

Curriculum Vitae

Donald Thomas Lysle, Ph.D.

**Kenan Distinguished Professor
Biological Psychology Program
Department of Psychology
University of North Carolina, at Chapel Hill**

University Address

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Education

- Ph.D. Biological Psychology, Learning and Development Program, University of Pittsburgh, 1986
- M.S. Biological Psychology, Learning and Development Program, University of Pittsburgh, 1983
- B.S. Anthropology-Psychology, Magna Cum Laude, Departmental Honors in Anthropology, University of Pittsburgh, 1979

Academic History

- 2007-Present Chair, Department of Psychology, University of North Carolina at Chapel Hill.
- 2005-Present Kenan Distinguished Professor, University of North Carolina, at Chapel Hill.
- 2004-2007 Associate Chair, Department of Psychology, University of North Carolina, at Chapel Hill.
- 2004-2005 Reynolds Distinguished Term Professor, University of North Carolina, at Chapel Hill.
- 2001-2004 Gillian T. Cell Distinguished Term Professor for Excellence in Undergraduate Teaching, University of North Carolina, at Chapel Hill.
- 1997-Present Professor, Department of Psychology, University of North Carolina, at Chapel Hill.

- 1995-2004 Director, Biological Psychology Program, Department of Psychology, University of North Carolina at Chapel Hill
- 1990-Present Graduate Faculty, Curriculum in Neurobiology, University of North Carolina, at Chapel Hill
- 1993-1997 Associate Professor, Department of Psychology, University of North Carolina, at Chapel Hill.
- 1990-1993 Assistant Professor, Department of Psychology, University of North Carolina, at Chapel Hill.
- 1988-1990 Research Assistant Professor, Department of Pathology, School of Medicine, University of Pittsburgh; and Adjunct Assistant Professor of Psychology, Department of Psychology, University of Pittsburgh.
- 1986-1987 Post-Doctoral Research Associate, Western Psychiatric Institute and Clinic, Department of Psychiatry, University of Pittsburgh.
- 1980-1986 Teaching Fellow, Department of Psychology, University of Pittsburgh.
- 1980-1986 Graduate Research Assistant, Department of Psychology, University of Pittsburgh.

Research Support (RO-1 and KO-2):

- 2004-2009 Principal Investigator, National Institute on Drug Abuse Research Grant (Renewal of R01-DA-13371): Behavioral Factors in Heroin's Effect on Nitric Oxide, total costs \$853,763.
- 2002-2007 Principal Investigator, National Institute on Drug Abuse Research Scientist Award (Renewal of K02-DA-00334-01): Opioid-Induced Alteration of Immune Status, total costs \$570,920
- 2002-2007 Principal Investigator, National Institute on Drug Abuse, (RO-1 DA15709): Opioid induced Immune Alterations: Sex Differences, total costs \$843,614.
- 2000-2005 Principal Investigator, National Institute on Drug Abuse Grant (Renewal of R01-DA-07481): Behavioral Determinants of Opioid/Immune Interactions, total costs \$637,137.
- 2000-2004 Principal Investigator, National Institute on Drug Abuse Research Grant (Renewal of R01-DA-13371): Behavioral Factors in Heroin's Effect on Nitric Oxide, total costs \$539,593.

- 1997-2002 Principal Investigator, National Institute on Drug Abuse Research Scientist Award (KO2-DA-00334-01): Opioid-induced alteration of immune status, total costs \$411,859.
- 1996-2000 Principal Investigator, National Institute on Drug Abuse Research Grant (RO1-DA-10167-01): Opioid induced alteration of nitric oxide production, total costs \$534,873.
- 1995-2000 Principal Investigator, National Institute on Drug Abuse Research Grant (Renewal of RO1-DA-07481): Behavioral Determinants of Opioid/Immune Interactions, total costs \$509,761.
- 1992-1997 Principal Investigator, National Institute of Mental Health Research Grant (Renewal of RO1-MH-46284): Immune Alterations Mediated by Conditioning, total costs \$782,910.
- 1992-1995 Co-Principal Investigator, National Institute on Drug Abuse Research Grant (RO1-DA-07481): Behavioral Determinants of Opioid/Immune Interactions, Principal Investigator, Linda A. Dykstra, Ph.D., total costs \$410,642.
- 1989-1992 Principal Investigator, National Institute of Mental Health Research Grant (RO1-MH-46284): Immune Alterations Mediated by Conditioning, total costs \$452,481.
- 1989-1990 Co-Principal Investigator, National Institute of Mental Health Research Grant (RO1-MH-24115): Signaling and Affective Functions in Conditioning, Principal Investigator Harry Fowler, Ph.D., total costs \$475,602.
- 1987-1990 Co-Principal Investigator, National Institute of Mental Health Research Grant (RO1-MH-43411): Characterization of Stressor-Induced Immune Alteration, Principal Investigator Bruce S. Rabin, M.D., Ph.D., total costs \$1,090,742.

Research Support (Sponsored Pre-doctoral Fellowships):

- 2006-2009 Predoctoral Individual National Research Service Award, Jennifer Szczytkowski-Thomson, National Institute on Drug Abuse (DA021467), Conditioned Effects of Heroin on Nitric Oxide, total costs \$85,932.
- 2006-2008 Predoctoral Individual National Research Service Award, Timothy B. Saurer, National Institute on Drug Abuse (DA019323), Dopaminergic Mechanisms of Opioid Immunomodulation, total costs \$54,210.
- 2003-2006 Predoctoral Individual National Research Service Award, Jay C. Elliott, National Institute on Drug Abuse (F31-DA 016836) Sex differences in Opioid-induced Immunomodulation, total costs \$81,316.

- 2003-2006 Predoctoral Individual National Research Service Award, Ryan K. Lanier, National Institute on Drug Abuse (F31-DA-017448) Effects of Heroin Self-Administration on Nitric Oxide, total costs \$81,316.
- 2001-2003 Predoctoral Individual National Research Service Award, Kelly Carrigan, National Institute on Drug Abuse (F31-DA-14466) Effects of Morphine on a Live Bacterial Infection, total costs \$74,316.
- 1998-2001 Predoctoral Individual National Research Service Award, Christina Nelson, National Institute on Drug Abuse (R01 DA05892-01): Opioid regulation of in vivo immune responses, total costs \$53,250.
- 1993-1996 Predoctoral Individual National Research Service Award, Lynn Perez, National Institute of Mental Health (MH10467), Opioid Receptors in Conditioned Immune Alterations, total costs \$35,400.
- 1993-1995 Predoctoral Individual National Research Service Award, Karamarie Fecho, National Institute on Drug Abuse (DA05594), Neural-Endocrine Mechanisms of Opioid-Immune Interaction, total costs \$35,400.
- 1992-1994 Predoctoral Individual National Research Service Award, Mary E. Coussons, National Institute on Drug Abuse (DA05522), Conditioning of Opioid-Induced Immune Alterations, total costs \$23,600.

Research Support (Other):

- 1992-1996 Co-Investigator and Associate Director, Psychoneuroimmunology Core Laboratory of the National Institute of Mental Health Clinical Research Center (MH33127), Director, Arthur J. Prange, Jr. M.D., total costs \$6,915,679.
- 1988-1990 Consultant, Western Pennsylvania Arthritis Foundation Grant: Effects of Stress on an Animal Model of Rheumatoid Arthritis, Principal Investigator Joan E. Cunnick, Ph.D., total costs \$10,000.

Academic Honors and Awards

- 1993 Arts and Sciences Foundation Award for Academic Achievements, University of North Carolina at Chapel Hill
- 1992 Junior Faculty Development Award, University of North Carolina at Chapel Hill.
- 1987 Post-Doctoral Research Fellowship Award, Clinic Research Center Grant (MH-30915), Effects of stress on immune function, Western Psychiatric Institute and Clinic, University of Pittsburgh.

1985 Apple for the Teacher Award for Outstanding Undergraduate Teaching, University of Pittsburgh.

Professional Organizations

American Psychological Association (1986-Present)
American Psychological Society (1989-Present)
Eastern Psychological Association (1986-1990)
International Society for Neuroimmunomodulation (1989-Present)
Psychoneuroimmunology Research Society (1992-Present)
Psychonomic Society (1989-Present)
Sigma Xi, The Scientific Research Society (1985-Present)
Society for Neuroscience (1988-Present)

Professional Services

Editorial Board Member: *Brain, Behavior, and Immunity* (1993-Present)
Behavioral Neuroscience (1995-2002)

Journal review: *American Psychologist, Biofeedback and Self Regulation, Brain Research, Developmental and Comparative Immunology, International Journal of Behavioral Medicine, Journal of Experimental Psychology: Animal Behavior Processes, Journal of Immunology, Journal of Neuroimmunology, Journal of Pharmacology and Experimental Therapeutics, Life Sciences, Molecular Pharmacology, Neuroimmunomodulation, Neuroscience Letters, Psychobiology, Psychophysiology, Psychosomatic Medicine, Regulatory Peptides*

Book review: Brooks/Cole Publishing, Gordon & Breach Publishing, John Wiley & Sons, Publishing, Sinauer Associates Publishing, Worth Publishing

Ad hoc Grant Reviewer: National Institute of Mental Health: Psychobiological, Biological, & Neurosciences Subcommittee - AIDS

Ad hoc Grant Reviewer: National Science Foundation: Behavioral Neuroscience

Ad hoc Grant Reviewer: National Institute on Drug Abuse: Special Emphasis Panel

Ad hoc Grant Reviewer: National Institutes of Health: Biobehavioral and Behavioral Processes I

Scientific Affairs Committee: Psychoneuroimmunology Research Society (1992-1996)

Council Member: Psychoneuroimmunology Research Society (1996-Present)

Nominating Committee: Psychoneuroimmunology Research Society (1997-1999)

Nominating and Membership Committee: Society on Neuroimmune Pharmacology (2000-Present)

Medical Research Council, London – Grant Reviewer (2002)

Grant Reviewer: Center for Scientific Review, Behavioral and Biobehavioral Processes (BBBBP-1) (1997-2000)

Minneapolis Medical Research Foundation – Grant Reviewer (2002)

Leo W. Jenkins Cancer Center, The Brody School of Medicine, ECU- Consultant (2002-Present)

Community Service

Team member, North Carolina Search and Rescue, Central Unit

Captain, Search and Special Operations Division, Orange County Rescue Squad (2002-2004)

Administrative Experience

Department of Psychology, University of Pittsburgh

Undergraduate Curriculum Committee, (1980-1983)

Animal Care and Use Committee, (1988-1990)

Department of Psychology, University of North Carolina, Chapel Hill

Computer Usage Committee, (1991-1993)

Animal Care and Use Committee, (1992-Present)

Department Advisory Committee, (1993-2004)

Graduate Education Committee, (1995-2004)

Biological Psychology Program Director, (1995-2004)

Research Advisory Committee, Advisory to Vice Chancellor for Research and Graduate Studies (Thomas Meyer), (1995-1999)

Faculty Committee on Research, Advisory to Chancellor (Michael Hooker), (1995-1999)

Chair, Biological Program Search Committee (1996, Recruitment of Regina Carelli, Ph.D.)

University Teaching Awards Committee, (1998-2003)

Chair, Biological Program Search Committee (2001, Recruitment of Todd Thiele, Ph.D.)

Member, Staff Resource Committee (2001)

Chair, Fixed-Term Instructor Search Committee (2004, Recruitment of Jeannie Koo-Loeb, Ph.D. and Elizabeth Jordan, Ph.D.)

Chair, Awards Nomination Committee (2004-present)

Member, Departmental Space and Hiring Task Force (2004)

Chair, Departmental Space Committee (2004-present)

Chair, Departmental Website Committee (2004-present)

Department Advisory Committee as Associate Chair, (2004-present)

Associate Chair, Department of Psychology (2004-Present)

Chair, Fixed-Term Instructor Search Committee (2006, Recruitment of F. Charles Wiss, Ph.D.)

University of North Carolina at Chapel Hill, University Service

Advisory Committee for the Department of Laboratory Animal Medicine, University of North Carolina, (1998-present).

Executive Committee for the Neurobiology Curriculum – Member (1995-2004)

Michael Polanyi Visiting Lectureship Committee, University of North Carolina, (1999-2004).

University Teaching Awards Committee, University of North Carolina, (1998-2001).

Center for Inflammation and Inflammatory Disorders, University of North Carolina, Investigator- Member (1996-Present)

Center for AIDS Research, University of North Carolina, Investigator- Member (2005-Present)

Teaching Experience

Undergraduate Teaching Experience, University of Pittsburgh, Main Campus

Instructor for:

Introduction to Psychology (6 terms)
Learning and Motivation (9 terms)
Comparative Psychology (5 terms)

Laboratory and Recitation Instructor for:

Experimental Psychology (18 terms)

Coordinator of Laboratory Instructors for:

Experimental Psychology (5 terms)

Undergraduate Teaching Experience, University of Pittsburgh, External Program

Part-time Instructor for the Western Pennsylvania State Correctional Institution, Pittsburgh, PA

Undergraduate Teaching Experience, University of North Carolina, at Chapel Hill

Instructor for:

Learning (4 semesters)
Comparative Animal Behavior (6 semester)

Graduate Teaching Experience, University of North Carolina, at Chapel Hill

Instructor for:

Seminar in Experimental Health Research (2 semesters)
Seminar in Psychoneuroimmunology (2 semesters)
Behavior and its Biological Bases I (Team taught - 3 semesters)
Applications of Experimental Psychology to Health Research (Team taught 3 semesters)
Research Seminar in Experimental Psychology (14 semesters)
Seminar in Neuroimmunology (2 semesters)

Graduate Masters/Doctoral Committees, University of North Carolina, at Chapel Hill

Andrew Barrett –Committee member
Mark Baxter - Committee member (Curriculum in Neurobiology)
Kimberly Brownley - Committee member
Sherry Broadwell - Committee member
Dave Bucci - Committee member (Curriculum in Neurobiology)

Rebecca Burwell - Committee member
Kelly Carrigan – Chair of Committee
Christy Carter - Committee member
Charlie Cook - Committee member
Mary Crenshaw - Committee member
Mary Coussons-Read - Chair of Committee
Jay Elliott – Chair of Committee
Karamarie Fecho - Co-Chair of Committee (Curriculum in Neurobiology)
Jon Fee – Committee member
Gregory Fox - Committee member
Paul Gendreau - Committee member
Susan Girdler - Committee member
Jane Gross - Committee member (Oral Biology Program)
Tammy Hatfield - Committee member
Steve Heymen – Committee member
Jon Hollander - Committee member
Jeanine Koo - Committee member
Yuh-Yih Lin – Committee member (Oral Biology Program)
Ryan Lanier – Chair of Committee
Debbie Lubin - Committee member
Sondra Mattox - Committee member
Drake Morgan – Committee member
Christina Nelson – Chair of Committee
Lynn Perez - Chair of Committee (Curriculum in Neurobiology)
Dani Smith – Committee member
Mark Smith - Committee member
Dennis Sparta – Committee member
Jennifer L. Szczytkowski-Thompson – Chair of Committee (Curriculum in Neurobiology)
Loreli Taylor – Committee member (Curriculum in Neurobiology)
Jolan Turner - Committee member
Paige West – Chair of Committee

Research Publications

Published Papers

Lomas, L.M., Barrett, A.C., Turner, J.M., Lysle, D.T., Picker, M.J. (in press). Sex differences in the potency of kappa opioids and mixed-action opioids administered systemically and at the site of inflammation against capsaicin-induced hyperalgesia in rats. *Psychopharmacology*.

Szczytkowski, J.L. & Lysle, D.T. (in press). Conditioned effects of heroin on the expression of inducible nitric oxide synthase are susceptible to extinction and latent inhibition. *Psychopharmacology*.

Saurer, T.B., Carrigan, K.A., Ijames, S.G., & Lysle, D.T. (2006). Suppression of natural killer cell

activity by morphine is mediated by the nucleus accumbens shell. *Journal of Neuroimmunology*, 173, 3-11.

Elliott, J.C., Wagner, A.F., & Lysle, D.T. (2006). Neurokinin 1 receptor signaling mediates sex differences in mu and kappa opioid-induced enhancement of contact hypersensitivity. *Journal of Neuroimmunology*, 181, 100-105.

Elliott, J.C., Picker, M.J., Sparrow, A.J., & Lysle, D.T. (2006). Dissociation between sex differences in the immunological, behavioral, and physiological effects of kappa- and delta-opioids in Fischer rats. *Psychopharmacology*, 185, 66-75.

Ahmed, F.E., Ijames, S., Lysle, D.T., Dobbs, L.J., Jr, Johnke, R.M., Flake, G., Stockton, P., Sinar, D.R., Naziri, W., Evans, M.J., Kovacs, C.J., & Allison, R.R. (2004). Improved methods for extracting RNA from exfoliated human colonocytes in stool and RT-PCR analysis. *Digestive Diseases and Sciences*, 49, 1889-1898.

Ahmed, F.E., Dobbs, L.J., Johnke, R.M., Ijames, S., Lysle, D.T., Sinar, D.R., Naziri, W., Evans, M.J., Kovacs, C.J., Daly, B.M., & Allison, R.R. (2004). Isolation of circulating colon carcinoma cells for reverse transcriptase polymerase chain reaction. *Analytical Biochemistry*, 332, 394-397.

Carrigan, K.A., Saurer, T.B., Ijames, S.G., Lysle, D.T. (2004). Buprenorphine produces naltrexone reversible alterations of immune status. *International Immunopharmacology*, 4, 419-428.

Saurer, T.B., Carrigan, K.A., Ijames, S.G., Lysle, D.T. (2004). Morphine-induced alterations of immune status are blocked by the dopamine D2-like receptor agonist 7-OH-DPAT. *Journal of Neuroimmunology*, 148, 54-62.

Elliott, J.C., Picker, M.J., Nelson, C.J., Carrigan, K.A., & Lysle, D.T. (2003). Sex differences in opioid-induced enhancement of contact hypersensitivity: Involvement of gonadal hormones. *Journal of Investigative Dermatology*, 121, 1053-1059.

Elliott, J.C., Ijames, S.G., & Lysle, D.T. (2003). Cocaine increases inducible nitric oxide synthase in rats: Effects of acute and binge administration. *International Immunopharmacology*, 3, 1011-1018.

Lysle, D.T. & Ijames, S. (2002). Heroin-associated environmental stimuli modulate the expression of inducible nitric oxide synthase in the rat. *Psychopharmacology*, 164, 416-422.

Fecho, K. & Lysle, D.T. (2002). Morphine-induced enhancement in the granulocyte response to thioglycollate administration in the rat. *Inflammation*, 26, 259-271.

Lanier, R.K., Ijames, S.G., Carrigan, K.A., Carelli, R.M., & Lysle, D.T. (2002). Self-administration of heroin produces alterations in the expression of inducible nitric oxide synthase. *Drug and Alcohol Dependence*, 66, 225-233.

- Nelson, C.J., & Lysle, D.T. (2001). Morphine modulation of the contact hypersensitivity response: Characterization of immunological changes. *Clinical Immunology*, 98, 370-377.
- Nelson, C.J., & Lysle, D.T. (2001). Involvement of substance P and central opioid receptors in morphine modulation of the CHS response. *Journal of Neuroimmunology*, 115, 101-110.
- Lysle, D.T., & Carrigan, K.A. (2001). Morphine-6 β -glucuronide modulates the expression of inducible nitric oxide synthase. *Inflammation*, 25, 267-275.
- Carrigan, K.A., & Lysle, D.T. (2001). Morphine-6 β -glucuronide induces potent immunomodulation. *International Immunopharmacology*, 1, 821-831.
- Nelson, C.J., Schneider, G.M., & Lysle, D.T. (2000). Involvement of central μ but not δ - or κ - opioid receptors in immunomodulation. *Brain, Behavior, and Immunity*, 14, 170-184.
- Nelson, C.J., Carrigan, K.A., & Lysle, D.T. (2000). Naltrexone administration attenuates surgery-induced immune alterations in rats. *Journal of Surgical Research*, 94, 172-177.
- Lysle, D.T., & How, T. (2000). Heroin-induced modulation of inducible nitric oxide synthase. *Immunopharmacology*, 46, 181-192.
- Fecho, K., Nelson, C.J., & Lysle, D.T. (2000). Phenotypic and functional assessments of immune status in the rat spleen following acute heroin treatment. *Immunopharmacology*, 46, 193-207.
- Fecho, K., & Lysle, D.T. (2000). Heroin-induced alterations in leukocyte numbers and apoptosis in the rat spleen. *Cellular Immunology*, 202, 113-123.
- Carrigan, K.A., Nelson, C.J., & Lysle, D.T. (2000). Endomorphin-1 induces antinociception without immunomodulatory effects in the rat. *Psychopharmacology*, 151, 299-305.
- West, J.P., Dykstra, L.A., Lysle, D.T. (1999). Immunomodulatory effects of morphine withdrawal are time-dependent and reversible by clonidine. *Psychopharmacology*, 146, 320-327..
- Petitto, J.M., Garipey, J-L., Gendreau, P.L., Rodriguiz, R.M., Lewis, M.H., & Lysle, D.T. (1999). Differences in NK cell function in mice bred for high and low aggression; Genetic linkage between complex behavioral and immunological traits. *Brain, Behavior, and Immunity*, 13, 175-186.
- Nelson, C.J., How, T. & Lysle, D.T. (1999). Enhancement of the contact hypersensitivity reaction by acute morphine administration at the elicitation phase. *Clinical Immunology*, 93, 176-183.
- Lysle, D.T. & How, T. (1999). Endogenous opioids regulate the expression of inducible nitric oxide synthase by splenocytes. *Journal of Pharmacology and Experimental Therapeutics*, 288, 502-508.

- Fecho, K., & Lysle, D.T. (1999). Phenotypic analysis of splenocyte subsets following acute morphine treatment in the rat. *Cellular Immunology*, *195*, 137-146.
- West, J.P., Dykstra, L.A., & Lysle, D.T. (1998). Differential tolerance to morphine's immunomodulatory effects following continuous administration. *Drug and Alcohol Dependence*, *53*, 31-38.
- Schneider, G.M., & Lysle, D.T. (1998). Role of central mu-opioid receptors in the modulation of nitric oxide production by splenocytes. *Journal of Neuroimmunology*, *89*, 150-159.
- Nelson, C.J. & Lysle, D.T. (1998). Severity, Time and β -adrenergic receptor involvement in surgery-induced immune alterations. *Journal of Surgical Research*, *80*, 115-122.
- West, J.P., Lysle, D.T., & Dykstra, L.A. (1997). Tolerance development to morphine-induced alterations of immune status. *Drug and Alcohol Dependence*, *46*, 147-157.
- Perez, L., & Lysle, D.T. (1997). Conditioned immunomodulation: Investigations of the role of endogenous activity at μ , κ , and δ opioid receptor subtypes. *Journal of Neuroimmunology*, *79*, 101-112.
- Nelson, C.J., Dykstra, L.A., & Lysle, D.T. (1997). Comparison of the time course of morphine's analgesic and immunologic effects. *Anesthesia and Analgesia*, *85*, 620-626.
- Schneider, G.M. & Lysle, D.T. (1996). Evidence for the involvement of CNS in the modulation of splenic nitric oxide production. *Journal of Neuroimmunology*, *69*, 36-38.
- Lysle, D.T., Hoffman, K.E., & Dykstra, L.A. (1996). Evidence for the involvement of the caudal region of the periaqueductal gray in a subset of morphine-induced alterations of immune status. *Journal of Pharmacology and Experimental Therapeutics*, *277*, 1533-1540.
- Fecho, K., Maslonek, K.A., Dykstra, L.A., & Lysle, D.T. (1996). Evidence for sympathetic and adrenal involvement in the immunomodulatory effects of acute morphine treatment in rats. *Journal of Pharmacology and Experimental Therapeutics*, *277*, 633-645.
- Fecho, K., Maslonek, K.A., Dykstra, L.A., & Lysle, D.T. (1996). Assessment of the involvement of central nervous system and peripheral opioid receptors in the immunomodulatory effects of acute morphine treatment in rats. *Journal of Pharmacology and Experimental Therapeutics*, *276*, 626-636.
- Scott, W., Hayden, M., Degnim, A.C., Maslonek, K., Lysle, D.T., & Nakayama, D.K. (1995). Neural/endocrine factors enhance the expression of inducible nitric oxide synthase in rat splenocytes. *Surgical Forum*, *46*, 25-27.
- Perez, L. & Lysle, D.T. (1995). Corticotropin-releasing hormone is involved in conditioned stimulus-induced reduction of natural killer cell activity but not in conditioned alterations in

cytokine production or proliferation responses. *Journal of Neuroimmunology*, 63, 1-8.

Lysle, D.T. & Coussons-Read, M.E. (1995). Mechanisms of conditioned immunomodulation. *International Journal of Immunopharmacology*, 17, 641-647.

Fecho, K., Maslonek, K.A., Dykstra, L.A., & Lysle, D.T. (1995). Mechanisms whereby macrophage-derived nitric oxide is involved in morphine-induced suppression of splenic lymphocyte proliferation. *Journal of Pharmacology and Experimental Therapeutics*, 272, 477-483.

Petitto, J.M., Lysle, D.T., Garipey, J.L., & Lewis, M.H. (1994). Association of genetic differences in social behavior and cellular immune responsiveness: Effects of social experience. *Brain, Behavior, and Immunity*, 8, 111-122.

Fecho, K., Maslonek, K.A., Coussons-Read, M.E., Dykstra, L.A., & Lysle, D.T. (1994). Macrophage-derived nitric oxide is involved in the depressed Con A-responsiveness of splenic lymphocytes from rats administered morphine in-vivo. *Journal of Immunology*, 152, 5845-5852.

Coussons-Read, M.E., Maslonek, K.A., Fecho, K., Perez, L., & Lysle, D.T. (1994). Evidence for the involvement of macrophage-derived nitric oxide in the modulation of immune status by a conditioned aversive stimulus. *Journal of Neuroimmunology*, 50, 51-58.

Coussons-Read, M.E., Dykstra, L.A. & Lysle, D.T. (1994). Pavlovian conditioning of morphine-induced alterations of immune status: Evidence for opioid receptor involvement. *Journal of Neuroimmunology*, 55, 135-142.

Coussons, M.E., Dykstra, L.A., & Lysle, D.T. (1994). Pavlovian conditioning of morphine-induced alterations of immune status: Evidence for peripheral β -adrenergic receptor involvement. *Brain, Behavior, and Immunity*, 8, 204-217.

Petitto, J.M., Lysle, D.T., Garipey, J., Clubb, P.H., Cairns, R.B., & Lewis, M.H. (1993). Genetic differences in social behavior: Relation to natural killer cell function and susceptibility to tumor development. *Neuropsychopharmacology*, 8, 35-43.

Lysle, D.T., Coussons, M.E., Watts, V.J., Bennett, E.H., & Dykstra, L.A. (1993). Morphine-induced alterations of immune status: Dose-dependency, compartment specificity and antagonism by naltrexone. *Journal of Pharmacology and Experimental Therapeutics*, 265, 1071-1078.

Fecho, K., Maslonek, K.A., Dykstra, L.A., & Lysle, D.T. (1993). Alterations of immune status induced by the sympathetic nervous system: Immunomodulatory effects of DMPP alone and in combination with morphine. *Brain, Behavior, and Immunity*, 7, 253-270.

Fecho, K., Dykstra, L.A., & Lysle, D.T. (1993). Evidence for β -adrenergic receptor involvement in the immunomodulatory effects of morphine. *Journal of Pharmacology and Experimental*

Therapeutics, 265, 1079-1087.

- Petitto, J.M., Lysle, D.T., & Lewis, M.H. (1992). The expression of genetic differences in social behavior in ICR mice correlates with differences in cellular immune responsiveness. *Clinical Neuropharmacology*, 15, 658-659.
- Lysle, D.T., Luecken, L.J., & Maslonek, K.A. (1992). Suppression of the development of adjuvant-arthritis by a conditioned aversive stimulus. *Brain, Behavior, and Immunity*, 6, 64-73.
- Lysle, D.T., Luecken, L.J., & Maslonek, K.A. (1992). Modulation of immune function by a conditioned aversive stimulus: Evidence for the involvement of endogenous opioids. *Brain, Behavior, and Immunity*, 6, 179-188.
- Luecken, L.J. & Lysle, D.T. (1992). Evidence for the involvement of β -adrenergic receptors in conditioned immunomodulation. *Journal of Neuroimmunology*, 38, 209-220.
- Coussons, M.E., Dykstra, L.A., & Lysle, D.T. (1992). Pavlovian conditioning of morphine- induced alterations of immune status. *Journal of Neuroimmunology*, 39, 219-230.
- Lysle, D.T. & Maslonek, K.A. (1991). Immune alterations induced by a conditioned aversive stimulus: Evidence for a time-dependent effect. *Psychobiology*, 19, 339-344.
- Lysle, D.T., Cunnick, J.E., & Maslonek, K.A. (1991) Pharmacological manipulation of immune alterations induced by a conditioned aversive stimulus: Evidence for a β - adrenergic receptor mediated Pavlovian conditioning process. *Behavioral Neuroscience*, 105, 443-449.
- Cunnick, J.E., Lysle, D.T., Armfield, A., & Rabin, B.S. (1991). Stressor-induced changes in mitogenic activity are not associated with decreased IL-2 production or changes in lymphocytes subsets. *Clinical Immunology and Immunopathology*, 60, 419-429.
- Rabin, B.S., Cunnick, J.E., & Lysle, D.T. (1990). Stress-induced alteration of immune function. *Progress in Neuroendocrinimmunology*, 3, 116-124.
- Lysle, D.T., Cunnick, J.E., & Rabin, B.S. (1990). Stressor-induced alteration of lymphocyte proliferation in mice: Evidence for enhancement of mitogenic responsiveness, *Brain, Behavior, and Immunity*, 4, 269-277.
- Cunnick, J.E., Lysle, D.T., Kucinski, B.J., & Rabin, B.S. (1990). Evidence that shock-induced immune suppression is mediated by adrenal hormones and peripheral β -adrenergic receptors. *Pharmacology, Biochemistry, & Behavior*, 36, 645-651.
- Antelman, S.M., Cunnick, J.E., Lysle, D.T., Caggiula, A.R., Knopf, S., Kocan, D.J., Rabin, B.S., & Edwards, D.J. (1990). Immobilization 12 days (but not one hour) earlier enhanced 2-deoxy-D-glucose-induced immunosuppression: Evidence for stressor-induced time-dependent sensitization of the immune system. *Progress in Neuro-Psychopharmacology & Biological*

Psychiatry, 14, 579-590.

- Lysle, D.T., Cunnick, J.E., Kucinski, B.J., Fowler, H., & Rabin, B.S. (1990). Characterization of immune alterations induced by a conditioned aversive stimulus. *Psychobiology, 18, 220-226.*
- Lysle, D.T., & Fowler, H. (1988). Changes in pain-reactivity induced by unconditioned and conditioned excitatory and inhibitory stimuli. *Journal of Experimental Psychology: Animal Behavior Processes, 14, 376-389.*
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Invited Presentations

“Morphine-induced suppression of natural killer cell activity is blocked by the dopamine D1 antagonist SCH23390,” (with T.B.Saurer) CPDD, June 2003, Bal Harbour, Florida.

“Sex differences in opioid-induced enhancement of contact hypersensitivity.” (with J.C. Elliott). Psychoneuroimmunology Research Society, June, 2002, Madison, Wisconsin.

“Self-administration of heroin induces alterations of inducible nitric oxide synthase.” (with R. K. Lanier). Psychoneuroimmunology Research Society. May 2001, Utrecht, The Netherlands.

“Heroin-induced alterations of inducible nitric oxide synthase”. (with L.M. Zweig). Experimental Biology Abstracts, April 2001, Orlando, FL.

“Central opioid receptors modulate the morphine-induced enhancement of the contact hypersensitivity response”. (with Nelson, C.J). Experimental Biology Abstracts, April 2001, Orlando, FL.

“An experimental model of bacterial infection for the study of opioid-immune interactions”. (with K.A. Carrigan). Psychoneuroimmunology Research Society, May 2001, Utrecht, The Netherlands.

“Substance P modulates the morphine-induced enhancement of the contact hypersensitivity response”. (with C.J. Nelson & K. A.Carrigan). Society for Neuroscience , November 2000, New Orleans, LA.

“Opioid-induced alterations of inducible nitric oxide synthase”. (with K.A. Carrigan, T. How). Psychoneuroimmunology Research Society, May 2000, Wilmington, NC.

“Morphine-induced increase in he neutrophil response to thioglycollate”, (with K. Fecho, T. How) Society for Neuroscience , November 2000, New Orleans, LA.

“Morphine-6-Glucuronide (M6G) induces potent antinociception and immunomodulation”. (with K.A. Carrigan). Psychoneuroimmunology Research Society, May 2000, Wilmington, NC.

“Heroin regulates the expression of inducible nitric oxide synthase”, presented at the meeting of the Psychoneuroimmunology Research Society, May 2000.

“Central opioid receptors modulate the morphine-induced enhancement of the contact hypersensitivity response”. (with C.J. Nelson, & K.A. Carrigan). Psychoneuroimmunology Research Society. May 2000, Wilmington, NC.

“The immunomodulatory effects of morphine-6-glucuronide”, (with K.A. Carrigan) International Society of Neuroimmunomodulation, September, 1999.

"Opioid-induced immunomodulation: Evidence for the role of nitric oxide", presented at the meeting of the College on Problems of Drug Dependence, June 1997.

"Endogenous opioids regulate the expression of inducible nitric oxide synthase by splenocytes", presented at the meeting of the Psychoneuroimmunology Research Society, June 1997.

"Effects of selective opioid agonists on nitric oxide production", presented at Third Annual Symposium on The Brain-Immune Axis and Substance Abuse, San Juan, Puerto Rico, June 1996.

"Effects of selective opioid agonists on nitric oxide production", presented at Third Annual Symposium on The Brain-Immune Axis and Substance Abuse, November 1995.

"Evidence for the involvement of macrophage-derived nitric oxide in stressor-induced modulation of proliferative response to microbial superantigen", presented at the meeting of the Psychoneuroimmunology Research Society, November 1994.

"Nitric oxide and stress", presented at Second Annual Symposium on The Brain-Immune Axis and Substance Abuse, June 1994.

"Conditioned immune alterations in animal models". presented at the Eleventh ORNL Life Sciences Symposium: Indoor air and human health revisited, sponsored by the United States Environmental Protection Agency, March 1994.

"Conditioned alterations of immune status: Evidence for the involvement of endogenous opioid activity and the β -adrenergic system". presented at the Annual Symposium on the Brain-Immune Axis and Substance Abuse, Committee on Problems of Drug Dependency and Drug Abuse, June 1993.

"Stressor-induced alterations of immune status", presented at the Environmental Protection Agency, Human Division, July 1993.

"Stressor-induced immune alterations: Evidence for the involvement of endogenous opioid activity and the β -adrenergic system", presented at the Environmental Protection Agency, May 1993.

"Conditioned alterations of immune status: Evidence for the involvement of endogenous opioid activity and the β -adrenergic system". presented at Research Perspectives in Psychoneuroimmunology IV, April 1993.

"Stressor-induced alterations of immune status", presented at the Curriculum in Neurobiology, University of North Carolina, Chapel Hill; March 1993.

"Pavlovian conditioned alterations of immune status: Evidence for the involvement of opioid and β -adrenergic receptors", presented at the University of Georgia, Athens, Georgia; May 1992.

"Conditioned immunomodulation: An overview", presented at the National Institute of Environmental Health Sciences; April 1992.

"Pavlovian conditioned alterations of immune function", presented at the Department of Psychology, Iowa State University, Ames, Iowa; March 1990.

"Rodents in Psychoneuroimmunology: Methodological problems", presented at a National Institute of Mental Health sponsored meeting entitled "Mechanisms of Neuroimmune Interaction", Pittsburgh, PA; September 1989.

"Conditioned stressor induced immune alterations", presented at the Yardley Symposium, entitled "Psychoneuroimmunology: Basic mechanisms and implications for Health", Johns Hopkins University, Baltimore, MD; May 1989.

"Conditioned stressor induced immune alterations", presented at the Department of Psychology, Dartmouth College, Hanover, NH; March 1989.

"Stress and Immune Function", presented at Washington & Jefferson College, Washington, PA; January 1989.

Teaching Experience and Philosophy

As a result of the excellent opportunities and influences I have had throughout my career, I have a strong commitment to teaching. I began teaching undergraduate classes in 1980, as a first year graduate student at the University of Pittsburgh in the Department of Psychology. I initially taught a laboratory course in Experimental Psychology. The teaching of this laboratory course allowed me to interact with small groups of students. From this experience, I acquired some fundamental teaching skills and learned to convey knowledge to small groups of students. As a second year graduate student I was given the opportunity to teach a large section of Introductory Psychology with an enrollment of about 200 students. Teaching this course provided me with an appreciation for all areas of Psychology and made me realize that a classroom with large numbers of students does not really alter the basic methods and principles of teaching, that is providing the students with a stimulating and challenging environment to learn new information, and to think about that information and express their own ideas. In addition to these courses, I had complete responsibility for two other courses during my graduate education. One course covered basic principles of learning and motivation, and the other course was designed to provide comprehensive coverage of principles of animal behavior. In 1985, I received an "Apple for the Teacher Award" for teaching the course in learning and motivation. This award is University wide and is based upon voting by the students for excellence in teaching. I continued to teach these courses in my post-doctoral years as a Adjunct Assistant Professor at the University of Pittsburgh. In addition, I supervised graduate students assigned to teach the Experimental laboratory. This provided me with the unique experience of teaching people how to teach, an experience that requires one to carefully evaluate teaching methods and skills. Thus, I acquired substantial teaching experience during the course of my graduate and post-doctoral education. I taught Introductory Psychology for 6 terms, Learning and Motivation for 9 terms, Animal Behavior for 5 terms, and was the instructor for 18 sections of the Experimental Psychology laboratory and was the Coordinator of the Instructors for 5 terms. In addition to all of this, I taught a course in Learning and Motivation at the Western Pennsylvania State Correctional Institution as part of an innovative program designed to provide a college education for prison inmates. Although I was initially concerned about the challenges of teaching at a correctional institution, I quickly realized that the inmates were wonderful students and like the more typical college students they thrived in a stimulating and challenging classroom. In short, I believe that my diverse experiences provided me with a keen understanding of teaching.

At the University of North Carolina, I have structured my teaching endeavors to include all levels of both undergraduate and graduate training. I have taught **Psychology 22**, entitled Learning, a course directed at the "lower level" undergraduate students. This course is designed to provide fundamental principles in learning theory. I am especially proud of my **Psychology 102** course, Biological Foundations of Behavior. This course is directed at upper level undergraduate students and is designed to provide perspectives of human and animal behavior based primarily on evolutionary theory and theoretical biology. This course focuses on unique perspectives that challenge current theories of psychology. I have received two commendations for teaching this course based on student evaluations. At the graduate level, I have been involved in the development of core graduate courses in Neurobiology. I have taught a variety of graduate seminars focussing on the effect of opioids, neuroimmunology, nitric oxide, and stress. My seminar courses has been a delight to teach, for they are interdisciplinary and attracts students with diverse backgrounds. The

students enrolled in my seminars are from different programs within psychology, as well as from other departments such as Pharmacology, Microbiology and Immunology, and Oral Biology.

I also have been involved in the mentoring of graduate students. The mentoring process is complex for it involves establishing a research and training environment that will foster the development of future scholars and researchers. I have established a laboratory that provides students with the opportunity to use cutting edge research techniques to test hypotheses about neuroimmune interactions. These techniques cover all levels of analysis from molecular biology to behavior. In terms of mentoring, rarely does a day pass that I do not meet with each of the students under my supervision. I am always available to discuss research and teaching issues, as well as any other events in the life of a graduate student. I am committed to the principle that students receive as much recognition as possible for their efforts. I have always provided funds for students to travel to scientific meetings. I believe that scientific meetings provide a forum for students to present their research and learn about the research enterprise. I like to instill in students a sense of commitment and ownership in their research projects. I routinely encourage students to take the lead role in the publication of manuscripts, often giving first authorship for their efforts. I encourage and help doctoral students to express independence by obtaining their own external research funding. Seven of my students have received **Individual National Research Service Awards** from the National Institute of Mental Health and the National Institute on Drug Abuse. Moreover, two of my students have won the distinguished **Tanner Award for Excellence in Undergraduate Teaching by Graduate Teaching Assistants**. I believe that the more tangible things also must be accompanied by personal support and encouragement during all phases of graduate education and into their post-doctoral years. It has been very rewarding to receive weekly telephone calls from a former Ph.D. student to discuss the high and low points of being a beginning Assistant Professor. Finally, I would like to mention that teaching at these different levels from early undergraduate to the post-doctoral level reinforces my conviction that academic research and teaching are truly synergistic, bringing ideas and experiences about cutting edge research to the classroom has the capacity to spark curiosity and enthusiasm in students, and the high levels of enthusiasm of the undergraduate and graduate students fuel the excitement about research and create new ideas.

My general approach to classroom teaching is simple. I begin each course by explaining the goals of the course and why the particular topic areas are included. Students are provided with the basic materials such as a syllabus, study guides for exams, and a textbook. To prepare new materials for class, I plan and practice each lecture until I know it well enough that I do not require notes. Thus, during my lectures I am free to move about the class, focussing my attention on the students. I encourage the students to engage in discussion, not simply answer rhetorical questions. Perhaps what I find the most enjoyable is that I encourage students to "argue" with me and each other about particular issues being discussed. I often take the position that is opposed to the one that I know is held by the students just to get them thinking and to voice **their** opinions. I enjoy walking around the classroom to be sure that those sitting in the back of the room remain highly involved in the class discussion. I accompany lectures with handouts, sometimes detailed, but often simply a picture, a table, or a single graph. These handouts are meant to get the students thinking about a topic rather than frantically writing down every spoken word. I believe that the bottom line is to engage the students and make the material interesting and relevant to them. I know that I have succeeded in teaching when the written comments from the student evaluations include phrases such as "the class

was a thinking class", "one of my favorite courses here at UNC", "I have learned a great deal", "the most interesting, thought-provoking, applicable to real life class I've had," and "extremely interesting and gave me a new and different perspective on many issues. (Note: quotes taken from Psychology 102 evaluations). I also know that I have made a lasting impression when students write to me after they have taken my class to inform me that my course was the "best class I've taken at Carolina" or "you were one of the most engaging professors I had."

In sum, I have devoted my career to teaching in all of its forms. I find great rewards and pleasures in teaching.

Research Experience and Plan for Five Years

My scientific career has involved a series of progressions in which new disciplines and techniques have been integrated with existing interests in the physiological and behavioral effects of opioids. My graduate training is in Experimental Psychology with an emphasis in the area of learning and how learning processes can influence physiological responses. This training took place at the University of Pittsburgh in the Department of Psychology. During my graduate training, I conducted a series of experiments in rats investigating the antinociceptive effect of aversive stimulation and how stimuli that predict the occurrence of aversive stimulation determine the neural mechanism underlying the antinociceptive response. In particular, this work shows that when aversive stimulation is predicted by a conditioned stimulus an opioid-dependent antinociceptive response is induced. In contrast, unexpected or unpredicted aversive stimulation induces a nonopioid antinociceptive response (Lysle & Fowler, 1988).

The focus of my graduate work had important implications for the next stage of my research career. During the 1980s there was the emergence of evidence for involvement of opioid processes in the regulation of immune function. I became very interested in this area of research and made plans to extend my work in this direction. The Mental Health Clinical Research Center, based at Western Psychiatric Institute and Clinic (WPIC) at the University of Pittsburgh, was interested in sponsoring innovative projects in new research areas, and had developed a funding mechanism for such projects. My application was successful and WPIC provided post-doctoral research support to develop work on opioid-immune interactions and to receive training in immunology. I acquired training in immunology through the Department of Pathology at the University of Pittsburgh. The Department of Pathology proved to be an ideal setting for this training, for the Department included the Pittsburgh Cancer Institute, headed by Dr. Ronald B. Herberman and the Division of Clinical Immunopathology, headed by Dr. Bruce S. Rabin. These individuals provided a setting for training in immunology, and the facilities to develop my research program investigating opioid-immune interactions. My initial investigations provided the data for me to submit an RO-1 grant to the National Institute of Mental Health (NIMH) to more fully conduct my investigations of the role of learning and opioid processes in the regulation of immune function. This RO-1 grant (MH46284) is now in the eighth year of funding. This research project continues to flourish at the University of North Carolina, at Chapel Hill where I became an Assistant Professor in 1990 and was promoted to Associate Professor in 1993. In 1997, I was promoted to Professor of Psychology. In 2001, I was given a three-year appointment as Gillian T. Cell Term Professor for Excellence in Undergraduate Teaching. In 2004, I was named the Reynolds Distinguished Professor.

To summarize my research efforts related to my studies of stress-induced immune alterations, my studies showed that electric shock, as well as conditioned stimuli that predict electric shock induce suppression of a number of immune parameters that appear to involve endogenous opioid activity (Lysle, et al., 1987; 1990; 1992). More specifically, this work showed that presentation of a conditioned stimulus developed through pairings with electric shock induces pronounced and reproducible suppression of the responsiveness of lymphocytes to T-cell mitogens, B-cell mitogens, and ionomycin/PMA, suppression of natural-killer cell activity, decreased interferon and interleukin-2 production, and a decrease in the development of adjuvant-induced arthritis (Lysle, et.al., 1988; 1990; 1992; Perez & Lysle, 1995). Control procedures enabled me to

conclude that the immune alterations are the result of a conditioned or learned state induced by the conditioned stimulus, and are not due to the prior electric shock experience itself, handling, or exposure to the type of stimulus used as the conditioned stimulus (Lysle, et.al., 1988; 1990). Subsequent investigations showed that the administration of the opioid-receptor antagonist naltrexone blocked the conditioned immunomodulatory effect (Lysle, et al., 1992). Further studies revealed that the μ -opioid receptor is the subtype of opioid receptor critical for the expression of this immunomodulatory effect (Perez & Lysle, 1997). These investigations clearly demonstrated that environmental stimuli and psychological processes can induce pronounced alterations of immune status that involve endogenous opioid processes.

My laboratory also began investigating the effects of administration of exogenous opioids on immune status. Dr. Linda A. Dykstra and I have formed a collaboration to investigate the impact of opioids, such as morphine, on the immune system in rodent models. Those studies were initially designed to establish that the immunomodulatory effects of morphine are pharmacological. To accomplish this aim, it was determined that the effects of morphine are dose-dependent, and antagonized by the opioid antagonist, naltrexone (Lysle, et al., 1993). These results provided the foundation for subsequent investigations of the mechanisms by which morphine-induces alterations of immune status. Subsequent studies showed that the effects of morphine are mediated by the central nervous system, in large part via sympathetic and sympathoadrenal activity (Fecho, et al., 1993; 1996; 1996). More recently studies have been initiated to explore the specific brain areas involved in morphine-induced immune alterations. Those investigations indicate that opioid-receptors in the more caudal aspect of the periaqueductal gray are involved in the regulation of natural-killer cell activity (Lysle, et al., 1996). This work is now supported by an RO-1 grant from NIDA (**DA07481**).

The conditioning studies and the morphine studies came together when my laboratory provided the first demonstration that alterations in immune function can be conditioned to stimuli which have been paired with morphine administration (Coussons, et al., 1992; 1994; 1994). Several investigators have shown that many of the behavioral effects of morphine can be conditioned. For example, environmental stimuli which have been paired with morphine administration elicit morphine-like effects, such as hyperthermia when presented in the absence of morphine. In our investigations, rats received subcutaneous injections of morphine in a distinctive environment. When rats were subsequently re-exposed to the distinctive environment in the absence of morphine, immunological alterations similar to those produced by morphine alone occurred. These included decreased mitogen responsiveness of lymphocytes, decreased interleukin-2 production, and decreased natural killer cell activity. Control procedures showed that these effects were the result of a conditioning process. We believe that these results have important implications for the long-term immunomodulatory effects of drug use.

My laboratory provided the first evidence that opioid-induced alterations in immune function are mediated by elevations in the production of inducible nitric oxide synthase, the enzyme responsible for the production of nitric oxide by macrophages (Fecho, et al., 1994; 1995). The development of this work has led to the formation of a collaboration between my laboratory and that of Don K. Nakayama, M.D., Chief of Pediatric Surgery, Department of Surgery, University of North Carolina, at Chapel Hill. Dr. Nakayama has well established expertise in the determination of

the expression of inducible nitric oxide synthase (iNOS). Together, we are using molecular biological and immunocytochemical techniques to test our working hypothesis that opioids produce pharmacologically-specific effects on nitric oxide production by macrophages, and that these effects are initiated at the level of the central nervous system. Our studies will provide a more complete understanding of how opioids induce alterations in nitric oxide production by identifying the subtype(s) of opioid receptor involved in the regulation of nitric oxide. The proposed plan also will provide an investigation of the effect of opioids on the *in vivo* expression of macrophage-derived nitric oxide. I recently received three years of funding from the National Institute on Drug Abuse (DA13371) to support this work.

Recently, I received a renewal of an **Independent Scientist Award (KO-2)** from the National Institute on Drug Abuse that will allow me to devote more of my time to research and the training of graduate students, and also extend my mentoring efforts to the post-doctoral level **DA-00334**). The additional time will allow me to enhance my scientific training and expertise. More specifically, I plan to enhance my knowledge and skills in microbiology biological methods suitable for the study of opioid-immune interactions. I have initiated a collaboration with Dr. Roland R. Arnold of the Dental Research Center, an expert with more than 20 years of experience in bacterial infection. In June, 2003, Dr. Hong-hong Wei joined my laboratory from China to work on this project with us. Dr. Arnold has developed a subcutaneous tissue chamber model that creates a contained environment for the study of host-pathogen interactions *in vivo*. Different infectious organisms have been studied in this model, but studies with *Porphyromonas gingivalis* have resulted in the most provocative data. These data provide insight into the inflammatory and immune mechanisms of the pathologic processes associated with Gram-negative infectious bacteria. There are three strain-specific outcomes following infectious challenge with *P. gingivalis* that differ along a continuum of non-infectious, infectious-non-disseminating, and infectious-disseminating strains and clearly involve discrete bacterially directed host responses. *P. gingivalis* is a strict anaerobe that is highly fastidious in its nutritional and growth requirements. The different strains of *P. gingivalis* have morphologically and physiologically distinguishable properties that relate to their different virulence traits. For example, the strains differ with regard to the production of discrete proteases and their autoaggregation property. The different strains have well-defined unique characteristics, but also there are discrete and unique host responses to infection challenge with the different strains that also determine the pathologic outcome of *P. gingivalis* infection. These host responses include differences in local and systemic production of specific cytokines and inflammatory mediators. The interaction of host responses with bacterial strain determines whether there is containment and clearance of the bacteria, or a more detrimental outcome such as bacterial spreading and dissemination. Our studies will determine how opioids alter the progression of infection with these different strains of *P. gingivalis*. My plan is to acquire fundamental knowledge of the classification of bacteria and their properties. I will learn methods for culturing bacteria, infectious dosing, monitoring the progression of infection, and harvesting tissues for bacteriological and immunological analysis. I plan to learn basic qualitative and quantitative anaerobic microbiological techniques along with the specific procedures required for *P. gingivalis*. Currently, I hold three major RO-1 grants from NIDA to investigate the health consequences of drug use, particularly opioid drugs such as heroin and morphine. These investigations have tremendous clinical importance as there is a high incidence of bacterial, viral, and fungal infections among heroin users. Moreover, morphine, a related form of heroin, has very wide-spread use as an analgesic in hospital

and other clinical settings.

In the next five years, I will devote the majority of time to the pursuit of my long-term goal of understanding opioid-immune interactions. This goal will be accomplished within the framework of existing NIH funded projects, as well as my KO-2 award (**DA-00334**). The first project (**DA07481**), entitled Behavioral Determinants of Opioid/Immune Interactions, provides an examination of opioid-induced alterations of immune status with emphasis on the role of the central nervous system and pharmacological variables in these interactions. Specifically, the proposal is to conduct studies on the effects of acute and chronic opioid administration on immune function, and identify the specific brain regions involved in those effects. The second project (**DA-13371**), entitled Opioid-induced Alterations of Nitric Oxide Production, will test the hypothesis that opioids acting at the level of the central nervous system induce alterations in nitric oxide production by tissue macrophages. This project will determine the subtype(s) of opioid receptors involved in opioid-induced alterations of nitric oxide production, and characterize the effect of opioid administration on nitric oxide production *in vivo*. Finally, I have initiated a new project to investigate sex differences in opioid-induced immunomodulation. We have conducted a number of studies and I currently have a new RO-1 grant (**DA-015709**) to continue this work. Collectively, these projects will provide important new information about how the central nervous system modulates the immune system, and the interdisciplinary approach of my research promises to provide a comprehensive understanding of the complex relationships between stress, drugs of abuse, and disease.

Service Experience and Plan for Five Years

My commitment to academics extends beyond research and teaching, as I have always felt that **faculty service** is essential to the life of a University and the local community. During my 13 year career at UNC, I have been involved in a variety of service activities. From 1995-2004, I was appointed the **Director of the Biological Psychology Program** with a substantial portion of my time devoted to the success of the Program. The Biological Psychology program covers a broad range of research areas. The program includes faculty not only from Psychology but also from other departments within the University such as Psychiatry, as well as other research institutions within the Research Triangle area such as the US Environmental Protection Agency. The Biological Psychology Training Program is sponsored by two NIH pre-doctoral training grants. One training grant is from the National Institute on Drug Abuse. The other training grant is from the National Institute on Mental Health and is shared with the Curriculum in Neurobiology. In 2004, I was appointed the **Associate Chair of Psychology**. In this new role, I have launched several initiatives that are directed at enhancing the academic environment of the department. For example, I have started work to revamp our system for mentoring and evaluating our junior faculty who are just starting their careers so that we can be assured of their success. I am chairing a new committee charged with nominating our faculty for awards to enhance the recognition of the contributions of our faculty and the department. I also chair the Website Committee and the Space Committee for the department.

Additionally, I serve on a number of other administrative committees including the Department of Psychology Advisory Committee, Space committee, and the Animal Care and Use Committee. Also, I serve on the Michael Polanyi Visiting Lectureship Committee, and the Advisory Committee for the Department of Laboratory Animal Medicine. My past committee involvements include being a member of the University Teaching Awards Committee, the Research Advisory Committee which was advisory to the Vice Chancellor for Research and Graduate Studies (Thomas Myer), and the Faculty Committee on Research which was advisory to the late Chancellor, Michael Hooker. In my research specialty, I serve on committees for the Psychoneuroimmunology Research Society and the newly formed Society for Neuroimmune Pharmacology. I am a member of the Editorial Board for two scientific journals, *Brain, Behavior, and Immunity* and *Behavioral Neuroscience*. Moreover, I act as an ad-hoc reviewer for about 12 other scientific journals. Furthermore, I am often asked to serve on the National Institute of Drug Abuse Scientific Review Committees for training and research related applications.

In addition to my academic service, I have used my expertise in canine behavior to provide service to the NC community. I am a canine handler for NC Search & Rescue Dog Association (NCSARDA). NCSARDA is a non-profit organization dedicated to saving the lives of lost persons by use of highly skilled personnel trained in search tactics, search management, and the use of specialized air scenting canines. The team members train continuously and respond at the request of local, state, or federal agencies to search for missing/lost persons in both wilderness and urban areas. The team responds to an average of forty calls per year most often to locate missing/lost children and elderly adults.