

## On oxytocin and social behavior

Akademisk avhandling

som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentlig försvaras i hörsal Arvid Carlsson, Medicinaregatan 3, fredagen den 9 november, klockan 13:00

av Daniel Hovey

Fakultetsopponent: Doktor Evdokia Anagnostou  
University of Toronto, Canada

### Avhandlingen baseras på följande delarbeten

- I. Westberg, L., Henningsson, S., Zettergren, A., Svärd, J., **Hovey, D.**, Lin, T., Ebner, N., Fischer, H. (2016). Variation in the oxytocin receptor gene is associated with face recognition and its neural correlates. *Frontiers in Behavioral Neuroscience* 10, 178.
- II. **Hovey, D.**, Henningsson, S., Cortes, D. S., Bänziger, T., Zettergren, A., Melke, J., Fischer, H., Laukka, P., Westberg, L. (2018). Emotion recognition associated with polymorphism in oxytocinergic pathway gene *ARNT2*. *Social Cognitive and Affective Neuroscience* 13, 173.
- III. **Hovey, D.**, Zettergren, A., Jonsson, L., Melke, J., Anckarsäter, H., Lichtenstein, P., Westberg, L. (2014). Associations between oxytocin-related genes and autistic-like traits. *Social Neuroscience* 9, 378.
- IV. **Hovey, D.**, Lindstedt, M., Zettergren, A., Jonsson, L., Johansson, A., Melke, J., Kerekes, N., Anckarsäter, H., Lichtenstein, P., Lundström, S., Westberg, L. (2016). Antisocial behavior and polymorphisms in the oxytocin receptor gene: findings in two independent samples. *Molecular Psychiatry* 21, 983.
- V. **Hovey, D.**, Martens, L., Laeng, B., Leknes, S., Westberg, L. The effect of intranasal oxytocin on visual processing and salience of human faces. *Submitted manuscript*.
- VI. Landin, J., **Hovey, D.**, Zettergren, A., Kettunen, P., Westberg, L. Endogenous oxytocin regulates social preference in zebrafish. *Submitted manuscript*.

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## Abstract

Complex social cognitive processes underlie social behavior. Oxytocin has long been recognized as crucial in social behavior in animals, but its role in regulating human social cognition and behavior is less clear, particularly with regard to endogenous oxytocin. The aims of this thesis were to investigate (i) how endogenous oxytocin affects face and emotion recognition in humans, (ii) how it may modulate social impairments in autism spectrum disorder and antisocial behavior, (iii) how exogenous (intranasal) oxytocin may influence the salience of human faces, and finally (iv) the role of endogenous oxytocin in zebrafish social behavior.

We investigated endogenous oxytocin by studying genetic variation in oxytocin-related genes, and found that oxytocin influences social cognition in humans, specifically via modulation of face recognition (Paper I) and via modulation of emotion recognition in women (Paper II). In addition, we found tentative associations between variation in oxytocin-related genes and autistic-like traits in the general population (Paper III), and showed that variation in the oxytocin receptor gene is associated with antisocial behavior in men (Paper IV). We also showed that exogenous (intranasal) oxytocin acts to increase the salience of human faces (Paper V), a mechanism that may underlie its behavioral effects. Finally, we demonstrated that an oxytocin receptor antagonist decreases social preference in adult and larval zebrafish (Paper VI).

In conclusion, this thesis confirms the importance of endogenous oxytocin for social cognition in humans, and demonstrates one mechanism by which exogenous oxytocin may act. Furthermore, we established an animal model for future research on the oxytocin system.

**Keywords:** oxytocin, social cognition, autism, antisocial behavior, zebrafish