

## Jennifer K. Nyborg

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### ■ Education

BS, Biochemistry, University of California, Riverside. 1981.  
Ph.D., Biochemistry, University of California, Riverside. 1986.  
Postdoctoral, Chemistry and Biochemistry, University of Colorado, Boulder. 1986-1990.

### ■ Professional Experience

Colorado State University, Department of Biochemistry and Molecular Biology.  
Assistant Professor, 1990-1996.  
Associate Professor, 1996-2000.  
Professor, 2000-present.  
Affiliate faculty, Department of Microbiology, 1991-2001.  
Program in Cellular and Molecular Biology, 1991-present.

### ■ Recent Awards

American Cancer Society Junior Faculty Research Award. 1994-1997.  
College of Natural Sciences Award: Outstanding Undergraduate Mentoring, 1998.  
Grant from the W.M. Keck Foundation (PI). Program in Chromatin Structure and Function. 2004.  
College of Natural Sciences Award: Excellence in Graduate Education and Mentoring. 2006.  
Professor Laureate, College of Natural Sciences, 2007-2010.

### ■ Professional and Community Service

Board of Directors, American Cancer Society, Larimer County, CO Unit. 1991-1994.  
American Cancer Society. Team Captain, Relay for Life. June 19-20, 1998.  
BiomEditor, International Bioscience Consultants. Scientific Advisory Board. 2004-present.  
Member, NIH Molecular Genetics-B Review Panel. 2004-2008  
Ad Hoc Member, NIH CDF-1, MG-B, and Virology Review Panels, 2002-2004.  
Editorial Board, Gene Expression, 1999 – present.  
Editorial Board, Journal of Virology, 2007-2009.  
Editorial Board, Retrovirology, 2007 – present.

### ■ Teaching

Molecular Genetics (BC 463); Fall 1991-1997.  
Biochemistry Seminar (BC 193); Fall 1992-1995.  
Biochemistry Seminar (BC 293); Spring 1996.  
Molecular Genetics Laboratory (BC 406B); Spring 1997-2004, Fall 2004.  
Molecular Biosciences (NS 201); Spring 1998-2001.  
Biochemistry Seminar (BC 193); Spring 1999.  
Special Topics: Transcriptional coactivators (BC763); Spring 2001.  
Eukaryotic Gene Expression (BC 663); Spring 2002.  
Biochemistry Seminar (BC 493); Spring 2002, Fall 2005.  
Biochemistry Seminar (BC 193); Fall 1992-1995, 2002.  
Biochemistry Seminar (BC 192); Fall 2003, 2005.  
Grant Writing (BC 701); Fall 2003, 2004, 2005, 2006.  
Senior Thesis (BC499B); Spring 2006.  
Responsible Conduct in Biochemical Research (BC 601); Fall 2004, 2005, 2006.  
Biochemistry of Human Disease (BC467); Spring 2007.

## ■ Committee Service (Department, College, and University; last 10 years)

- 1995 – 1998 Chair, Committee to Develop an Interdisciplinary Undergraduate Program in Molecular Biology.
- 1995 – 1996 Search Committee, Department.
- 1996 – 2002 Executive Committee, Department.
- 1997 Task Force on Reorganization of Regulatory Committees, University.
- 1997 Hughes Grant Application Committee. CNS.
- 1997 – 2001 Graduate Recruitment Committee. Department.
- 1998 – 1999 Faculty Search Committee. Department.
- 1998 Life Science Task Force. Reorganization of the Life Sciences At CSU.
- 1998 Curriculum Committee. CNS.
- 1998 – 1999 Committee to Reappoint the Chair, Dept. of Biochemistry. Department.
- 1999 Freshman Biology Curriculum Committee, University.
- 1999 – 2001 Teaching Awards Committee. CNS.
- 1999 – 2000 Faculty Search Committee, Dept. Chemistry. CNS.
- 1999 – 2002 Institutional Biosafety Committee. University.
- 2000 – 2001 Faculty Search Committee, Dept. Chemistry. CNS.
- 2000 Committee to Reorganize the Office of the Vice President for Research and Information Technology. University.
- 2000 – 2001 KS/IP 8: Research & Graduate Education Committee. University.
- 2000 – 2001 Search Committee, Dean. CNS.
- 2001 – 2004 Beckman Scholar. University.
- 2001 – 2002 Search Committee, Dean. CNS.
- 2001 Review Committee, Academic Program Review of the College of Veterinary Medicine and Biomedical Sciences. University.
- 2003 – 2006 Sabbatical Leave Committee, CNS.
- 2003 – 2007 Graduate Affairs Committee. Department.
- 2004 – 2005 Search Committee for the Chair. Department.
- 2004 – 2005 Search Committee, IDI Prion Biologists. MIP. CVMBS.
- 2004 – 2005 Chair, Search Committee, IDI Assistant Professor. Department.
- 2004 Reviewer, AEP Grants. Office of the Vice President for Research. University.
- 2004 – 2007 Chair, Graduate Affairs Committee. Department.
- 2004 – 2009 Graduate Affairs Committee. Department.
- 2004 – 2005 Executive Committee. Department.
- 2004 – 2007 Faculty Council, University.
- 2005 – 2006 Search Committee, Department.
- 2005 – 2006 Search Committee, Vice President for Research. University.
- 2006 – 2009 Executive Committee. Department.
- 2005 – 2006 Graduate Recruitment Committee, Cell & Molecular Biology.
- 2006 – 2008 Beckman Scholar. University.
- 2006 – 2007 Academic Committee, Cell & Molecular Biology.
- 2006 – 2007 Search Committee, Dept. Chair, Dept. Biochemistry & Molecular Biology.
- 2007 – 2010 Sexual Harassment Committee. University.
- 2007 – 2008 Awards Committee. Department.

## ■ Reviewing Activities

### *Grant applications:*

- Review Panel for Personnel Grants, American Cancer Society (Ad Hoc), 1993 – 1996.
- Review Panel, Research Grants, National Science Foundation, Oct. 1996.
- Program Reviewer, NIH, National Cancer Institute. 2001.
- CDF-1 Review Panel, NIH (Ad Hoc), Nov. 2002, Nov. 2003.
- Virology Review Panel, NIH (Ad Hoc), Feb. 2003, Oct. 2003, Feb. 2004, June 2004.
- Exp. Therapeutics-2, Special Emphasis Panel, NIH. April 2004.
- Virology-B Review Panel, NIH (Ad Hoc), Oct. 2004.
- Regular Member, Molecular Genetics-B, NIH 2004-2007.

### *Journals:*

Editorial Board: Journal Virology, Gene Expression, Retrovirology.

Ad Hoc reviewer for:

*Mol. Cell. Biol.*

*J. Biol. Chem.*

*J. Virology*

*Virology*

*Oncogene*

*J. Cell Science*

*Biochemical J.*

*Proc. Natl. Acad. Sci.*

*Biochemistry*

*Nucl. Acids Res.*

*J. Mol. Biol.*

### ■ Research Funding (last 5 years, grants in effect in bold)

NIH R01 CA55035. Years 5-9. Title: "Transcriptional Regulation by the HTLV-I Tax Protein." Term: 12/01/97-11/30/02. PI: Jennifer K. Nyborg. Total costs: \$1,197,738.

NIH R01 CA80002. Title: "Tax Dereglulation of Gene Expression through CBP." Term: 12/01/98-11/30/03. PI: Jennifer K. Nyborg. Total costs: \$1,304,220. Current Annual Support: \$273,383.

Research Supplement. Term: 7/01/99-06/30/03. PI: JKN. Total costs: \$491,379.

NIH R01 CA87540. Title: "Tax Transactivation in the Context of Chromatin." Term: 04/01/01-03/31/06. PI: Jennifer K. Nyborg. Total costs: \$1,385,055. Annual Support: \$277,011.

Academic Enrichment Program Grant. Colorado State University. Title: "Establishment of a Recombinant Protein Expression and Purification Facility." Term: 07/01/02-06/30/04. PI: Jennifer K. Nyborg. Total costs: \$130,000.

**NIH R01 CA55035. Years 10-14. Title: "Transcriptional Regulation by the HTLV-I Tax Protein." Term: 06/01/03-05/31/08. PI: Jennifer K. Nyborg. Total Costs: \$1,550,285. Current Annual Support: \$308,785.**

**Underrepresented Minority Supplement. Term: 06/20/04-11/30/07. Minority fellow: Ms. Julita Ramírez. Total costs: \$151,673.**

**NIH R01 CA80002. Years 6-10. Title: "Tax Dereglulation of Gene Expression through CBP." Term: 04/01/04-03/31/09. PI: Jennifer K. Nyborg. Total Costs: \$1,710,360. Current Annual Support: \$342,072. Equipment Supplement 07/05, \$15,000.**

**The W.M. Keck Foundation. Title: "The Keck Program in Chromatin Structure and Function." Award date: 01/01/04. PI: Jennifer K. Nyborg, co-PIs: Karolin Luger, Paul Laybourn, Jeff Hansen. Total Award: \$1,200,000.**

### ■ Publications

Gieger, T.R., Sharma, N., Kim, Y.-M., and Nyborg, J.K. The HTLV-1 Tax Protein Confers CBP/p300 Recruitment and Transcriptional Activation Properties to Phosphorylated CREB. *Mol. Cell. Biol.* *in press* (2007).

Ramírez, J.A. and Nyborg, J.K. Molecular Characterization of the HTLV-1 Tax Interaction with the KIX Domain of CBP/p300. *J. Mol. Biol.* 372, 958-969 (2007).

Lopez, D.I., Mick, J.E., and Nyborg, J.K. Purification of CREB to Apparent Homogeneity: Removal of Truncation Products and Contaminating Nucleic Acid. *Protein Expression and Purification* 55, 406-418 (2007).

Sharma, N., Lopez, D.I. and Nyborg, J.K. DNA Binding and Phosphorylation Induce Conformational Alterations in the Kinase Inducible Domain of CREB: Implications for the Mechanism of CREB Transcription Function. *J. Biol. Chem.* 282, 19872-19883 (2007).

Kim, Y.-M., Ramirez, J.A., Mick, J.E., Giebler, H.A., Yan, J.-P. and Nyborg, J.K. Molecular Characterization of the Tax-containing HTLV-1 Enhancer Complex Reveals a Prominent Role for CREB Phosphorylation in Tax Transactivation. *J. Biol. Chem.* 282, 18750-18757 (2007).

Lemasson, I., Lewis, M., Hivin, P., Cavanagh, M.-H., Polakowski, N., Thébault, S., Barbeau, B., Nyborg, J.K. and Mesnard, J.M. HTLV-1 bZIP protein interacts with the cellular transcription factor CREB to inhibit HTLV-1 transcription. *J. Virology* 81, 1543-1553 (2007).

Konesky, K.L., Nyborg, J.K. and Laybourn, P.J. Tax Abolishes Histone H1 Repression of p300 Acetyltransferase Activity at the HTLV-I Promoter. *J. Virology*, 80, 10542-10553 (2006).

Lemasson, I., Polakowski, N., Laybourn, P.J. and Nyborg, J.K. Tax-Dependent Displacement of Nucleosomes During transcriptional Activation of Human T-cell Leukemia Virus Type 1. *J. Biol. Chem.* 281,13075-13082 (2006).

Nyborg, J.K. and Peersen, O.B. That Zincing Feeling: The Effects of EDTA on the Behavior of Zinc-Binding Transcriptional Regulators. *Biochem. J.* 381, e3-e4 (2004).

Lemasson, I., Polakowski, N.J., Laybourn, P.J., and Nyborg, J.K. Transcription Regulatory Complexes Bind the Human T-cell Leukemia Virus 5' and 3' Long Terminal Repeats to Control Gene Expression. *Mol. Cell. Biol.* 24, 6117-6126 (2004).

Livengood, J.A. and Nyborg, J.K. The High Affinity Sp1 Binding Site in the HTLV-1 Promoter Contributes to Tax-Independent Basal Expression. *Nuc. Acids Res.* 32, 2829-2837 (2004).

Livengood, J.A., Fechter, E.J., Dervan, P.E., and Nyborg, J.K. Paradoxical Effects of DNA Binding Polyamides on HTLV-I Transcription. *Frontiers in Bioscience* 9, 3058-3067 (2004).

McBryant, S.J., Park, Y.-J., Abernathy, S.M., Laybourn, P.J., Nyborg, J.K. and Luger, K. Preferential binding of the histone (H3-H4)<sub>2</sub> tetramer by NAP1 is mediated by the amino terminal histone tails. *J. Biol. Chem.* 278, 44574-44583 (2003).

Georges, S.A., Giebler, H.A., Cole, P.A., Luger, K., Laybourn, P.J., and Nyborg, J.K. Tax Recruitment of CBP/p300, via the KIX Domain, Reveals a Potent Requirement for Acetyltransferase Activity that is Chromatin-Dependent and Histone Tail-Independent. *Mol. Cell. Biol.* 23, 3392-3404 (2003).

Lemasson, I, Polakowski, N.J., Laybourn, P.J. and Nyborg, J.K. Transcription Factor Binding and Histone Modifications on the Integrated Proviral Promoter in HTLV-I-Infected T-Cells. *J. Biol. Chem.* 177, 49459-49465 (2002).

Livengood, J.A., Scoggin, K.E.S., Van Orden, K., Edayathumangalam, R. McBryant, S.J., Laybourn, P.J. and Nyborg, J.K. p53 Interaction with the SRC-Interacting Domain of CBP/p300 Mediates Coactivator-Dependent Transcriptional Activity. *J. Biol. Chem.* 277, 9054-9061 (2002).

Georges, S. Kraus, W.L., Luger, K. Nyborg, J.K., and Laybourn, P.J. p300-Mediated HTLV-I Tax Transactivation on Recombinant Chromatin Templates: Histone Tail Deletion Mimics Coactivator Function. *Mol. Cell. Biol.* 22, 127-137 (2002).

Scoggin, K. E. S., Ulloa, A. and Nyborg, J.K. The Oncoprotein Tax Binds the SRC-Interacting Domain of CBP/p300 to Mediate Transcriptional Activation. *Mol. Cell. Biol.* 16, 5520-5530 (2001).

Lemasson, I. and Nyborg, J.K. HTLV-I Tax Repression of p73 $\beta$  is Mediated Through Competition for the C/H1 domain of CBP. *J. Biol. Chem.* 276, 15720-15727 (2001).

Mick, J.E., Colgin, M.A. Brauweiler, A. and Nyborg, J. K. Analysis of CREB mutants in Tax complex formation and transactivation. *AIDS Research and Human Retroviruses* 16, 1597-1601 (2000).

Van Orden, K. and Nyborg, J.K. Insight into CBP function through the viral oncoprotein Tax. *Gene Expression.* 9, 29-36 (2000).

Giebler, H.A., Lemasson, I. and Nyborg, J.K. p53 recruitment of CBP mediated through phosphorylated CREB: A novel pathway for tumor suppressor regulation. *Mol. Cell. Biol.* 20, 4849-4858 (2000).

Van Orden, K., Giebler, H.A., Lemasson, I., Gonzales, M. and Nyborg, J.K. Binding of p53 to the KIX domain of CBP: A potential link to HTLV-I associated leukemogenesis. *J. Biol. Chem.* 274, 26321-26328 (1999).

Lenzmeier, B.A., Baird, E.E., Dervan, P.B. and Nyborg, J.K. The Tax Protein-DNA Interaction is Essential for HTLV-I Transactivation *in vitro*. *J. Mol. Biol.* 291, 731-744 (1999).

Van Orden, K., Yan, J.-P., Ulloa, A. and Nyborg, J.K. Binding of the Human T-Cell Leukemia Virus Tax Protein to the Coactivator CBP Interferes with CBP-mediated Transcriptional Control. *Oncogene*. 18, 3766-3772 (1999).

Van Orden, K. and Nyborg, J.K. Binding of HTLV-I Tax to the Coactivator CBP Disrupts the Transcription Activity of c-Jun, in *Molecular Pathogenesis of HTLV-I: a current perspective*. eds. O. John Semmes and Marie-Louise Hammarskjold, ABl Professional Publications, (USA) (1999).

Lenzmeier, B.A. and Nyborg, J.K. Molecular Mechanisms of Viral Transcription and Cellular Deregulation Associated with the HTLV-I Tax Protein. *Gene Ther. Mol. Biol.* 3, 327-345 (1999).

Colgin, M.A. and Nyborg, J.K. The HTLV-I Oncoprotein Tax Inhibits the Transcriptional Activity of c-Myb through Competition for CBP. *J. Virol.* 72, 9396-9399 (1998).

Yan, J.-P., Garrus, J.E., Giebler, H.A., Stargell, L.A. and Nyborg, J.K. Molecular Interactions Between the Human T-Cell Leukemia Virus Tax Protein and the Cellular Coactivator CBP. *J. Mol. Biol.* 281, 395-400 (1998).

Howard, R.D., McIlwraith, C.W., Trotter, G.W. and Nyborg, J.K. Cloning of equine interleukin 1a receptor antagonist and determination of its full-length cDNA sequence. *Am. J. Vet. Res.* 59, 712-716 (1998).

Howard, R.D., McIlwraith, C.W., Trotter, G.W. and Nyborg, J.K. Cloning of equine Interleukin-1 $\alpha$  and equine Interleukin-1 $\beta$  and determination of their full-length cDNA sequence. *Am. J. Vet. Res.* 59, 704-711 (1998).

Brooks, P.A., Cockerell, G.L. and Nyborg, J.K. Activation of BLV Transcription by NF-kB and Tax. *Virology* 243, 94-98 (1998).

Lenzmeier, B.A., Giebler, H.A. and Nyborg, J.K. HTLV-I Tax Requires Direct Access to DNA for Recruitment of CBP. *Mol. Cell. Biol.* 18, 721-731 (1998).

Giebler, H.A., Loring, J., Van Orden, K., Colgin, M., Garrus, J., Escudero, K., Brauweiler, A. and Nyborg, J.K. Anchoring of CBP to the HTLV-I Promoter: A Molecular mechanism of Tax Transactivation. *Mol. Cell. Biol.* 17, 5156-5164 (1997).

Lenzmeier, B. and Nyborg, J.K. *In vitro* Transcription of Human T-cell Leukemia Virus Type I is RNA Polymerase II Dependent. *J. Virology* 71, 2577-2580 (1997).

Brauweiler, A., Garrus, J.E., Reed, J.C. and Nyborg, J.K. Repression of Bax Gene Expression by the HTLV-I Tax Protein: Implications for Suppression of Apoptosis in Virally-Infected Cells. *Virology* 231, 135-140 (1997).

Gottesfeld, J.M., Johnson, D.L. and Nyborg, J.K. Transcriptional Activation of RNA Polymerase III-Dependent Genes by the HTLV-I Tax Protein. *Mol. Cell. Biol.* 16, 1777-1785 (1996).

Uittenbogaard, M.N., Giebler, H.A., Reisman, D. and Nyborg, J.K. Transcriptional Repression of p53 by the Human T-Cell Leukemia Virus type I Tax Protein. *J. Biol. Chem.* 270, 28503-28506 (1995).

Brauweiler, A., Garl, P., Franklin, A.A., Giebler, H.A. and Nyborg, J.K. A Molecular Mechanism for HTLV-I Latency and Tax Transactivation. *J. Biol. Chem.* 270, 12814-12822 (1995).

Baranger, A.M., Palmer, C.R., Hamm, M.K., Giebler, H.A., Brauweiler, A., Nyborg, J.K. and Schepartz, A. Mechanism of DNA Binding Enhancement by the HTLV-I Transactivator Tax. *Nature* 376, 606-608 (1995).

Franklin, A.A., and Nyborg, J.K. Mechanisms of Tax Regulation of Human T-Cell Leukemia Virus Gene Expression. *J. Biomedical Science* 2, 17-29 (1995).

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- Uittenbogaard, M., Armstrong, A.P., Chiaramello, A. and Nyborg, J.K. Human T-Cell Leukemia Virus Type I Tax Protein Represses Gene Expression Through the Basic Helix-Loop-Helix Family of Transcription Factors. *J. Biol. Chem.* 269, 22466-22469 (1994).
- Armstrong, A.P., Franklin, A.A., Uittenbogaard, M.N., Giebler, H.A. and Nyborg, J.K. Pleiotropic Effect of the Human T-Cell Leukemia Virus Tax Protein on the DNA Binding Activity of Eucaryotic Transcription Factors. *Proc. Natl. Acad. Sci. (USA)* 90, 7303-7307 (1993).
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- Nyborg, J.K. and Dynan, W.S. Interaction of Host Cell Proteins with the HTLV-I Transcriptional Control Region: I. Purification of Cellular Proteins that Bind the 21-bp Repeat Elements. *J. Biol. Chem.* 265, 8230-8236 (1990).
- Nyborg, J.K., Matthews, M.H., Yucel, J., Walls, L., Golde, W.T., Dynan, W.S. and Wachsman, W. Interaction of Host Cell Proteins with the HTLV-I Transcriptional Control Region: II. Identification of Sp1 and NF- $\kappa$ B Binding Sites, and Characterization of a Minimal Promoter Containing These Binding Sites and a 21-bp Repeat. *J. Biol. Chem.* 265, 8237-8242 (1990).
- Nyborg, J.K., Matthews, M.H., Golde, W.T. and Dynan, W.S. The Identification of Cellular Proteins that Interact with the HTLV-I LTR, in *Human Retroviruses, UCLA Symposia on Molecular and Cellular Biology*. New series, Volume 119 (J. E. Groopman, I. Chen, M. Essex & R. Weiss, eds.) Alan R. Liss, Inc., New York, 131 (1990).
- Spindler, S.R., Crew, M.D., Wight, P.A. and Nyborg, J.K. Thyroid Hormone Responsive Regions of the Growth Hormone Gene and Chromatin. *Endocrine Res.* 15, 475-481 (1990).
- Nyborg, J.K., Dynan, W.S., Chen, I.S.Y. and Wachsman, W. Binding of Host Cell Factors to DNA Sequences in the Long Terminal Repeat of Human T-Cell Leukemia Virus Type 1: Implications for Viral Gene Expression. *Proc. Natl. Acad. Sci. (USA)* 85, 1457-1461 (1988).
- Nyborg, J.K. and Spindler, S.R. Alterations in Local Chromatin Structure Accompany Thyroid Hormone Induction of Growth Hormone Gene Transcription. *J. Biol. Chem.* 261, 5685-5689 (1986).
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- Nyborg, J.K., Nguyen, A.P. and Spindler, S.R. Relationship Between Thyroid and Glucocorticoid Hormone Receptor Occupancy, Growth Hormone Gene Transcription and mRNA Accumulation. *J. Biol. Chem.* 259, 12377-12381 (1984).