

CURRICULUM VITAE AND LIST OF PUBLICATIONS (137)

/March 6, 2026

CURRICULUM VITAE

Name: Mathias Hallberg
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EDUCATION

- Student Diploma	Engineering Program 3 year, Lund	1987-1990
- Military Service (fallskärmsjägarutb)	Swedish Army's Parachute Ranger School	1991-1992
- Teacher Training Program, (60 hp) and	Malmö högskola	
Master of Science, Biology/Chem (240 hp)	Lund University	1999
- Doctor of Pharmacy (PhD, Pharmacology)	Uppsala University	2005
- Assistant Professor (Docent, Pharmacology)	Uppsala University	2007
- Ämneslärarexamen (BScEd), Chem/Biology	Uppsala University	2009
- Teacher certification (renewed)	Swedish National Agency for Education	2015

APPOINTMENTS

- Employment Gambro Ltd (20 months)	Lund	1990-1994
- Doctoral Studentship	Uppsala University	2000-2005
- Director of Studies (studierektor)	Uppsala University	2005-2020
- Project Leader, Researcher	Uppsala University	2005-2010
- Senior lecturer (universitetslektor)	Uppsala University	2010-2016
- Professor (molekylär beroendeforskning)	Uppsala University	2016-
- Dean, Faculty of Pharmacy	Uppsala University	2020-

TEACHING AND PEDAGOGICAL EXPERIENCE

- Supervisor, PhD Jenny Johansson	2007-2013
- Supervisor, PhD Alfhild Grönbladh	2008-2013
- Supervisor, PhD Erik Nylander	2014-2019
- Supervisor, PhD Sofia Zelleröth	2016-2022
- Supervisor, PhD Frida Stam	2019-2024
- Supervisor, PhD candidate Haydar Majid	2025-
- Deputy Supervisor, PhD Milad Botros	2006-2008
- Deputy Supervisor, PhD Kristina Magnusson	2005-2009
- Deputy Supervisor, PhD Uwe Rossbach	2005-2010
- Deputy Supervisor, PhD Malik Mumtaz Taqi	2007-2011
- Deputy Supervisor, PhD Anna Jonsson	2009-2015
- Deputy Supervisor, PhD Erika Brolin	2010-2017
- Deputy Supervisor, PhD Esther Olaniran Håkansson	2020-2025
- Deputy Supervisor, PhD candidate Sara Florén Lind	2021-

- Lecturer, Course Leader and Examiner for "Drug Development and Drug Usage, 7.5 hp" every semester. In total > 3500 Pharmacy students attended 2005- 2020
- Lecturer, Course Leader and Examiner for "Drugs in Society", 5.5 hp" every semester 2020- 2021
- Lecturer, Course Leader and Examiner for "Basic Pharmaceutical Science and Professional Development, 3.5 hp" every semester: 90 students/semester 2017- 2021
- Lecturer and Course Co-Leader (with Professor Erik Nylander) for the Course "Drugs and Dependence, Advanced Course C, 7,5 hp": 30-50 students/semester 2015- present
- Lecturer, Course Leader and Examiner for the Advanced course "Neuropharmacology, 7,5 hp": 25-50 students/semester 2018- 2021
- Lecturer, Course Leader and Examiner for the Course "Drugs, Doping and Gambling Addiction, 5 hp", Summer course Uppsala University, Campus Gotland: 15-20 students/year 2018- present
- Lecturer, Course Leader and Examiner for the Course "Drugs: Use, Abuse and Dependence, 10.5 hp", Social Care Program: 25-30 students/year 2006-2008
- Lecturer and Course Leader for the Course "Theory of Dependence, Prevention and Therapy; Focus on Abuse of Cannabis, 5 p": 20 students/course 2005-2009
- Lecturer, Course Co-Leader and Examiner for the Course "Drug-assisted Treatment of Drug Abuse and Dependence, 10 p". Number of students: 12 2006
- Supervisor for the Problem-Based Learning (PBL) in the course "Drug Development and Drug Usage, 5 p". Total number of groups: 16 (8-10 students/group) 1999-2004
- Supervisor for In-depth Research Projects in Pharmacology, 15 hp (C-level) and 30 hp (D-level). Number of students: 15 2000-

Educational activities outside Uppsala University:

1-3 Days courses:

- Chairman/Moderator and Lecturer in Short Courses (mainly on narcotics and drug abuse) organized by Uppsala University Education and arranged all over Sweden. Participants: 50-300 / course. Total number of Courses > 20

Examples of other lectures outside Uppsala University:

Lectures at several foreign Universities; On a regular basis at St. George's Hospital Medical School, University of London. Presentations at Läkarstämman, Svenska Läkaresällskapet, Svenska Föreningen för Alkohol och Drogforskning (SAD) and at Nätverk mot Anabola Steroider; Lectures at The Swedish Prosecution Authority (regularly) and at Rosenbad, Stockholm; Hearings Rosenbad; Anti Doping Denmark's research seminars, Copenhagen; Numerous lectures at public schools and for the public. Lectures for Utbildningsradion/ Kunskapskanalen (SVT). Lecturer and Chairman annually at seminars in Almedalen, Gotland 2018-

ORGANIZATION OF CONFERENCES

- Member of the organizing committee *European Opioid Conference* 2002 in Uppsala. 2001-2002
- Swedish Coordinator for the *European Opioid Conference* (EOC) 2005-2015
- Local host and member of the organizing committee *Nordisk AAS konferens* 2007 in Uppsala 2006-2007
- Member organizing committee *International Narcotics Research Conference* in Malmö 2009-2010
- Member organizing committee *4th Nordic Conference on Abuse of Anabolic Steroids and Anti-Doping Work* 2013 in Stockholm 2012-2013
- Organizer and Chairman of the international conference; *IRAP 2015 – The second Symposium on IRAP/PLAP/oxytocinase and angiotensin IV*, 13-15 Sept, 2015, in Uppsala 2015

- Co-organizer of *10th Nordic Opioid Symposium*, 20 Nov, 2025 in Malmö 2025
- Organizer and Chairman of >10 national U-FOLD conferences on drug abuse and addiction 2018-

RESEARCH ACTIVITIES OUTSIDE UPPSALA UNIVERSITY

Research scientist at Vicore Pharma Ltd / New York Medical School, with Prof Eric Simon (6 months)

EXTERNAL GRANTS

Research grants and economic support *e.g.* from The Swedish Brain Foundation, the Beijer Foundation and the DDD platform of SciLifeLab/UU Innovation ca. 15 MSEK 2014-

AWARDS AND HONORS

- The Benzelius Award from the Royal Society of Sciences, Uppsala 2007
- The Special Award for “Studentbemötande” from the Pharmacy Student Union 2008
- The Oscar Prize from Uppsala University 2009
- Commencement Speech as best teacher at the Social Care program, Faculty of Social Sciences 2011
- The Special Award for “Studentbemötande” from the Pharmacy Student Union 2013
- The Best Teacher Award 2013, from Uppsala University (Pedagogiska priset 2013) 2013
- Awarded a Beijer Scholarship 2014
- Promoted to Excellent teacher, from Uppsala University (Excellent lärare) 2016
- Prize for Best Lecture 2017 (shared with Anna Sarkadi), Science Festival (SciFest), Uppsala 2017
- Awarded “Attractive Innovation Project Prize 2021” from UU Innovation (shared with Mats Larhed) 2022
- U-FOLD (chairman) awarded the “Nordic Drugs Grand Prize 2021” 2021
- Member of the Royal Society of Sciences, Uppsala 2019-
- Member of the Royal Society of Arts and Sciences, Uppsala 2020-

COMMISSIONS OF TRUST AND MISCELLANEOUS

- Member of the Board of the Department of Pharmaceutical Biosciences 2007-2012
- Member (deputy) of the Board of the Department of Pharmaceutical Biosciences 2013-2015
- Member of the Department Board for Ethnicity and Equal opportunities 2013-2015
- Member of Lärarutredningen, Uppsala University 2015-2016
- Member (deputy) of the Board for Education (GRUFF), Faculty of Pharmacy 2008-2011
- Member of the Board for Education (GRUFF), Faculty of Pharmacy 2011-2014
- Vice Chairman of the Student Recruitment Committee, Faculty of Pharmacy 2012-2017
- Member of Lokalkommittén, at The Biomedical Centre (BMC) 2016-2018
- Member of the Reference group for the Language Workshop, Uppsala University 2009-2019
- Vice Chairman of the Board for Education (GRUFF), Faculty of Pharmacy 2014-2020
- Chairman of the Student Recruitment Committee, Faculty of Pharmacy 2018-2020
- Member of the Board of Svenska Föreningen för Alkohol och Drogforskning (SAD) 2019-2020
- Chairman National University Coordination Node (UU) for Education, Learning and Research (ULF) 2018-2020
- Chairman of the National Research Evaluation Committee for ULF Grant 2019-2020
- Member of the Board of Sveriges Landsråd för Alkohol och Narkotikafrågor (SLAN) 2019-2021
- Member Steering Committee for e-learning, Uppsala University 2017-2022
- Member of the Steering Committee for the Language Workshop, Uppsala University 2019-
- Chairman/coordinator U-FOLD, Forum för läkemedels- och drogberoende, Uppsala University 2018-
- Deputy Chairman, Department of Pharmaceutical Biosciences, Faculty of Pharmacy 2020
- Member of the Board of the Disciplinary Domain of Medicine and Pharmacy, Uppsala University 2020-
- Chairman of the Steering Board, Faculty of Pharmacy (Farmaceutiska kommittén) 2020-
- Chairman of the Recruitment Committee for Faculty of Pharmacy appointments 2020-
- Chairman of Lokalkommittén, Medicine/Pharmacy, Uppsala University 2020-
- Member of the Board for WOMHER, Uppsala University 2020-
- Member of the SciLifeLab Committee, Uppsala University 2021-
- Member of the Advisory Board for Equal Opportunities, Uppsala University 2023-
- Member of the Board for National Centre for Knowledge on Men's Violence Against Women (NCK) 2023-
- Chairman of the Assessment Panel for Admittance of Distinguished University Teachers (MedFarm) 2024-

- Chairman of the Pedagogical Academy, Medicine/Pharmacy, Uppsala University 2025-
- Faculty PhD Thesis Opponent, most recently Annica Börjesson KI (2021), Patrick Quinlan GU (2022)
Member of Evaluation Boards of Master and PhD Thesis 2008-

Participation in panel discussions and university leadership program;

- Member of numerous panel discussions in Sweden and US on doping issues, illegal drugs and addiction; eg, at the National Institute on Drug Abuse in Washington DC 2013-
- Högre ledarprogrammet (HeLP, organized by SUHF) 2025-2026

BRIEF DESCRIPTION OF RESEARCH PROGRAM

Program title: The impact of addictive drugs on cognition; memory and learning and efforts to identify unique cognitive enhancers, analgesics and anti-fibrotic agents. The program comprises three parts; A, B and C. Part B and C are drug discovery projects.

Part A. Neuropharmacology with focus on the impact of addictive drugs (anabolic androgenic steroids, opioids, GHB *etc.*), but also hormones (growth hormone *etc.*), on important biochemical and physiological processes that are associated with drug dependence, behaviour and cognition. The effects of these substances on *e.g.* learning and memory in various experimental models are examined.

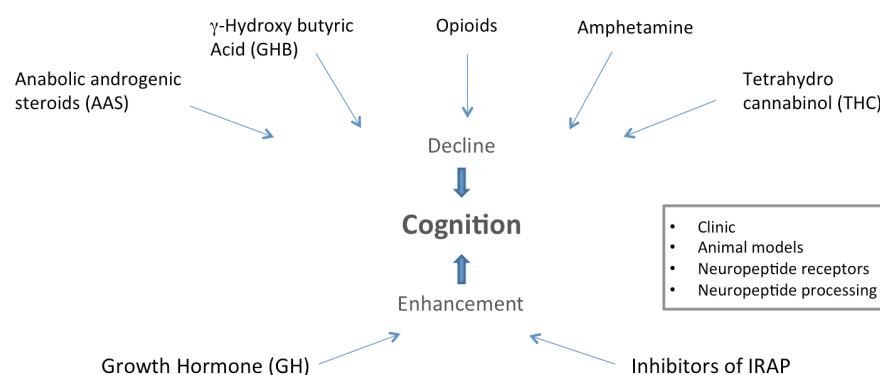


Figure 1: Several abused drugs affect cognitive functions. Growth hormone and inhibitors of IRAP enhance cognitive functions, *vide infra*. For a review on GH; Nyberg F, Hallberg M. Growth hormone and cognitive function. *Nature Rev Endocrinology*. 2013, 9: 357-365.

Part B. Abuse of addictive drugs like opioids results often in cognitive decline. This subproject has a focus on cognitive enhancers, *i.e.* growth hormone and in particular inhibitors of insulin-regulated aminopeptidase (IRAP). The hexapeptide angiotensin IV (Ang IV), a metabolite from the hypertensive octapeptide angiotensin II, acts as an IRAP inhibitor and improves memory after *i.c.v.* injection in rats as previously demonstrated. In 2005, after the PhD exam a new program was initiated aimed at discovering nonpeptide, drug-like orally active inhibitors of IRAP as a potential novel class of cognitive enhancers by utilizing either the short-lived Ang IV as the structural starting point in the design processes or by applying high throughput screening procedures combined with various pharmacological evaluations.

Part C. This subproject is derived from our findings in the tachykinin and renin-angiotensin systems (RAS). Opioids, although superior analgesics are severely addictive. Our objective is to discover new unique classes of analgesics devoid of the addictive properties of morphine and related opioids. Nonpeptides mimicking the antinociceptive substance P metabolite SP (1-7) and nonpeptides acting as angiotensin II AT2 receptor (AT2R) antagonists are made and characterized as potential analgesics. Project support from SciLifeLab DDD. Furthermore, unique AT2R agonists for CV indications and as potential anti-inflammatory and anti-fibrotic agents (IPF) are examined. Close collaboration with the Department of Medicinal Chemistry at the Faculty of Pharmacy is established.

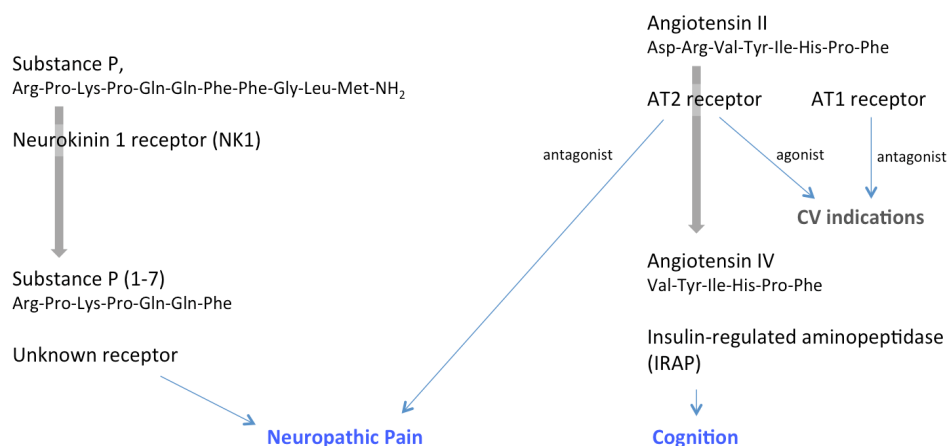


Figure 2: The two grey bold arrows represent degradation of parent peptides to bioactive fragments. For the first two reports from our group on efforts to make drug-like substance P (1-7) and angiotensin IV peptidomimetics, see ref 24 and ref 15, respectively. For an early review on angiotensin IV peptidomimetics as IRAP inhibitors, see ref 31: Hallberg M. Drug News Perspect. **2009**, 22: 133-9. For a review on proteolytic degradation of neuropeptides, see ref 62: Hallberg M. Med Res Rev. **2015**, 35: 464-5.

LIST OF PUBLICATIONS (137)

122 Articles in peer-reviewed international journals and 15 book chapters and other publications

Articles

1. Johansson P, Hallberg M, Kindlundh A, Nyberg F. The effect on opioid peptides in the rat brain, after chronic treatment with the anabolic androgenic steroid, nandrolone decanoate. Brain Res Bull. 51 (2000) 413-418. PMID: 10715562.
2. Hallberg M, Johansson P, Kindlundh A, Nyberg F. Anabolic-androgenic steroids affects the content of substance P and substance P₁₋₇ in the rat brain. Peptides. 21 (2000) 845-852. PMID: 10959007.
3. Kindlundh AM, Bergstrom M, Monazzam A, Hallberg M, Blomqvist G, Langstrom B, Nyberg F. Dopaminergic effects after chronic treatment with nandrolone visualized in rat brain by positron emission tomography. Prog Neuropsychopharmacol Biol Psychiatry. 26 (2002) 1303-8. PMID: 12502017.
4. Hallberg M, Nyberg F. Neuropeptide conversion to bioactive fragments - an important pathway in neuromodulation. Curr Protein Pept Sci. 4 (2003) 31-44. PMID: 12570783.
5. Marinova Z, Yakovleva T, Melzig MF, Hallberg M, Nylander I, Ray K, Rodgers DW, Hauser KF, Ekstrom TJ, Bakalkin G. A novel soluble protein factor with non-opioid dynorphin A-binding activity. Biochem Biophys Res Commun. 321 (2004) 202-9. PMID: 15358236.
6. Hallberg M, Thunell E, Kindlundh AMS, Nyberg F. Anabolic androgenic steroids: A gateway to drug addiction and aggressive behavior? Methods Find Exp Clin Pharmacol. 26:Suppl 2 (2004) 33-37.
7. Zhou Q, Kindlundh AM, Hallberg M, Nyberg F. The substance P (SP) heptapeptide fragment SP1-7 alters the density of dopamine receptors in rat brain mesocorticolimbic structures during morphine withdrawal. Peptides. 25 (2004) 1951-7. PMID: 15501527.

8. Hallberg M, Kindlundh AM, Nyberg F. The impact of chronic nandrolone decanoate administration on the NK1 receptor density in rat brain as determined by autoradiography. *Peptides*. 26 (2005) 1228-34. PMID: 15949641.
9. Steensland P, Hallberg M, Kindlundh A, Fahlke C, Nyberg F. Amphetamine-induced aggression is enhanced in rats pre-treated with the anabolic androgenic steroid nandrolone decanoate. *Steroids*. 70 (2005) 199-204. PMID: 15763599.
10. Hallberg M, Magnusson K, Kindlundh AMS, Steensland P, Nyberg F. The effect of anabolic androgenic steroids on calcitonin gene-related peptide (CGRP) levels in the rat brain. *PharmacologyOnline*. 1 (2005) 177-195:
http://pharmacologyonline.silae.it/files/archives/2005/vol1/09_Hallberg_CGRP.pdf
11. Marinova Z, Vukojevic V, Surcheva S, Yakovleva T, Cebers G, Pasikova N, Usynin I, Hugonin L, Fang W, Hallberg M, Hirschberg D, Bergman T, Langel U, Hauser KF, Pramanik A, Aldrich JV, Graslund A, Terenius L, Bakalkin G. Translocation of dynorphin neuropeptides across the plasma membrane: A putative mechanism of signal transmission. *J Biol Chem*. 280 (2005) 26360-26370. PMID: 15894804.
12. Lindblom J, Petrovska R, Hallberg M, Magnusson K, Nyberg F, Uhlén S. Nandrolone treatment decreases the alpha1B-adrenoceptor mRNA level in rat kidney, but not the density of alpha1B-adrenoceptors in cultured MDCK-D1 kidney cells. *Eur J Pharmacol*. 527 (2005) 157-162. PMID: 16309668.
13. Magnusson K, Hallberg M, Kindlundh Hogberg AM, Nyberg F. Administration of the anabolic androgenic steroid nandrolone decanoate affects substance P endopeptidase-like activity in the rat brain. *Peptides*. 27 (2006) 114-121. PMID: 16099548.
14. Botros M, Hallberg M, Johansson T, Zhou Q, Lindeberg G, Frändberg P-A, Tömböly C, Tóth G, Le Grevès P, Nyberg F. Endomorphin-1 and endomorphin-2 differentially interact with specific binding sites for substance P (SP) aminoterminal SP1-7 in the rat spinal cord. *Peptides*. 27 (2006) 753-759. PMID: 16216386.
15. Axén A, Lindeberg G, Demaegdt H, Vauquelin G, Karlén A, Hallberg M. Cyclic insulin-regulated aminopeptidase (IRAP)/AT₄ receptor ligands. *J Pept Sci*. 12 (2006) 705-713. PMID: 16967438.
16. Wu X, Wan Y, Mahalingam A, Plouffe B, Beaudry H, Botros M, Murugaiah A, Karlén A, Hallberg M, Gallo-Payet N, Alterman M. Selective angiotensin II AT(2) receptor agonists: Arylbenzyl imidazole structure activity relationships. *J Med Chem*. 49 (2006) 7160-7168. PMID: 17125268.
17. Bergh A, Nyman G, Roepstorff L, Zhou Q, Hallberg M, Drevemo S, Roethlisberger-Holm K. Defocused CO₂ laser therapy in traumatic arthritis of the metacarpophalangeal joint: a randomised clinical study. *Equine and Comparative Exercise Physiology*. 3 (2006) 169-177.
Doi:10.1017/S147806150622677X
18. Takahashi K, Hallberg M, Magnusson K, Nyberg F, Watanabe Y, Långström B, Bergström M. Increase in [¹¹C]vorozole binding to aromatase in the hypothalamus in rats treated with anabolic androgenic steroids. *NeuroReport*. 18 (2007) 171-174. PMID: 17301684.
19. Magnusson K, Hallberg M, Bergqvist J, Nyberg F. Enzymatic conversion of dynorphin A in the rat brain is affected by administration of nandrolone decanoate. *Peptides*. 28 (2007) 851-858. PMID: 17240479.

20. Axén A, Andersson H, Lindeberg G, Rönnholm H, Kortessmää J, Demaegdt H, Vauquelin G, Karlén A, Hallberg M. Small potent ligands to the insulin-regulated aminopeptidase (IRAP)/AT₄ receptor. *J Pept Sci.* 13 (2007) 434-444. PMID: 17559064.
21. Ginya H, Asahina, J, Yoshida M, Asano T, Ikeda H, Hatano YM, Shishido M, Johansson B-M, Zhou Q, Hallberg M, Takahashi M, Nyberg F, Taijima H, Yohda M. Development of Handy Bio-strand and its application to genotyping of OPRM1 (A118G). *Anal Biochem.* 367 (2007) 79-86. PMID: 17570330.
22. Nyberg F, Hallberg M. Peptide Conversion - A potential pathway modulating G-protein signaling. *Current Drug Targets,* 8 (2007) 147-154. PMID: 17266538.
23. Murugaiah AMS, Wallinder C, Mahalingam AK, Wu X, Wan Y, Plouffe B, Botros M, Karlén A, Hallberg M, Gallo-Payet N, Alterman M. Selective angiotensin II AT₂ receptor agonists devoid of the imidazole ring system. *Bioorg Med Chem.* 15 (2007) 7166-7183. PMID: 17825570.
24. Fransson R, Botros M, Nyberg F, Lindeberg G, Sandström A, Hallberg M. Small peptides mimicking substance P (1-7) and encompassing a C-terminal amide functionality. *Neuropeptides.* 42 (2008) 31-37. PMID: 18093649.
25. Yang R, Smolders I, Bundel DD, Fouyn R, Hallberg M, Demaegdt H, Vanderheyden P, Dupont AG. Brain and peripheral angiotensin II type 1 receptors mediate renal vasoconstrictor and blood pressure responses to angiotensin IV in the rat. *J Hypertension.* 26 (2008) 998-1007. PMID: 18398343.
26. Svensson A-L, Bucht N, Hallberg M and Nyberg F. Reversal of opiate-induced apoptosis by human recombinant growth hormone in mice foetus primary hippocampal neuronal cell-cultures. *Proc Natl Acad Sci USA.* 105 (2008) 7304-7308. PMID: 18474854.
27. Botros M, Johansson T, Zhou Q, Lindeberg G, Tömböly C, Tóth G, Le Grevès P, Nyberg F, Hallberg M. Endomorphins interact with the substance P (SP) aminoterminal SP(1-7) binding in the ventral tegmental area of the rat brain. *Peptides.* 29 (2008) 1820-1824. PMID: 18597894.
28. Andersson H, Demaegdt H, Vauquelin G, Lindeberg G, Karlén A, Hallberg M. Ligands to the (IRAP)/AT₄ receptor encompassing a 4-hydroxydiphenylmethane scaffold replacing Tyr². *Bioorg Med Chem.* 16 (2008) 6924-6935. PMID: 18556208.
29. Magnusson K, Birgner C, Bergström L, Nyberg F, Hallberg M. Nandrolone decanoate administration affects the density of κ_1 -opioid receptors in the rat brain determined by autoradiography. *Neuropeptides.* 43 (2009) 105-11. PMID: 19201466.
30. Rossbach U, Nilsson A, Fälth M, Kultima K, Zhou Q, Hallberg M, Gordh T, Andrén P, Nyberg F. A quantitative peptidomic analysis of peptides related to the endogenous opioid and tachykinin systems in nucleus accumbens of rats following naloxone-precipitated morphine withdrawal. *J Proteome Res.* 8 (2009) 1091-1098. PMID: 19159213.
31. Hallberg M. Targeting insulin-regulated aminopeptidase/AT₄ receptor for cognitive disorders. *Drug News Perspect.* 22 (2009) 133-139. PMID: 19440555.
32. Zhou Q, Carlsson A, Botros M, Fransson R, Sandström A, Gordh T, Hallberg M, Nyberg F. The C-terminal amidated analogue of the Substance P (SP) fragment SP₁₋₇ attenuates the expression of naloxone-precipitated withdrawal in morphine dependent rats. *Peptides.* 30 (2009) 2418-2422. PMID: 19686790.

33. Carlsson A, Ohsawa M, Hallberg M, Nyberg F, Kamei J. Substance P(1-7) induces antihyperalgesia in diabetic mice through a mechanism involving the naloxone sensitive sigma-receptors. *Eur J Pharmacol.* 626 (2010) 250–255. PMID: 19836387.
34. Fransson R, Botros M, Sköld C, Zhou Q, Lindeberg G, Nyberg F, Hallberg M, Sandström A. Discovery of dipeptides as potent ligands of the specific binding site for Substance P 1-7. *J Med Chem.* 53 (2010) 2383-2389. PMID: 20178322.
35. Andersson H, Demaegdt H, Vauquelin G, Lindeberg G, Karlén A, Hallberg M, Erdélyi M, Hallberg A. Disulfide cyclized tripeptide analogues of angiotensin IV as potent and selective inhibitors of insulin-regulated aminopeptidase (IRAP). *J Med Chem.* 53 (2010) 8059-8071. PMID: 21047126.
36. Ohsawa M, Carlsson A, Asato M, Koizumi T, Nakanishi Y, Fransson R, Sandström A, Hallberg M, Nyberg F, Kamei J. The effect of substance P(1-7) amide on nociceptive threshold in diabetic mice. *Peptides.* 32 (2011) 93-98. PMID: 20933559.
37. Nyberg F, Hallberg M. Localization of neuropeptides by radioimmunoassay. *Methods Mol Biol.* 789 (2011) 191-201. PMID: 21922409.
38. Zhou Q, Carlsson A, Hallberg M, Nyberg F. Substance P N-terminal fragment SP(1-7) attenuates chronic morphine tolerance and affects dynorphin B and nociceptin in rats. *Peptides.* 32 (2011) 1661-1665. PMID: 21763376.
39. Andersson H, Demaegdt H, Johnsson A, Vauquelin G, Lindeberg G, Hallberg M, Erdélyi M, Karlén A, Hallberg A. Potent macrocyclic inhibitors of insulin-regulated aminopeptidase (IRAP) by olefin ring-closing metathesis. *J Med Chem.* 54 (2011) 3779-3792. PMID: 21476495.
40. Hallberg M. Impact of anabolic androgenic steroids on neuropeptide systems? *Mini Rev Med Chem.* 11 (2011) 399-408. Doi: <https://doi.org/10.2174/138955711795445961>
41. Ohsawa M, Carlsson A, Asato M, Koizumi T, Nakanishi Y, Fransson R, Sandström A, Hallberg M, Nyberg F, Kamei J. The dipeptide Phe-Phe amide attenuates signs of hyperalgesia, allodynia and nociception in diabetic mice using a mechanism involving the sigma receptor system. *Mol Pain.* 7 (2011) 85. PMID: 22040520.
42. Nyberg F, Hallberg M. Interactions between opioids and anabolic androgenic steroids: Implications for the development of addictive behavior. *Int Rev Neurobiol.* 102 (2012) 189-206. PMID: 22748831.
43. Hallberg M, Nyberg F. Growth hormone receptors in the brain and their potential as therapeutic targets in central nervous system disorders. *The Open Endocrinology Journal.* 6:Suppl 1 (2012) 27-33.
44. Enhamre E, Carlsson A, Grönbladh A, Watanabe H, Hallberg M, Nyberg F. The expression of growth hormone receptor gene transcript in the prefrontal cortex is affected in male mice with diabetes-induced learning impairments. *Neurosci Lett.* 523 (2012) 82-6. PMID: 22750159.
45. Andersson H, Hallberg M. Discovery of inhibitors of insulin-regulated aminopeptidase as cognitive enhancers. *Int J Hypertens.* 2012 (2012). PMID: 23304452.
46. Grönbladh A, Johansson J, Nyberg F, Hallberg M. Recombinant human growth hormone affects the density and functionality of GABA(B) receptors in the male rat brain. *Neuroendocrinology.* 97 (2013) 203-211. PMID: 22710737.
47. Johansson J, Grönbladh A, Nyberg F, Hallberg M. Application of *in vitro* [³⁵S]GTPγ-S autoradiography in studies of growth hormone effects on opioid receptors in the male rat brain. *Brain Res Bull.* 90 (2013) 100-106. PMID: 23063719.

48. Grönbladh A, Johansson J, Nörtl A, Nyberg F, Hallberg M. Growth hormone improves spatial memory and reverses certain anabolic androgenic steroid-induced effects in intact rats. *J Endocrinology*. 216 (2013) 31-41. PMID: 23092877.
49. Enhamre-Brolin E, Carlsson A, Hallberg M, Nyberg F. Growth hormone reverses streptozotocin-induced cognitive impairments in male mice. *Behav Brain Res*. 238 (2013) 273-278. PMID: 23124136.
50. Rhodin A, Grönbladh A, Ginya H, Nilsson KW, Rosenblad A, Zhou Q, Enlund M, Hallberg M, Gordh T, Nyberg F. Combined analysis of circulating beta-endorphin with gene polymorphisms in OPRM1, CACNAD2 and ABCB1 reveals correlation with pain, opioid sensitivity and opioid-related side effects. *Molecular Brain*. 2013; 6:8. PMID: 23402298.
51. Fransson R, Sköld C, Kratz J, Svensson R, Artursson P, Nyberg F, Hallberg M, Sandström A. Constrained H-Phe-Phe-NH₂ analogues with high affinity to the substance P 1-7 binding site and with improved metabolic stability and cell permeability. *J Med Chem*. 56 (2013) 4953-4965. PMID: 23735006.
52. Grönbladh A, Johansson J, Bergquist J, Hallberg M. The impact of nandrolone decanoate and growth hormone on biosynthesis of steroids in rats. *Steroids*. 78 (2013) 1192-1199. PMID: 24012727.
53. Nyberg F, Hallberg M. Growth hormone and cognitive function. *Nature Rev Endocrinology*. 9 (2013) 357-365. PMID: 23629538.
54. Grönbladh A, Johansson J, Nyberg F, Hallberg M. Administration of growth hormone and nandrolone decanoate alters mRNA expression of the GABA(B) receptor subunits as well as of the GH receptor, IGF-1, and IGF-2 in rat brain. *Growth Horm IGF Res*. 24 (2014) 60-66. PMID: 24480470.
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