Wehkamp W, Willigenburg R, Nordquist RE, Ganderup N-C, van der Staay FJ (2013) Performance of conventional pigs and Göttingen miniature pigs in a spatial holeboard task: effects of the putative muscarinic cognition impairer biperiden. *Behavioral and Brain Functions*, 9:4

Hewlett SE, Zeinstra EC, van Eerdenburg FJ, Rodenburg TB, van Kooten PJ, van der Staay FJ, Nordquist RE (2014) Hypothalamic vasotocin and tyrosine hydroxylase levels following maternal care and selection for low mortality in laying hens. *BMC Veterinary Research* 10:167

Murphy E, Kraak L, van den Broek J, Nordquist RE, van der Staay FJ (2015) Decision-making under risk and ambiguity in low-birth-weight pigs. *Animal Cognition* 18:561-572

Nordquist RE, Zeinstra EC, Rodenburg TB, van der Staay FJ (2013) Effects of maternal care and selection for low mortality on tyrosine hydroxylase concentrations and cell soma size in hippocampus and nidopallium caudolaterale in adult laying hen. *Journal of Animal Science* 91:137-156

Behaviour & Welfare contact

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