- von Mäusen und Menschen -

Chemosensorische Mechanismen sozialer Kommunikation

BfR Workshop
Berlin
06. Mai 2014

Marc Spehr

Lichtenberg-Professor
Institute for Biology II
Department of Chemosensation
RWTH-Aachen University
The mammalian olfactory system
- anatomical and physiological principles -

two major subsystems:

adapted from: Spehr et al., 2006 (CMLS)
The mammalian olfactory system
- anatomical and physiological principles -

two major subsystems:
- Main Olfactory Epithelium
- VNO

adapted from: Spehr et al., 2006 (CMLS)
The mammalian olfactory system
- anatomical and physiological principles -

two major subsystems:
Main Olfactory Epithelium
and
Vomeronasal Organ

adapted from: Spehr et al., 2006 (CMLS)
Unresolved puzzles
- issues in pheromone signaling -

~300 receptors: only a handful receptor – ligand pairs identified
role of $G_{ai2}$ protein signaling still obscure
effector enzyme(s) and downstream second messenger(s) still elusive
transduction channel(s) and their individual functions unclear

from: Spehr et al., 2006 (CMLS)
ESP22 is produced in lacrimal glands (and secreted into juvenile tear fluid)

Identification of putative social chemosignals:
- exocrine gland secreting peptide (ESP) 22 -

LG, lacrimal gland
ESP, exocrine gland secreting peptide
ABP, androgen binding protein
MUP, major urinary protein
MHC, major histocompatibility complex
Identification of putative social chemosignals:
- exocrine gland secreting peptide (ESP) 22 -

ESP22 activates vomeronasal sensory neurons

Ferrero et al., Nature 2013
Identification of putative social chemosignals:
- exocrine gland secreting peptide (ESP) 22 -

ESP22 activates vomeronasal sensory neurons

Ferrero et al., Nature 2013
ESP22-dependent behavior in vomeronasal loss-of-function mutant mice:
- Trpc2−/− males display increased sexual behavior towards juveniles -

Ferrero et al., Nature 2013
ESP22-dependent behavior in wild-type mice:
- ESP22 inhibits male sexual behavior -

Ferrero et al., Nature 2013
concluding remarks

- ESP22 is a lacrimal peptide secreted into tears of juvenile mice
- ESP22 is a juvenile chemosignal that activates a VNO response pathway
- Trpc2^{-/-} mice exhibit increased sexual behavior towards juvenile mice

ESP22 is a juvenile pheromone that blocks sexual behavior through the vomeronasal system
Thank you!

**Lab members**
Monika Gorin
Lisa M Moeller
Jennifer Spehr
Tobias Ackels
David Fleck
Daniela Drose
Chryssanthi Tsitoura
Damian Droste
Corinna H Engelhardt
Susanne Lipartowski

**alumni**
Daniela Flügge
Annika Cichy
Thomas Veitinger
Sophie Veitinger
Silke Hagendorf
Annika Triller
Jennifer Hauk

**International collaborators**

**University of Geneva**
Stephane Riviere
Ludivine Challet
Ivan Rodriguez

**University of Maryland, Baltimore**
Steven D. Munger

**University of California, LA**
Richard K. Zimmer

**Harvard University**
David Ferrero
Stephen Liberles

**University of Tokyo**
Takuya Osakada
Kazushige Touhara

**The Scripps Research Institute, La Jolla, CA**
Angeldeep Kaur
Lisa Stowers

**The Hebrew University, Jerusalem**
Yoram Ben-Shaul

**Bristol University, UK**
Peter Brennan

**Axxam Inc., Milano**
Sabrina Corazza
Silvia Cainarca
Stefan Lohmer

**National collaborators**

**University of Linz**
Werner Baumgartner
Agnes Weth

**Fraunhofer IVV, Freising**
Andrea Büttner
Michael Czerny

**Charite Berlin**
Eva M. Neuhaus

**Local collaborators**

**RWTH / UKAachen**
Ralf Hausmann
Günther Schmalzing

**Research Center Jülich**
Melanie Söchtig
Frank Müller

**RWTH / UKAachen**
Eileen Dietzel
Willi Jahnken-Dechent

**RWTH Aachen**
Maria Kateri

**RWTH Aachen**
Martijn Arts
Anke Schmeink
Rudolf Mathar

**Support**

VolkswagenStiftung

Emmy Noether-Programm
Deutsche Forschungsgemeinschaft
Stiftung Mercator

DAAD
Deutscher Akademischer Austausch Dienst
German Academic Exchange Service