

Curriculum Vitae, Iris Lindberg, Ph.D.

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Education

1975 A.B. Biochemistry University of California at Berkeley
1980 Ph.D. Pharmacology Univ. of Wisconsin-Madison Medical School

Post Graduate Education and Training

1981 - 1984 Staff Fellow, NRSA Postdoctoral Fellow
and Pharmacology Research Associate Trainee (PRAT program)
Laboratory of Preclinical Pharmacology,
NIMH, St. Elizabeth's Hospital, Washington D.C.

Employment

1984 - 1989 Assistant Professor, Dept. of Biochemistry and Molecular Biology
Louisiana State University Medical School
New Orleans, LA

1989 - 1994 Associate Professor, Dept. of Biochemistry and Molecular Biology
Louisiana State University Health Sciences Center (name changed)
New Orleans, LA
Tenure conferred in 1989 (with promotion to Associate Professor)

1994 - 2007 Professor, Dept. of Biochemistry and Molecular Biology
Louisiana State University Health Sciences Center
New Orleans, LA

2006- 2007 LSUHSC Cancer Center Member

2007- present Professor, Department of Anatomy and Neurobiology
University of Maryland Medical School
Baltimore, MD
Secondary Appointment: Department of Biochemistry; Member,
Greenebaum Cancer Center

Professional Society Memberships

1978 - present Society for Neuroscience
1982-present Winter Conference on Brain Research
1985 - 2005 American Society for Biochemistry and Molecular Biology
1999 -2005 American Society for Cell Biology
2001 - present The Endocrine Society

Career Development Awards and Honors

1981	NIH Individual Postdoctoral Fellowship
1981-1983	Pharmacology Research Associate Traineeship
1988-1993	Research Career Development Award (NIDDK)
1993-1998	Research Scientist Development Award (NIDA)
1998-2003	Research Scientist Development Award (NIDA)

Administrative Service*Institutional Service (Committees)*

1985-present	Neuroscience Center Executive Steering Committee
1986-1988	Biochemistry Dept. Graduate Recruitment Committee
1992-1997	LSUHSC Graduate Council
1996-2000	LSUHSC Neuroscience Center Faculty Recruitment Committee
1997-2002	Neuroscience Center Graduate Program Recruitment Committee
2001	LSU School of Medicine Research Retreat Committee
2003-2004	Emergency Preparedness Faculty Committee, LSUHSC
2003-2005	LSUHSC Research Council
2004	Biochemistry Dept. Graduate Recruitment Committee
2004-2005	Faculty Search Committee, Biochemistry Department
2004-2005	Graduate Advisor, Biochemistry Department
2004-2005	LSUHSC Graduate Council
2005-2007	Faculty Assembly, LSUHSC
2007- present	Program in Neuroscience Seminar Committee, University of Maryland
2007- present	Program in Neuroscience Training Committee, University of Maryland
2007- present	Dept. Anatomy & Neurobiology Promotions Committee (Chair, 2010)
2008- present	Proteomics Core Steering Committee, University of Maryland
2009- present	Radiation Safety Institutional Committee, University of Maryland
2009- 2010	Pharmacology Head Search Committee, University of Maryland
2009- present	Department Representative to School of Medicine Council Meeting
2010-present	Qualifying Exam Committee, Program in Neuroscience

Other Institutional Service

1990, 1992, 1995, 1997	Design & production of Biochemistry Dept. recruitment brochure
1997-2002	Neuroscience Center brochure production
2004-2006	Grantsmanship presentations to LSUHSC faculty and students
2008, Winter	To U.M. grad students: "How to Succeed in Grad School"

Ph.D. Thesis Committees:

LSUHSC: Minetta Gardinier, Jeremy Springhorn, Richard Shen, Yi Zhou, John Mathis, Tamim Shaikh, Erik Pakarinen, Joomyeong Kim, Virginia Strand, Astrid Roy, Ping Wei, Mary Breslin, Neva West, Yolanda Fortenberry, Mike Serou, Changning Gong, Bin Tu, Peimin Zhu, Yuri Peterson, Faramarz Taheri, Elly Park, and Tanya Roy. **University of Maryland-Baltimore:** Amanda Elson, Zhongping Liu, and Akina Hoshino

Local Service

1985-86, 1988-89 *Secretary*, Greater New Orleans Society for Neuroscience
 2005-2006 *President*, Greater New Orleans Society for Neuroscience
 In 2005-06, my major duty was to organize the distribution of \$100,000 in Katrina relief funds from the national Society for Neuroscience to local neuroscience graduate students.

National Service**Ad hoc and regular grant reviewer:**

1987 Study section member, NLS1
 1989, 1997 Study section member, NIDA Biochemistry
 1989, 1990 Special study sections member, NIDDK
 1990- present *Ad hoc* reviewer, *J. Biol. Chem.*
 1990- present *Ad hoc* reviewer, *J. Neurochem.*
 1990- present *Ad hoc* reviewer, *Peptides*
 1990- present *Ad hoc* reviewer, *J. Neurosci.*
 1990- present *Ad hoc* reviewer, *Endocrinol.*
 1990- present *Ad hoc* reviewer, *Analyt. Biochem.*
 1990- present *Ad hoc* reviewer, *FEBS Lett.*
 1990- present *Ad hoc* reviewer, *Protein Engineering, Design, and Selection*
 1991 Study section member, NIMH career awards
 1994 Special study section member, NINDS
 1995 Study section member, NLS1
 1995, 1996, 1998 Study sections and special emphasis panel member, NIDDK
 1996, 1997, 2002 Study section member (phone reviews), NLS1
 1996-2000 Regular member, Endocrinology study section
 1998-2000 Advisory Committee Member, Gordon Conference:
 Hormonal and Neural Peptide Synthesis
 1999 Study section member, ACS
 2000-2005 Editorial Board Member, *Journal of Biological Chemistry*
 2000 *Ad hoc* service, Endocrinology study section (phone reviews), NIMH career awards
 study section
 2002-2005 *Ad hoc* service, Endocrinology study section
 2002 Vice-Chair, Gordon Conference: *Hormonal and Neural Peptide Synthesis*
 2004 Chair, Gordon Conference: *Proprotein Processing, Trafficking, and Secretion* (conference renamed)
 2006/2008/2010 Advisory Committee Member, Gordon Conference: *Proprotein Processing, Trafficking, and Secretion*
 2007-2010 Regular member, MCE study section; SEP, NIDDK 2/2010

International Review Service

2002 Finnish National Academy of Sciences Review Panel, Helsinki, Finland
 2002-present Canada Research Chairs, College of Reviewers
 2003 Chair, Finnish National Academy of Sciences Review Panel
 2005 Foundation for Scientific Research- Flanders, Belgium, grant review
 2006 Wellcome Trust grant reviewer

2008-2010 Foundation for Scientific Research- Flanders, Belgium, grant review

Teaching Service

1985- 1986 Dental Biochemistry (17 lecture h per year) -85 students
 1985-2005 One lecture in "Methods in Neuroscience" -15 students
 (course given at Tulane University in alternate years
 on protein expression methods) (2 h)
 1987 -1999 Medical Biochemistry (17 h) -150 students
 1991, fall Graduate seminar in the cell biology of protein targeting (20 h) 8 students
 1995 - 2001 Neuroscience Survey (2 h) 8 students
 1997 Endocrinology (on radioimmunoassay and opioid peptides) (2 h) 10 students
 1998- 2004 Molecular Neuroscience (on neurotransmitters) (4 h) 8 students
 2000 Nursing Biochemistry (20 h) 80 students
 2001 Graduate Seminar in Protein Motifs (20 h) 7 students
 2001, 2002 Special Topics Graduate Seminar in Methods in Biochemistry; 8 students
 (Protein Expression and Purification) (2 h)
 2003, 2005 Endocrinology - Bioactive peptides and radioimmunoassay (4 h and 2h) 12 students
 2003-2005 Graduate Seminar ("Professional Skills").
 Graduate student mentoring: giving talks, preparing grants,
 writing papers, career choices (30 h); 12 students
 2006 Dental Biochemistry (4 h); 85 students
 2006 Molecular Neuroscience - Neuropeptides (4 h) and Grantsmanship (1 h) 3 students
 2006, 2007 Endocrinology Graduate course "Radioimmunoassay and other
 hormone-measurement techniques" (2 h); 25 students (includes Allied Health
 students)
 2008-present Professional Skills course in Molecular Medicine ("How to Write/Review Grants")
 2008-present GPILS Core Course "Posttranslational Processing" (1h)
 2010-present Neuroscience (GPILS 641) "Peptides, Modulators and Growth Factors" (1h)
 2010-present Structure and Development "Endocrine Systems" (1h)

Students and postdoctoral fellows supervised

Graduate Students supervised: (rotation students not listed)

1. Fu-sheng Shen (1986- 1988) (Ph.D. 1990, from Institute of Physiology, Beijing)
2. John Mathis (1988- 1994) Ph.D. 1994
3. Yi Zhou (1990- 1994) Ph.D. 1994
4. Yolanda Fortenberry (1997- 2001) Ph.D. 2001 (NRSA Fellow)
5. Maria Sayah (3/00- 12/00) (Master's thesis; French practical training)
6. Valery Iattignon (1/04- 4/04) (Master's thesis; French practical training)
7. Akina Hoshina (11/07- present)

Postdoctoral Fellows supervised

1. Dr. Nympha B. D'Souza (1987-1988)
2. Dr. Steven F. Roberts (1988- 1991)
3. Dr. Joseph Irvine (1989- 1991)
4. Dr. Fu-sheng Shen (1991- 1992)
5. Dr. Osvaldo Vindrola (1991- 1993)
6. Dr. Nazarius Lamango (1994- 1996)

7. Dr. Xiaorong Zhu (1994- 1997) (NRSA fellow)
8. Dr. Karla Johanning (1994- 1998)
9. Dr. Laurent Muller (1996- 1999)
10. Dr. Ekaterina Apletalina (1997- 2000)
11. Dr. Jae-Ryoung Hwang (1998- 2001)
12. Dr. Angus Cameron (1999- 2000)
13. Dr. Virginie Laurent (1999-2002)
14. Dr. Ashok Dubey (2000- 2001)
15. Dr. Miroslav Sarac (2000- 2003)
16. Dr. Emmanuel Prodhomme (2001-2002)
17. Dr. Weidong Liu (2001-2002)
18. Dr. Sang-Nam Lee (2002- 2007)
19. Dr. Juan Ramon Peinado (2003-2004)
20. Dr. Magdalena Kacprzak (2003- 2005)
21. Dr. Bainan Liu (2004- 2005)
22. Dr. Dorota Kowalska (2005) (2008-2009)
23. Dr. Wagner Judice (2006- 2007) (NIDA INVEST Fellow)
24. Dr. Jin Liu (2006- 2008)
25. Dr. Akihiko Ozawa (2006- present)
26. Dr. Michael Helwig (2009- present)
27. Dr. Mirella Vivoli (2010-present)

Grant Support

Ongoing Research Support

Control of Peptide Hormone Biosynthesis by PC2 and 7B2

RO1 DK49703-13A1 I. Lindberg (P.I.)

09/15/96- 03/31/13

NIH/NIDDK

This grant investigates the role of the neuroendocrine protein 7B2 in peptide hormone synthesis through both cell biological as well as mouse knockout experiments.

ARRA Supplement received 12/2009 for purchase of AKTA FPLC

Opioid Peptide Synthesizing Enzymes

04/01/88- 02/28/14

RO1 DA05084-23 I. Lindberg (P.I.)

NIH/NIDA

This grant is to identify regulatory mechanisms for PC1 activity; to identify small molecule convertase inhibitors using combinatorial compound screening; and to crystallize PC1.

Identification of Novel Peptide Hormones

R21 DK084481-01 I. Lindberg (P.I.)

06/15/09- 05/31/11

NIH/NIDDK

This grant is to validate potential peptide hormone precursors identified through bioinformatics using *in vitro* testing and then generate and test physiologically modified peptides in six metabolic assays (in collaboration with FivePrime Therapeutics).

De-Orphanizing the Peptidome I. Lindberg and B. Roth (co-P.I.s)

07/01/09-06/30/13

R01 DA027170-01

NIH/NIDA

This grant is to identify novel ligand-receptor pairs through systematic screening of novel and known peptide products against novel orphan receptors.

Completed Research Support

1/85-12/86	I. Lindberg, PI "Pharmacologic control of opioid peptide biosynthesis." Pharmaceutical Manufacturer's Association Starter Grant
4/85 - 11/88	I. Lindberg, PI (30% effort) "Biosynthesis of enkephalin in the adrenal medulla." R01 DK35199-01
4/88 - 3/91	I. Lindberg, PI (30% effort) "Opioid peptide-synthesizing enzymes" R01 DA05084-01
7/88-6/93	I. Lindberg, PI (90% salary) Research Career Development Award K04 DK01868 (salary award only)
12/88 - 11/91	I. Lindberg, PI (30% effort) "Biosynthesis of enkephalin in the adrenal medulla." R01 DK35199-04
4/91 - 3/94	I. Lindberg, PI (30% effort) "Opioid peptide-synthesizing enzymes" R01 DA05084-04
10/93- 9/98	I. Lindberg, PI (75% salary) Research Scientist Development Award K02 DA00204-01 (salary award)
4/94 - 3/99	I. Lindberg, PI (30% effort) "Opioid peptide-synthesizing enzymes" R01 DA05084-07
7/96- 3/02	I. Lindberg, PI (30% effort) "Control of peptide hormone biosynthesis by PC2 and 7B2" R01 DK49703
10/98- 9/03	I. Lindberg, PI (75% salary) Research Scientist Development Award K02 DA00204-06 (salary award renewal)
4/99- 4/04	I. Lindberg, PI (30% effort) "Opioid peptide-synthesizing enzymes" R01 DA05084-12
2004	Gordon Conference support grant "Proprotein processing, trafficking and secretion" 5R13DK061936-04
2004	NSF Conference Support: received \$2,000 for A poster award program for the same Gordon Conference cited above
9/02-8/05	I. Lindberg, PI) (20% effort) "Blockade of anthrax toxin cytotoxicity using furin inhibitors" R21 AI 053517
8/03-8/06	P. Sunkara, PI (5% effort) "Hexa-D-Arg: a furin inhibitor for anthrax biodefense"

	Subcontract, Molecular Therapeutics SBIR R43 A1056850
9/04-3/06	S. Pincus, PI (5% effort) "Furin Inhibition in HIV Disease" R21 AI058714-01
3/06-6/06	I. Lindberg, PI (10% effort) "Furin as an Anti-Cancer Target" Louisiana Cancer Research Consortium

Contributed sections to several **COBREs and equipment grants** awarded to various LSUHSC faculty and to **ARRA Equipment Supplement** and **Multi-user Equipment** applications at the University of Maryland)

Research Support as Mentor

7/95-6/98	Mentor to Dr. Xiaorong Zhu, NRSA postdoctoral fellowship
10/97-8/01	Mentor to Ms. Yolanda Fortenberry, NRSA predoctoral fellowship
12/06-12/07	Mentor to Dr. Wagner Judice, 1 year NIDA INVEST Fellowship

Patents

1. Patent # 6,548,736 on the 7B2 null mouse as a model for pituitary Cushing's was granted to C.H. Westphal, **I. Lindberg**, and P. Leder.
2. Patent number # 7,033,991 on polyarginine furin inhibitors in inhibiting bacterial disease and cancer was granted on April 25, 2006 to **I. Lindberg**, A. Cameron, J. Appel, and R.A. Houghten.

Publications

Peer-Reviewed Journals

1. **Lindberg, I.**, Smythe, S., and Dahl, J.L. (1979) Distribution of enkephalin in bovine brain. *Brain Research*, 168, 200-203.
2. **Lindberg, I.**, and Dahl, J.L. (1981) Characterization of enkephalin release from rat striatum. *J. Neurochem.* 36, 506-512.
3. Epstein, M., **Lindberg, I.**, and Dahl, J.L. (1981) Development of enkephalinergic neurons in the gut of the chick. *Peptides* 2, 271-276.
4. **Lindberg, I.**, Yang, H.-Y.T., and Costa, E. (1982) An enkephalin-generating enzyme in bovine adrenal medulla. *Biochem. Biophys. Res. Commun.* 106, 186-1934.
5. Dahl, J.L., Epstein, M.L., Silva, B.W., and **Lindberg, I.** (1982) Multiple forms of met⁵- and leu⁵-enkephalin in fetal and neonatal rat brain and gut. *Life Sci.* 31, 1853-1856.
6. **Lindberg, I.**, Yang, H.-Y.T., and Costa, E. (1982) Characterization of a partially purified trypsin-like enkephalin-generating enzyme in bovine adrenal medulla. *Life Sci.* 31, 1713-1716.
7. **Lindberg, I.**, Yang, H.-Y.T., and Costa, E. (1983) A high molecular weight form of met⁵-enk-arg⁶-gly⁷-leu⁸ in rat brain and bovine adrenal chromaffin granules. *Life Sciences* 33 Supp. I., 5-8.
8. **Lindberg, I.**, and Yang, H.-Y.T. (1984) Distribution of met⁵-enkephalin-arg⁶-gly⁷-leu⁸-immunoreactive peptides in rat brain: presence of multiple immunoreactive forms. *Brain Research* 299, 73-78.
9. **Lindberg, I.**, Yang, H.-Y.T., and Costa, E. (1984) Further characterization of an enkephalin-generating enzyme from bovine adrenal chromaffin granules. *J. Neurochem.* 42, 1411-1419.

10. **Lindberg, I.**, Yang, H.-Y.T., and Costa, E. (1985) Release of multiple immunoreactive forms of met⁵-enkephalin-arg⁶-gly⁷-leu⁸ from rat brain. *Neuropeptides* 5, 541-544.
11. **Lindberg, I.**, and White, L. (1986) Reptilian enkephalins: implications for the evolution of proenkephalin. *Arch. Biochem. Biophys.* 245, 1-7.
12. Wang, Y.N. and **Lindberg, I.** (1986) Distribution and characterization of met-enk-arg- gly-leu in the gastrointestinal tract of the rat. *Cell and Tiss. Res.* 244, 77- 85.
13. **Lindberg, I.**, and White, L. (1986) Distribution of immunoreactive Peptide B in the rat brain. *Biochem. Biophys. Res. Commun.* 139, 1024-1032.
14. **Lindberg, I.** (1986) Reserpine-induced alterations in the processing of proenkephalin in cultured chromaffin cells: increased amidation. *J. Biol. Chem.* 261, 16317- 16323.
15. Panula, P., and **Lindberg, I.** (1987) Pituitary enkephalins: biochemical and immunohistochemical observations. *Endocrinology* 121, 48-58.
16. Byrd, J., Naranjo, J., and **Lindberg, I.** (1987) Proenkephalin gene expression in the PC12 cell line: stimulation by sodium butyrate. *Endocrinology* 121, 1299-1305.
17. D'Souza, N. and **Lindberg, I.** (1988) Evidence for the phosphorylation of a proenkephalin-derived peptide, Peptide B. *J. Biol. Chem.* 263, 2548-2552.
18. Shen, F.S. and **Lindberg, I.** (1988) Characterization of enkephalin-immunoreactive peptides generated from plasma proteins by peptic digestion. *Endocrinology* 122, 2905-2910.
19. Shen, F-S., and **Lindberg, I.** (1989) Purification and assay of opioid activity of low molecular weight enkephalin-immunoreactive peptides generated by peptic digestion of rat plasma proteins. *Neuropeptides* 13, 23-28.
20. Shen, F.-S., Roberts, S.F., and **Lindberg, I.** (1989) A putative processing enzyme for proenkephalin in bovine adrenal chromaffin granules- purification and characterization. *J. Biol. Chem.* 264, 15600-15605 (1989).
21. **Lindberg, I.**, and Thomas, G. (1990) Cleavage of proenkephalin by a chromaffin granule processing enzyme. *Endocrinology* 126, 480-487.
22. Irvine, J., Roberts, S.F., and **Lindberg, I.** (1990) Electrophoretic analysis of proteinases in sodium dodecyl sulfate polyacrylamide gels containing copolymerized radiolabelled protein substrates: application to proenkephalin processing enzymes. *Analyt. Biochem.* 190, 141-146.
23. **Lindberg, I.**, Shaw, E., Finley J., Leone, D., and Deininger, P. (1991) Posttranslational modifications of recombinant rat proenkephalin overexpressed in Chinese hamster ovary cells. *Endocrinology* 128, 1849-1856.
24. Irvine, J.W., and **Lindberg, I.** (1991) Partial purification and characterization of a putative prohormone processing enzyme complex from bovine pituitary. *Endocrinology*, 128, 2345- 2352.
25. **Lindberg, I.**, and Shaw, E. (1992) Posttranslational processing of proenkephalin in a human neuroblastoma cell line, SK-N-MC. *J. Neurochem.* 58, 458-453.
26. Roberts, S.F., Irvine, J.W., and **Lindberg, I.** (1992) Proteolytic activity in bovine adrenal chromaffin granules visualized using [³⁵S]methionine-labelled proenkephalin copolymerized into SDS-PAGE. *J. Neurochem.* 58, 593-599.
27. **Lindberg, I.**, Lincoln, B., and Rhodes, C.J. (1992) Fluorometric assay of a calcium-dependent, paired basic processing endopeptidase present in insulinoma granules. *Biochem. Biophys. Res. Commun.* 183, 1-7.
28. Vindrola, O., and **Lindberg, I.** (1992) Biosynthesis of the prohormone convertase mPC1 in AtT-20 cells. *Mol. Endocrinol.* 6, 1088-1094.
29. Mathis, J., and **Lindberg, I.** (1992) Posttranslational processing of proenkephalin in AtT-20 cells: evidence for cleavage at a Lys-Lys site. *Endocrinology* 131, 2287-2296.

30. Zhou, Y., and **Lindberg, I.** (1993) Purification and characterization of the prohormone convertase PC1 (PC3) *J. Biol. Chem.* 268, 5615- 5623.
31. Shen, F.S., Seidah, N.G., and **Lindberg, I.** (1993) Biosynthesis of the prohormone convertase PC2 in Chinese hamster ovary cells and in rat insulinoma cells. *J. Biol. Chem.* 268, 24910-24915.
32. Breslin, M., **Lindberg, I.**, Benjannet, S., Lazure, C., Mathis, J.P., and Seidah, N.G. (1993) Processing of proenkephalin by PC1(PC3), PC2, and furin. *J. Biol. Chem.* 268, 27084-27093.
33. Vindrola, O., and **Lindberg, I.** (1993) Release of the prohormone convertase PC1 from AtT-20 cells. *Neuropeptides* 25, 151-160.
34. Hornby, P.J., Rosenthal, S.D., Mathis, J.P., Vindrola, O., and **Lindberg, I.** (1993) Immunocytochemical analysis of the neuropeptide-synthesizing enzyme PC1 in AtT-20 cells. *Neuroendocrinol.* 58, 555-563.
35. Dupuy, A., **Lindberg, I.**, Zhou, Y., Akil, H., Lazure, C., Chretien, M., Seidah, N.G., and Day, R. (1994) Processing of prodynorphin by the prohormone convertase PC1 results in high molecular weight intermediate forms: cleavage at a single arginine. *FEBS Lett.* 337:60-65.
36. O'Hara, B.F., Donovan, D., **Lindberg, I.**, Brannock, M.T., Ricker, D.D., Moffatt, C.A., Klaunberg, B.A., Schindler, C., Chang, T.S.K., Nelson, R.J., and Uhl, G.R. (1994) Proenkephalin transgenic mice: a short promoter confers high testis expression and reduced fertility. *Mol. Reprod. and Devel.* 38, 275-284.
37. Martens, G.M., Braks, A.M., Eib, D., Zhou, Y., and **Lindberg, I.** (1994) The neuroendocrine polypeptide 7B2 is a naturally occurring inhibitor of the prohormone convertase PC2. *Proc. Nat. Acad. Sci.* 91, 5784-5785.
38. **Lindberg, I.** (1994) Evidence for cleavage of the PC1/PC3 prosegment in the endoplasmic reticulum. *Mol. Cell. Neurosci.* 5, 263-268.
39. Zhou, Y., and **Lindberg, I.** (1994) Enzymatic properties of carboxy-terminally truncated prohormone convertase 1 (PC1/PC3). *J. Biol. Chem.* 269, 18408-18413.
40. **Lindberg, I.**, Ahn, S.C. and Breslin, M.B. (1994) Cellular distributions of the prohormone processing enzymes PC1 and PC2. *Mol. Cell. Neurosci.* 5, 614-622.
41. **Lindberg, I.**, Van den Hurk, W.H., Bui, C.B., and Batie, C.J. (1995) Enzymatic characterization of immunopurified prohormone convertase PC2: potent inhibition by a 7B2 peptide fragment. *Biochemistry* 34, 5486- 5493.
42. Rothenberg, M.E., Eilertson, C.D., Klein, K., Zhou, Y., **Lindberg, I.**, McDonald, J.K., and Noe, B.D. (1995) Processing of mouse proglucagon by recombinant PC1 and PC2. *J. Biol. Chem.* 270, 10136-10146.
43. Van Horsen, A. M., Van den Hurk, H., Baillyes, E.M., Hutton, J.C., Martens, G.J.M., and **Lindberg, I.** (1995) Identification of the region within the neuroendocrine polypeptide 7B2 responsible for the inhibition of prohormone convertase 2. *J. Biol. Chem.* 270, 14292-14296.
44. Zhu, X., and **Lindberg, I.** (1995) 7B2 facilitates the maturation of proPC2 in neuroendocrine cells and is required for the expression of enzymatic activity. *J. Cell Biol.* 129, 1641-1650.
45. Zhou, Y., Rovere, C., Kitabgi, P., and **Lindberg, I.** (1995) Mutational analysis of PC1 in PC12 cells: 66 kDa PC1 is fully functional. *J. Biol. Chem.* 270, 24702-24706.
46. Johannng, K., Mathis, J.P., and **Lindberg, I.** (1996) Role of the prohormone convertase PC2 in proenkephalin processing: antisense and overexpression studies. *J. Neurochem.* 66, 898-907.
47. Zhu, X., Rouille, Y., Lamango, N. S., Steiner, D. F., and **Lindberg, I.** (1996) Internal cleavage of the PC2 inhibitor 7B2 CT peptide: a potential inactivation mechanism. *Proc. Natl. Acad.Sci.* 93, 4919-4924.
48. Lamango, N., Zhu, X., and **Lindberg, I.** (1996) Purification and enzymatic characterization of recombinant PC2: stimulation of activity by 21 kDa 7B2. *Arch. Biochem. Biophysics* 330, 238-250.

49. Zhu, X., Lamango, N.S., and **Lindberg, I.** (1996) Involvement of a polyproline helix-like structure in the interaction of 7B2 with prohormone convertase 2. *J. Biol. Chem.* 271, 23582-23587.
50. Johanning, K., Mathis, J.P., and **Lindberg, I.** (1996) Processing site blockade results in more efficient conversion of proenkephalin to active opioid peptides. *J. Biol. Chem.* 271, 27871-27878.
51. Muller, L., Zhu, X., and **Lindberg, I.** (1997) Mechanism of facilitation of PC2 maturation by 7B2: involvement in PC2 transport and activation, but not folding. *J. Cell. Biol.* 139, 625-638.
52. Zhu, X., Muller, L., Mains, R.E. and **Lindberg, I.** (1998) Structural elements of PC2 required for its interaction with its helper protein 7B2. *J. Biol. Chem.* 273, 829-836.
53. Day, R., Lazure, C., Basak, A. Boudreault, A., Limperis, P., Dong, W., and **Lindberg I.** (1998) Prodynorphin processing by proprotein convertase 2 (PC2): cleavage at single basic residues and enhanced processing in the presence of carboxypeptidase. *J. Biol. Chem.* 273, 1153- 1164.
54. **Lindberg, I.**, Tu, B., Muller, L., and Dickerson, I. (1998) Cloning and functional analysis of *C. elegans* 7B2. *DNA and Cell Biol.* 17, 727-734.
55. Apletalina, E., Appel, J., Lamango, N.S., Houghten, R., and **Lindberg, I.** (1998) Identification of potent inhibitors of prohormone convertases 1 and 2 using a peptide combinatorial library. *J. Biol. Chem.* 273, 26589-26595.
56. Johanning, K., Juliano, M.A., Juliano, L., Lazure, C., Lamango, N., Steiner, D.F., and **Lindberg, I.** (1998) Specificity of prohormone convertase 2 on proenkephalin and proenkephalin-related fluorogenic peptides. *J. Biol. Chem.* 273, 22672-22680.
57. Lamango, N.S., Apletalina, E., Liu, J., and **Lindberg, I.** (1999) Conversion of proPC2 is a pH-driven process. *Arch. Biochem. Biophys.* 362, 275-282.
58. Westphal, C.H., Muller, L., Zhou, A., Zhu, X., Bonner-Fraser, S., Schambelan, M., Steiner, D.F., **Lindberg, I.***, Leder, P.* (1999) The neuroendocrine protein 7B2 is required for peptide hormone processing *in vivo* and provides a novel mechanism for pituitary Cushing's disease. *Cell* 96, 689-700. (*co-senior authors)
59. Muller, L., Zhu, P. Juliano, M.A., Juliano, L., and **Lindberg, I.** (1999) A 36-residue peptide contains all of the information required for 7B2-mediated activation of proPC2. *J. Biol. Chem.*, 274, 21471-21477.
60. Fortenberry, Y., Liu, J., and **Lindberg, I.** (1999) The role of the CT peptide in the inhibition of PC2 *in vivo*. *J. Neurochemistry*, 73, 994-1003.
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Book Chapters

1. Epstein, M., Dahl, J.L., and **Lindberg, I.** (1982) Ontogeny of leu- and met-enkephalin in chick brain; an enkephalin-like substance present in embryonic, but not adult brain. In: Rich, D., and Gross, E.

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2. **Lindberg, I.**, Yang, H.-Y.T., and Costa, E. (1982) Enzymatic production of met⁵-and leu⁵-enkephalin in adrenal chromaffin granules. In: (M. Trabucchi and E. Costa, Adv. Biochem. Psychopharmacol. 33, 183-191
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6. **Lindberg, I.** and Appel, J. (2010) Inhibitor screening of proprotein convertases using positional scanning libraries. *In press*.

Recent Invited Presentations

Title of most presentations: "Proprotein convertases and their inhibitors"

March 2005 Max-Planck Institute for Biochemistry, Martinsried, Germany

April 2005 Pfizer Pharmaceuticals, St. Louis, MO

November 2005 Dept. of Pharmacology Mt. Sinai College of Medicine, NY

November 2005 Dept. of Molecular Pharmacology, Albert Einstein College of Medicine, NY

December 2005 Burnham Institute, San Diego, CA

January 2006 University of Arizona, College of Medicine, Phoenix campus, AZ

March 2006 University of Georgia, Dept. of Biochemistry, Athens, GA

April 2006 California Pacific Medical Center Research Institute, San Francisco, CA

May 2006 Georgetown University, Department of Endocrinology, Washington DC

August 2006 Temple University, Department of Biochemistry, Philadelphia, PA

November 2006 University of Pittsburgh, Department of Pharmacology, PA

December 2006 Boston University, Department of Pharmacology, Boston, MA

December 2006 University of Maryland, Department of Anatomy and Neurobiology, Baltimore, MD

February 2007 University of Maryland BioPark, Baltimore, MD

April 2008 Johns Hopkins University Dept. Endocrinology, Baltimore, MD

March 2009 K.U. Leuven, Belgium

December 2009 NIH, Bethesda, MD

RESEARCH INTERESTS

My research focuses on the elements within the secretory pathway required for the successful production of bioactive peptide hormones and neuropeptides. These elements include chaperones, abundant secretory proteins such as granins, and precursor processing enzymes, in particular the proprotein convertases PC1 and PC2. We study how PC1 and PC2 are regulated within the cell; we are attempting their crystallization; and we are working on identifying activators and inhibitors through various pharmacological collaborations. Lastly, two ongoing projects focus on the identification of novel peptides and potential functions.