**CURRICULUM VITAE**

Michela Gallagher, Ph.D.
The Johns Hopkins University
Department of Psychological and Brain Sciences
216B Ames Hall, 3400 North Charles Street
Baltimore, Maryland 21218
Telephone: (410) 516 - 0167
Fax: (410) 516 - 0494
michela@jhu.edu

**Education:**

B.A., Colgate University, 1969.

Ph.D., The University of Vermont, 1977, Physiological Psychology.
Thesis title: *The Effects of Norepinephrine Manipulations in the Amygdala on Time-Dependent Memory Processes.*

**Faculty Appointments**:

The University of Vermont, Assistant Professor of Psychology, 1977-1980.
The University of North Carolina at Chapel Hill, Assistant Professor of Psychology, 1980-1984.
The University of North Carolina at Chapel Hill, Neurobiology Program Faculty, 1980-1997.
The University of North Carolina at Chapel Hill, Associate Professor of Psychology, 1984-1988.
The University of North Carolina at Chapel Hill, Professor of Psychology, 1989-1997.
The University of North Carolina at Chapel Hill, Director of the Graduate Training Program in Experimental and Biological Psychology, 1990-1995.
Duke University, Adjunct Professor of Psychology: Experimental, 1994-1997.
The University of North Carolina at Chapel Hill, Kenan Professor of Psychology, 1994-1997.
The Johns Hopkins University, Professor of Psychology, 1997-present.
The Johns Hopkins University, Professor of Neuroscience, 1998-present.
The Johns Hopkins University, Chair of the Department of Psychological and Brain Sciences, 2000-2007.
The Johns Hopkins University, Vice-Provost for Academic Affairs, 2008-2011.
The Johns Hopkins University, Interim Dean for the Krieger School of Arts and Sciences, 2010.
The Johns Hopkins University, Krieger-Eisenhower Professor, 2003-present.
Director of The Johns Hopkins University, Neurogenetics and Behavior Center, 2003-present.
The Johns Hopkins Kavli Neuroscience Discovery Institute, Executive Committee and Associate Member, 2015-present.

**Synopsis of Scientific Contributions (in current NIH biosketch format):**

**Memory modulation:** Early in my career I conducted studies of memory modulation using neuropharmacological approaches. These studies were particularly novel at the time in extending a retrograde paradigm to study memory for rewarding as well as aversive experiences. Research continues in these areas, with studies on brain circuits and neurochemical systems from this phase of my work, which also represented a valuable and relevant background to current translational studies with therapeutics (see Scientific Contribution #5).


Gallagher, M., Kapp, B.S., Musty, R.E., & Driscoll, P.A. (1977). Memory formation: Evidence for a specific neurochemical system in the amygdala. *Science*, *198*(4315): 423-425. PMID: 20664.

Gallagher, M., & Kapp, B.S. (1978). Manipulation of opiate activity in the amygdala alters memory processes. *Life Sciences*, *23*(19): 1973-1977. PMID: 214656.

Gallagher, M., Kapp, B.S., Frysinger, R.C., & Rapp, P.R. (1980). ß-adrenergic manipulation in amygdala central n. alters rabbit heart rate conditioning. *Pharmacology, Biochemistry and Behavior*, *12*(3): 419-426. PMID: 6248896.

Gallagher, M., King, R.A., & Young, N.B. (1983). Opiate antagonists improve spatial memory. *Science*, *221*(4614): 975-976. PMID: 6879198.


**Associative learning functions of amygdala subsystems:** This research isolated distinctive functions of the central nucleus and the basolateral nucleus of the amygdala in associative learning. Studies also identified connectional circuitry with other subcortical systems in the mediation of these functions. Notably, this research at the time focused the role of the amygdala in appetitive and reward learning, alongside the focus of much research on the amygdala and fear conditioning to which I also contributed scientifically.


Gallagher, M., Graham, P.W., & Holland, P.C. (1990). The amygdala central nucleus and appetitive Pavlovian conditioning: Lesions impair one class of conditioned behavior. *The Journal of Neuroscience*, *10*(6): 1906-1911. PMID: 2355257.

Gallagher, M., & Holland, P.C. (1994). The amygdala complex: Multiple roles in associative learning and attention. *Proceedings of the National Academy of Sciences of the United States of America, 91*(25): 11771-11776. PMID: 7991534.

Petrovich, G.D., Setlow, B., Holland, P.C., & Gallagher, M. (2002). Amygdalo-hypothalamic circuit allows learned cues to override satiety and promote eating. *The Journal of Neuroscience*, *22*(19): 8748-8753. PMID: 12351750.

Holland, P.C., & Gallagher, M. (2006). Different roles for amygdala central nucleus and substantia innominata in the surprise-induced enhancement of learning. *The Journal of Neuroscience, 26*(14): 3791-3797. PMID: 16597732.


**Outcome expectancy and the prefrontal cortex:** My work first used a reinforcer devaluation procedure to probe the function of orbitofrontal cortex in rodents (Gallagher et al 1999). The research on prefrontal cortex also employed large-scale electrophysiological recordings in orbitofrontal cortex and the interconnected basolateral amygdala to study the information encoding properties at cortical and subcortical sites and the effects of disconnection on behavior and neural encoding. This work in rats has extended to studies in non-human primates and in the use of neuroimaging to capture a

similar functional network in humans. My work has also extended and refined prefrontal behavioral protocols for use in mouse models.


Schoenbaum, G., Chiba, A.A., & Gallagher, M. (1998). Orbitofrontal cortex and basolateral amygdala encode expected outcomes during learning. *Nature Neuroscience*, *1*(2): 155-159. PMID: 10195132.

Gallagher, M., McMahan, R., & Schoenbaum, G. (1999). Orbitofrontal cortex and representation of incentive value in associative learning. *The Journal of Neuroscience*, *19*(15): 6610-6614. PMID: 10414988.

Schoenbaum, G., Setlow, B., Saddoris, M.P., & Gallagher, M. (2003). Encoding predicted outcome and acquired value in orbitofrontal cortex during cue sampling depends upon input from basolateral amygdala. *Neuron*, *39*(5): 855-867. PMID: 12948451.

Mayse, J., Nelson, G. Avila, I., Gallagher, M., Lin, S.C. (2015). Basal forebrain neuronal inhibition enables rapid behavioral stopping. *Nature Neuroscience,* 18:1501–1508. doi: 10.1038/nn.4110. PMID:26368943; PMCID: PMC4583818.


**An outbred rat model for individual differences in neurocognitive aging:** I developed a well-characterized outbred rat model in which a subpopulation of rats exhibit age-related memory impairment while aged cohorts have preserved memory function. Key discoveries in the model demonstrated 1) preserved neuron number in the hippocampal system, irrespective of age or cognitive status, 2) circuit specific loss of synaptic connectivity and plasticity, and 3) network-wide alterations, including elevated activity of CA3 pyramidal neurons to shift the balance of pattern separation and pattern completion as a basis for age-related memory impairment. This model served as a basis for translational studies in humans as described in the section that follows.


Gallagher, M., Burwell, R., & Burchinal, M. (1993). Severity of spatial learning impairment in aging: Development of a learning index for performance in the Morris water maze. *Behavioral Neuroscience*, *107*(4): 618-626. PMID: 8397866.

Rapp, P.R., & Gallagher, M. (1996). Preserved neuron number in the hippocampus of aged rats with spatial learning deficits. *Proceedings of the National Academy of Science of the United States of America*, *93*(18): 9926-9930. PMID: 8790433.

Wilson, I.A., Ikonen, S., Gallagher, M., Eichenbaum, H., & Tanila H. (2005). Age-associated alterations of hippocampal place cells are subregion specific. *The Journal of Neuroscience*, *25*(29): 6877-6886. PMID: 16033897.

Stranahan, A.M., Haberman, R.P., & Gallagher, M. (2011). Cognitive decline is associated with reduced reelin expression in the entorhinal cortex of aged rats. *Cerebral Cortex, 21*(2): 392-400. PMID: 20538740; PMCID: 3020582.


**Translational research to target hippocampal overactivity as a basis for memory impairment in aging and patients with aMCI:** Based on findings in the outbred rat model, we targeted hippocampal overactivity with experimental therapeutics. Such treatments improved memory performance and network properties in aged rodents. We used high-resolution fMRI to isolate hippocampal overactivity in human aging (compared to young) and in patients with aMCI (compared to age-matched controls), which was localized to the DG/CA3 in both conditions. I then led a clinical study that demonstrated the efficacy of treatment with the atypical anti-epileptic levetiracetam at

low doses to reduce overactivity and improve performance in the scanning task in patients with aMCI (Bakker et al 2012; Bakker et al. 2015). Support for a FDA registered trial in aMCI is provided by NIA under the NIH public/private partnership, on which I serve as Co-PI with Marilyn Albert, Director of the Johns Hopkins Alzheimer's Disease Research Center


Koh M.T., Haberman R.P., Foti S., McCown T.J., & Gallagher M. (2010). Treatment strategies targeting excess hippocampal activity benefit aged rats with cognitive impairment. *Neuropsychopharmacology, 35*(4): 1016-1025. PMID: 20032967; PMCID: PMC2820138.

Yassa, M.A., Lacy, J.W., Stark, S.M., Albert, M.S., Gallagher, M., & Stark, C.E.L. (2010). Pattern separation deficits associated with increased hippocampal CA3 and dentate gyrus activity in nondemented older adults. *Hippocampus, 21*(9). PMID: 20865732; PMCID: 3010452.

Bakker, A., Krauss, G.L., Albert, M.S., Speck, C.L., Jones, L.R., Stark, C.E., Yassa, M.A., Bassett, S.S., Shelton, A.L., & Gallagher, M. (2012). Reduction of hippocampal hyperactivity improves cognition in amnestic mild cognitive impairment. *Neuron, 74*(3): 467-474. PMID: 22578498; PMCID: PMC3351697.

Bakker, A., Albert, M. S., Krauss, G., Speck, C. L., Gallagher, M. (2015). Response of the medial temporal lobe network in amnestic mild cognitive impairment to therapeutic intervention assessed by fMRI and memory task performance. *NeuroImage: Clinical*. 2015 Feb 21;7:688-98. doi: 10.1016/j.nicl.2015.02.009. [eCollection 2015]. PMID: 25844322; PMCID: PMC4377841.


***Honors and Awards***

NIMH Research Scientist Development Award, 1980-1990.
NIMH Research Scientist Award, 1990-1999.
University of Vermont Distinguished Alumni Award, 2000.
Bristol-Myers Squibb Foundation, Freedom to Discover Award, 2003-2008.
Ellison Medical Foundation, Senior Scientist Award, 2008-2012.
International Behavioral Neuroscience Society Career Achievement Award, 2008.
American Psychological Association, D.O. Hebb Distinguished Scientific Contribution Award, 2010.
Society for Neuroscience, Mika Salpeter Lifetime Achievement Award, 2014.
Pavlovian Society, Gantt Medal, 2017.
Alzheimer's Drug Discovery Foundation, Melvin R. Goodes Prize for Excellence in Alzheimer's Drug Discovery, 2018.
Alzheimer's Drug Discovery Foundation, Estelle Gelmen Award for Innovation in Drug Discovery, 2019.
University of Vermont, Doctor of Science, *honoris causa,* 2019.

**Professional Affiliations:**

American Association for the Advancement of Science, Fellow.
American Psychological Association, Fellow.
Association for Psychological Science, Fellow.
The Society for Neuroscience, Member.

European Brain and Behaviour Society, Member.
Memory Disorders Research Society, Member.

**Professional Activities (selected from 1988-present):**

***NIH activities***

National Institute of Mental Health, Study Section, Cellular Neurobiology and Psychopharmacology Subcommittee, 1988-1990.
National Institute of Mental Health, Chair, Study Section, Neurochemistry and Neuropharmacology, 1990-1992.
National Institute on Aging, Study Section, Neuroscience, Behavior, and Sociology of Aging, Subcommittee A, 1994-1997.
National Institute on Aging, Oversight Committee for Alzheimer's Disease Clinical Research Unit, 1991-2007.
National Institute on Mental Health, Board of Scientific Counselors, 2004-2009.
National Institute on Aging, Board of Scientific Counselors, 2007-2012.

***Editorial Activities***

Associate Editor, *Psychobiology,* 1986-1989.
Section Editor, *Neurobiology of Aging*, 1993-1998.
Editor-in-chief, *Behavioral Neuroscience,* Journal of the American Psychological Association, 1995-2001.
Editorial Committee, *Annual Review of Psychology*, 1996.
Guest Editor, *Current Opinion in Neurobiology - Cognitive Neuroscience*, 1999.
Editor, *Volume 3 Biological Psychology, Handbook for Psychology*, John Wiley & Sons.
Editorial Boards *Hippocampus*, *Behavioral Neuroscience, Learning and Memory. Behavior Neuroscience*, Editor Search Committee, 2013

***Professional Societies & Committees***

Sigma Xi
American Psychological Society, Task Force on Graduate Education, 1988-1992.
The University of North Carolina at Chapel Hill Chapter of Sigma Xi, Executive Committee and President, 1989-1994.
American Psychological Association, Committee on Animals in Research and Ethics, 1990-1992.
Society for Neuroscience, Nominating Committee, 1990.
American Psychological Society, Governing Board and Secretary, 1991-1993.
Society for Neuroscience, Lindsley Award Committee, 1994-1996.
American Association for the Advancement of Science, Electorate Nominating Committee, 1998-2000.
Society for Neuroscience Minority Fellowship Program, Advisory Board, 1998 - 2001.
Society for Neuroscience, Nominating Committee, 2001.
Society for Neuroscience, Lindsley Award Committee Chair, 2001-2003.

Society for Neuroscience, Publication Committee, 2001-2003.
Society for Neuroscience Achievement Awards Selection Committee, 2014-2018

***Advisory Boards***

Tennessee Mouse Genome Consortium, 2001-2004.
Bristol Myers Squibb Foundation Neuroscience Award Selection Committee, 2003-2008.
Georgetown-Hopkins Working Group on Neuroscience and Moral Philosophy, 2005-2011.
Internal Scientific Advisory Committee of the Johns Hopkins Alzheimer's Disease Research Center, 2006-present.
Nanotech and the Behavioral Sciences, A Working Group of the Federation of Behavioral, Psychological, and Cognitive Sciences, Co-Chair, 2007-2011.
Jackson Labs, Nathan Shock Center Advisory Board, 2008-2010.
Stanley Center for Psychiatric Research at the Broad Institute, Scientific Advisory Board, 2009-2015.
University of Minnesota, N. Budd Grossman Center for Memory Research and Care, Board of Directors, 2010-2015.
Alzforum, Alzheimer's Association, advisory group, 2009-present.
University of California, San Francisco, The Gladstone Institutes, External Advisory Behavioral Core Committee, 2011-present.
Council of the German Center for Neurodegenerative Disease (DZNE), DZNE Senate Member, 2015-present.

**Notable Speaking Engagements 2016-2018:**

Plenary Speaker, "Challenges in Alzheimer's Disease: The Use of Brain Imaging in Translational Drug Discovery," The 89th Annual Meeting of the Japanese Pharmacological Society, March 9 –11, 2016, Yokohama, Japan.

Invited Speaker, "Contributions of neurocognitive aging to risk or resilience" Cognitive Aging Summit III, April 6-7, 2016, Bethesda, MD.

Invited Speaker, "Gaps and Bridges: Translating the Function of Neurocognitive Systems from Rodents to Primates," Gladstone Institutes Behavioral Neuroscience Symposium, November 1, 2016, San Francisco, CA.

Panelist, Alzheimer's Drug Discovery Foundation 7th Annual Fall Symposium, November 14, 2016, New York, NY.

Invited Speaker, "The Two-Way Street Linking Amyloid, Tau, and Neural Activity," Alzheimer's Association International Conference, July 16-20, 2017, London, UK.

Invited Speaker, “Treating Early AD with Antiepileptic Drugs,” Alzheimer’s Association Workshop on the Intersection of Epilepsy and Alzheimer’s Disease, September 24-25, 2017, Chicago, IL.

Keynote Speaker, “The Two-Way Street Linking Rodent and Primate Brains in Translational Research,” Pavlovian Society Meeting, October 6-7, 2017, Philadelphia, PA.

Panelist, NIH Alzheimer’s Research Summit: Path to Treatment and Prevention, March 1-2, 2018, Bethesda, MD.

Invited Speaker, “Targeting Hippocampal Overreactivity in Prodromal Alzheimer's Disease,” American Society for Experimental Neurotherapeutics Annual Meeting, March 7-10, 2018, Rockville, MD.

Invited Speaker, “Contributions of Neurocognitive Aging to Risk and Resilience,” University of Florida William G. Luttge Lectureship in Neuroscience, March 15, 2018, Gainesville, FL.

Panelist, “Alzheimer’s Disease: Rewriting the Playbook,” 2018 Milken Global Conference, April 30, 2018, Los Angeles, CA.

**Active Research Support:**

NIA PO1 AG09973-24 (Gallagher, P.I.)
“Cognition and Hippocampal/Cortical Systems in Aging”

NIMH P50 MH094268 (Sawa, P.I.: M. Gallagher Behavioral Core Leader)
"Gene-Environment Interactions for Cortical Development and Schizophrenia"

NIA R01AG048349-03 (Albert, Gallagher, Co-PIs)
“Phase III trial for Slowing Progression in Mild Cognitive Impairment”

T32 AG027668 (Gallagher, Knierim, co-PI.s.)
“Research Training in Age-Related Cognitive Disorders”

Mentored Fellowship (Tran, Tammy) 9/1/15-9/1/18
National Defense Science and Engineering Graduate Fellowship

Mentored Fellowship (Branch, Audrey) 01/15/17-01/14/19
Kavli Neuroscience Discovery Institute Postdoctoral Discovery Fellows Program
Three-dimensional analysis of newborn neuron integration in aging

Mentored Fellowship (Corona, Caitlin) 2018-present
Dr. Kelly Miller Underrepresented Minority Graduate Fellowship

**Other Notable Previous Research Support:**

National Institute on Aging RC 2AG36419, Gallagher, P.I.
American Recovery and Reinvestment Act Funding
"Bridging Cognitive Aging in Rodents to Man Using fMRI in Amnestic MCI"

National Center for Research Resources P40 RR017688, Gallagher, P.I.
"Neurogenetics and Behavior Center"

Ellison Medical Foundation AG SS206408 (Gallagher, P.I.)
"Neurocognitive Phenotyping in a Cross-Sectional Study of Aging in 32 Inbred Strains of Mice"

National Science Foundation Individual Investigator Grant, Gallagher, P.I.

National Institute of Mental Health RO1 MH060179, Gallagher, P.I.
"Associative Functions of Basolateral Amygdala"

Human Frontiers Award
Supported project with P. Holland, E. Murray, T. Robbins, & E. Everitt.

Research Scientist Awards (20 years total of 'development' and then 'senior scientist' KO support) NIMH 1980-1999.

**Research Articles, Review Articles, Invited Papers, and Commentaries:**

Gallagher, M., Kapp, B.S., Musty, R.E., & Driscoll, P.A. (1977). Memory formation: Evidence for a specific neurochemical system in the amygdala. *Science*, *198*(4315): 423-425. PMID: 20664.

Gallagher, M., & Kapp, B.S. (1978). Manipulation of opiate activity in the amygdala alters memory processes. *Life Sciences*, *23*(19): 1973-1977. PMID: 214656.

Kapp, B.S., & Gallagher, M. (1979). Opiates and memory. *Trends in Neurosciences, 2*: 177-180.

Kapp, B.S., Gallagher, M., Holmquist, B.K., & Theall, C.L. (1978). Retrograde amnesia & hippocampal stimulation: Dependence upon the nature of associations formed during conditioning. *Behavioral Biology*, *24*(1): 1-23. PMID: 570029.

Kapp, B.S., Frysinger, R.C., Gallagher, M., & Haselton, J.R. (1979). Amygdala central nucleus lesions: Effect on heart rate conditioning in the rabbit. *Physiology and Behavior*, *23*(6): 1109-1117. PMID: 542522.

Gallagher, M., Kapp, B.S., Frysinger, R.C., & Rapp, P.R. (1980). ß-adrenergic manipulation in amygdala central n. alters rabbit heart rate conditioning. *Pharmacology, Biochemistry and Behavior*, *12*(3): 419-426. PMID: 6248896.

Gallagher, M., & Kapp, B.S. (1981). Effect of phentolamine administration into the amygdala complex of rats on time-dependent memory process. *Behavioral and Neural Biology*, *31*(1): 90-95. PMID: 6118125.

Gallagher, M., Kapp, B.S., McNall, C.L., & Pascoe, J.P. (1981). Opiate effects within the amygdala central nucleus on heart rate conditioning in rabbits. *Pharmacology, Biochemistry and Behavior*, *14*(4): 497-505. PMID: 7232473.

Gallagher, M., & Kapp, B.S. (1981). Influence of amygdala opiate sensitive mechanisms, fear motivated responses, and memory processes for aversive experiences. In J. L.Martinez, Jr., R. A. Jensen, R.B. Messing, J. Rigter, & J. L. McGaugh (Eds.), *Endogenous Peptides and Learning and Memory Processes* (pp. 445-462). New York: Academic Press.

Gallagher, M., Kapp, B.S., Pascoe, J.P., & Rapp, P.R. (1981). A neuropharmacology of amygdala systems which contribute to learning and memory. In Y-Ben-Ari (Ed.), *The Amygdaloid Complex* (pp. 343-354). Amsterdam: Elsevier/North Holland Biomedical Press.

Hynes, M.A., Gallagher, M., & Yacos, K.V. (1981). Systemic and intraventricular naloxone administration: Effects on food and water intake in rats. *Behavioral and Neural Biology*, *32*(3): 334-342. PMID: 7283923.

Kapp, B.S., Gallagher, M., Frysinger, R.C., & Applegate, C.D. (1981). The amygdala, emotion and cardiovascular conditioning. In Y-Ben-Ari (Ed.), *The Amygdaloid Complex* (pp. 355-366). Amsterdam: Elsevier/North Holland Biomedical Press.

Applegate, C.D., Frysinger, R.C., Kapp, B.S., & Gallagher, M. (1982). Multiple unit activity in the amygdala central nucleus during aversive Pavlovian heart rate conditioning in the rabbit. *Brain Research*, *238*(2): 457-462. PMID: 7093668.

Gallagher, M. (1982). Naloxone enhancement of memory processes: Effects of other opiate antagonists. *Behavioral and Neural Biology*, *35*(4): 375-382. PMID: 6299265.

Gallagher, M., Kapp, B.S., & Pascoe, J.P. (1982). Enkephalin analogue effects in amygdala central nucleus on conditioned heart rate. *Pharmacology, Biochemistry and Behavior, 17*(2): 217-222. PMID: 6291066.

Kapp, B.S., Gallagher, M., Underwood, M.D., McNall, C.L., & Whitehorn, D. (1982). Cardiovascular responses elicited by electrical stimulation of the amygdala in the rabbit. *Brain Research*, *234*(2): 251-262. PMID: 7059829.

Kapp, B.S., Gallagher, M., Applegate, C.D., & Frysinger, R.C. (1982). The amygdala central nucleus: Contributions to conditioned cardiovascular responding during aversive Pavlovian conditioning in the rabbit. In C. D. Woody (Ed.), *Conditioning: Representation of Involved Neural Function* (pp. 343-354). New York: Plenum Press.

Walsh, T., Gallagher, M., Bostock, E., & Dyer, R.S. (1982). Trimethyltin impairs retention of a passive avoidance task. *Neurobehavioral Toxicology and Teratology*, *4*(2): 163-167. PMID: 7088244.

Gallagher, M., King, R.A., & Young, N.B. (1983). Opiate antagonists improve spatial memory. *Science*, *221*(4614): 975-976. PMID: 6879198.

Pascoe, J.P., Gallagher, M., & Kapp, B.S. (1983). Benzodiazepine effects on heart rate conditioning in the rabbit. *Psychopharmacology*, *79*(2-3): 256-261. PMID: 6133306.

Gallagher, M. (1984). Current perspectives on memory systems and their modulation. In G. Lynch, J. L. McGaugh, & N. M. Weinberger (Eds.), *Neurobiology of Learning and Memory* (pp. 368-372). New York: Guilford Press.

Gallagher, M. (1984). Neurochemical modulation of memory: A case for opioid peptides. In L. Squire & N. Butters (Eds.), *Neuropsychology of Memory* (pp. 579-587). New York: Guilford Publications, Inc.

Fanelli, R.J., Rosenberg, R.A., & Gallagher, M. (1985). Role of noradrenergic function in opiate antagonist facilitation of spatial memory. *Behavioral Neuroscience*, *99*(4): 751-755. PMID: 3939666.

Gallagher, M. (1985). Effect of ß-funaltrexamine (ß-FNA) on retention of passive avoidance conditioning. *Behavioral and Neural Biology*, *44*(3): 499-502. PMID: 3002317.

Gallagher, M. (1985). Re-viewing modulation of learning and memory. In N.M. Weinberger, J. L. McGaugh, & G. Lynch (Eds.), *Memory Systems of the Brain: Animal and Human Cognitive Processes* (pp. 311-334). New York: Gilford Press.

Gallagher, M., Fanelli, R.J., & Bostock, E. (1985). Opioid peptides: Their position among other neuroregulators of memory. In J.L. McGaugh (Ed.),

*Contemporary Psychology: Biological Processes and Theoretical Issues* (pp. 69-93). Amsterdam: Elsevier/North Holland Biomedical Press.

Gallagher, M., Bostock, E., & King, R.A. (1985). Effects of opiate antagonists on spatial memory in young and aged rats. *Behavioral and Neural Biology*, *44*(3): 374-385. PMID: 4084183.

Gallagher, M., Rapp, P.R., & Fanelli, R.J. (1985). Opiate antagonist facilitation of time-dependent memory processes: Dependence upon intact norepinephrine function. *Brain Research*, *347*(2): 284-290. PMID: 3933763.

Decker, M.W., & Gallagher, M. (1987). Scopolamine-disruption of radial arm maze performance: Modification by noradrenergic depletion. *Brain Research*, *417*(1): 59-69. PMID: 3620979.

Gallagher, M., Bostock, E., & Meagher, M.W. (1987). Effects of opiate manipulations on latent inhibition in rabbits: Sensitivity of the medial septal area to intracranial treatments. *Behavioral Neuroscience*, *101*(3): 315-324. PMID: 3038136.

Pelleymounter, M.A., & Gallagher, M. (1987). Spatial learning impairments in aged rats trained with a salient configuration of stimuli. *Psychobiology, 15*(3): 248-254. PMID: Unavailable.

Rapp, P.R., Fanelli, R.F., McGuire, M., Rosenberg, R.A., & Gallagher, M. (1987). Alterations in [3H]-desmethylimipramine binding in the aged rat brain: an in vitro autoradiographic demonstration. *Neuroscience Letters, 79*(1-2): 17-22. PMID: 3670726.

Rapp, P.R., Rosenberg, R.A., & Gallagher, M. (1987). An evaluation of spatial information processing in aged rats. *Behavioral Neuroscience*, *101*(1): 3-12. PMID: 3828055.

Bostock, E., Gallagher, M., & King, R.A. (1988). Effects of opioid microinjections into the medial septal area on spatial memory in rats. *Behavioral Neuroscience*, *102*(5): 643-652. PMID: 3196434.

Decker, M.W., Pelleymounter, M., & Gallagher, M. (1988). Effects of training on a spatial memory task on high-affinity choline uptake in hippocampus and cortex in young adult and aged rats. *The Journal of Neuroscience*, *8*(1): 90-99. PMID: 3339421.

Gallagher, M. (1988). Behavioral significance of opioid peptides in relation to hippocampal function. *NIDA Research Monograph, 82*: 118-132. PMID: 2969457.

Gallagher, M., & Pelleymounter, M.A. (1988). An age-related spatial learning deficit: Choline uptake distinguishes "impaired" and "unimpaired" rats. *Neurobiology of Aging*, *9*(4): 363-369. PMID: 3185855.

Gallagher, M., & Pelleymounter, M.A. (1988). Spatial learning deficits in old rats: A model for memory decline in the aged. *Neurobiology of Aging*, *9*(5-6): 549-556. PMID: 3062465.

Gallagher, M., & Burwell, R.D. (1989). Relationship of age-related decline across several behavioral domains. *Neurobiology of Aging*, *10*(6): 691-708. PMID: 2628781.

Gallagher, M., Meagher, M., & Decker, M.W. (1989). Distinctive functional properties of limbic system opioid peptides. In Y. Tache (Ed.), *Neuropeptides and Stress* (pp. 2297-2312). New York: Springer-Verlag.

Jiang, H.-K., Owyang, V., Hong, J.-S., & Gallagher, M. (1989). Elevated dynorphin in the hippocampal formation of aged rats: Relation to cognitive impairment on a spatial learning task. *Proceedings of the National Academy of Science of the United States*, *86*(8): 2948-2951. PMID: 2565040.

Robinson, G.S.,Jr., Crooks, G.B.,Jr., Shinkman, P.G., & Gallagher, M. (1989). Behavioral effects of MK-801 mimic deficits associated with hippocampal damage. *Psychobiology*, *17*(2): 156-164. PMID: Unavailable.

Gallagher, M., Burwell, R.D., Kodsi, M.H., McKinney, M., Southerland, S., Vella-Rountree, L., & Lewis, M.H. (1990). Markers for biogenic amines in the aged rat brain: Relationship to decline in spatial learning ability. *Neurobiology of Aging*, *11*(5): 507-514. PMID: 2234281.

Gallagher, M. (1990) Robinson et al. (1989) deserves another look. *Psychobiology*, 18(3): 258-260.

Gallagher, M., Graham, P.W., & Holland, P.C. (1990). The amygdala central nucleus and appetitive Pavlovian conditioning: Lesions impair one class of conditioned behavior. *The Journal of Neuroscience*, *10*(6): 1906-1911. PMID: 2355257.

Pelleymounter, M.A., Beatty, G., & Gallagher, M. (1990). Hippocampal [3H]-CPP binding and spatial learning deficits in aged rats. *Psychobiology*, *18*(3): 298-304. PMID: Unavailable.

Zhang, W.-Q., Mundy, W.R., Thai, L., Gallagher, M., Tilson, H.A., & Hong, J.-S. (1991). Decreased glutamate release correlates with elevated dynorphin content in the hippocampus of aged rats with spatial learning deficits. *Hippocampus*, *1*(4): 391-398. PMID: 1688281.

Burwell, R.D., Whealin, J., & Gallagher, M. (1992). Effects of aging on the diurnal pattern of water intake in rats. *Behavioral and Neural Biology*, *58*(3): 196-203. PMID: 1456941.

Gallagher, M., & Holland, P.C. (1992). Preserved configural learning and spatial learning impairment in rats with hippocampal damage. *Hippocampus*, *2*(1): 81-88. PMID: 1308174.

Gallagher, M., & Holland, P.C. (1992). Understanding the function of the central nucleus: Is simple conditioning enough? In J. Aggleton (Ed.), *The Amygdala: Neurobiological aspects of emotion, memory, and mental dysfunction* (pp. 307-321). New York: John Wiley & Sons.

Hatfield, T., Graham, P.H., & Gallagher, M. (1992). Taste potentiated odor aversion learning: Role of the amygdaloid basolateral complex and central nucleus. *Behavioral Neuroscience*, *106*(2): 286-293. PMID: 1317183.

Willner, J., Graham, P., Crooks, G., & Gallagher, M. (1992). N-Methyl-D-Aspartate Antagonist D-APV selectively disrupts taste-potentiated odor aversion learning. *Behavioral Neuroscience*, *106*(2): 315-323. PMID: 1350450.

Burwell, R.D., & Gallagher, M. (1993). A longitudinal study of reaction time performance in Long-Evans rats. *Neurobiology of Aging*, *14*(1): 57-64. PMID: 8450934.

Gallagher, M. (1993). Neurochemical markers of age-related memory deficits in rats. *Neuroscience Facts, 4*: 3.

Gallagher, M., Burwell, R., & Burchinal, M. (1993). Severity of spatial learning impairment in aging: Development of a learning index for performance in the Morris water maze. *Behavioral Neuroscience*, *107*(4): 618-626. PMID: 8397866.

Gallagher, M., & Nicolle, M.M. (1993). Animal models of normal aging: Relationship between cognitive decline and markers in hippocampal circuitry. *Behavioral Brain Research,* 57(2): 155-162. PMID: 7906946.

Gallagher, M. (1993). Issues in the development of models for cognitive aging across primate and non-primate species. *Neurobiology of Aging*, *14*(6): 631-633. PMID: 8295668.

Holland, P.C., & Gallagher, M. (1993). Amygdala central nucleus lesions disrupt increments, but not decrements, in Conditioned Stimulus processing. *Behavioral Neuroscience*, *107*(2): 246-253. PMID: 8484890.

Holland, P.C., & Gallagher, M. (1993). Effects of amygdala central nucleus lesions on blocking and unblocking. *Behavioral Neuroscience*, *107*(2): 235-245. PMID: 8484889.

Nagahara, A.H., Nicolle, M.N., & Gallagher, M. (1993). Alterations in [$^{3}$H]-kainate receptor binding in the hippocampal formation of aged Long-Evans rats. *Hippocampus*, *3*(3): 269-277. PMID: 8394771.

Whealin, J., Burwell, R.D., & Gallagher, M. (1993). The effects of aging on diurnal water intake and melatonin binding in the suprachiasmatic nucleus. *Neuroscience Letters*, *154*(1-2): 149-52. PMID: 8361631.

Gallagher, M., Gill, T.M., Baxter, M.G., & Bucci, D.J. (1994). The development of neurobiological models for cognitive decline in aging. *Seminars in Neuroscience, 6*(6)*:* 351-358.

Gallagher, M., Nagahara, A.H., & Burwell, R.D. (1994). Cognition and hippocampal systems in aging: Animal models. In J. L. McGaugh, N. Weinberger, & G. Lynch. (Eds.), *Brain and Memory: Modulation and Mediation of Neuroplasticity* (pp. 103-126). New York: Oxford University Press.

Stenvers, K., Zimmermann, E.M., Gallagher, M., & Lund, P.K. (1994). Expression of insulin-like growth factor binding protein-4 and -5 mRNAs in adult rat forebrain. *The Journal of Comparative Neurology*, *339*(1): 91-105. PMID: 7508953.

Gallagher, M., & Holland, P.C. (1994). The amygdala complex: Multiple roles in associative learning and attention. *Proceedings of the National Academy of Sciences of the United States of America, 91*(25): 11771-11776. PMID: 7991534.

Baxter, M.G., Bucci, D.J., Gorman, L. K., Wiley, R.G., & Gallagher, M. (1995). Selective immunotoxic lesions of basal forebrain cholinergic cells: Effects on learning and memory in rats. *Behavioral Neuroscience*, *109*(4): 714-722. PMID: 7576215.

Bucci, D.J., Chiba, A.A., & Gallagher, M. (1995). Spatial learning in male and female Long-Evans rats. *Behavioral Neuroscience*, *109*(1): 180-183. PMID: 7734074.

Burwell, R.D., Lawler, C.P., & Gallagher, M. (1995). Mesostriatal dopamine markers in aged Long-Evans rats with sensorimotor impairment. *Neurobiology of Aging*, *16*(2): 175-186. PMID: 7777135.

Chiba, A.A., Bucci, D.J., Holland, P.C., & Gallagher, M. (1995). Basal forebrain cholinergic lesions disrupt increments but not decrements in conditioned stimulus processing. *The Journal of Neuroscience, 15*(11): 7315-7322. PMID: 7472485.

Chouinard, M.L., Gallagher, M., Uasuda, R.P., Wolfe, B.B., & McKinney, M. (1995). Hippocampal muscarinic receptor function in spatial learning impaired aged rats. *Neurobiology of Aging*, *16*(6): 955-963. PMID: 8622787.

Han, J.-S., Gallagher, M., & Holland, P.C. (1995). Hippocampal lesions disrupt decrements but not increments in conditioned stimulus processing. *The Journal of Neuroscience, 15*(11): 7323-7329. PMID: 7472486.

Hatfield, T., & Gallagher, M. (1995). Taste-potentiated odor conditioning: Impairment produced by infusion of N-Methyl-D-aspartate antagonist into basolateral amygdala. *Behavioral Neuroscience*, 109: 663-8. PMID: 7576210

Holland, P.C., & Gallagher, M. (1995). Attention and learning. *Learning and Memory: Proceedings of the 23rd Goettingen Neurobiology Conference 1995:* 129-157. PMID: Unavailable.

Gallagher, M., & Colombo, P.J. (1995). Ageing: The cholinergic hypothesis of cognitive decline. *Current Opinion in Neurobiology, 5*(2): 161-168. PMID: 7620303.

Nagahara, A.H., Otto, T., & Gallagher, M. (1995). Entorhinal-Perirhinal lesions impair performance of rats on two versions of place learning in the Morris water maze. *Behavioral Neuroscience*, *109*(1): 3-9. PMID: 7734077.

Smith, T.D., Gallagher, M., & Leslie, F.M. (1995). Cholinergic binding sites in rat brain: Analysis by age and cognitive status. *Neurobiology of Aging*, *16*(2): 161-173. PMID: 7777134.

Zyzak, D.R., Otto, T., Eichenbaum, H., & Gallagher, M. (1995). Cognitive decline associated with normal aging in rats: A neuropsychological approach. *Learning and Memory*, *2*(1): 1-16. PMID: 10467562.

Baxter, M.G., Bucci, D.J., Sobel, T.J., Williams, M.J., Gorman, L.K., & Gallagher, M. (1996). Intact spatial learning following lesions of basal forebrain cholinergic neurons. *Neuroreport*, *7*(8): 1417-1420. PMID: 8856689.

Baxter, M.G., & Gallagher, M. (1996). Authors' response to commentaries. *Neurobiology of Aging, 17*(3): 500. PMID: Unavailable.

Baxter, M.G., & Gallagher, M. (1996). Intact spatial learning in both young and aged rats following selective removal of hippocampal cholinergic input. *Behavioral Neuroscience*, *110*(3): 460-467. PMID: 8888991.

Baxter, M.G., & Gallagher, M. (1996). Neurobiological substrates of behavioral decline: Models and data analytic strategies for individual differences in aging. *Neurobiology of Aging, 17*(3): 491-495. PMID: 8725914.

Gallagher, M., & Chiba, A. (1996). The amygdala and emotion. *Current Opinion in Neurobiology*, *6*(2): 221-227. PMID: 8725964.

Hatfield, T., Han, J.-S., Conley, M., Gallagher, M., & Holland, P.C. (1996). Neurotoxic lesions of the basolateral, but not central, amygdala interfere with Pavlovian second-order conditioning and reinforcer-devaluation effects. *The Journal of Neuroscience*, *16*(16): 5256-5265. PMID: 8756453.

Nagahara, A.H., Gill, M., Nicolle, M., & Gallagher, M. (1996). Alterations in opiate receptor binding in hippocampus of aged Long-Evans rats. *Brain Research*, *707*(1): 22-30. PMID: 8866710.

Nicolle, M.M., Bizon, J., & Gallagher, M. (1996). In vitro autoradiography of ionotropic glutamate receptors in the hippocampus and striatum of aged Long-Evans rats: Relationship to spatial learning. *Neuroscience*, *74*(3): 741-756. PMID: 8884770.

Rapp, P.R., & Gallagher, M. (1996). Preserved neuron number in the hippocampus of aged rats with spatial learning deficits. *Proceedings of the National Academy of Science of the United States of America*, *93*(18): 9926-9930. PMID: 8790433.

Stanton, M.E., & Gallagher, M. (1996). Use of Pavlovian conditioning techniques to study disorders of attention and learning. *Mental Retardation and Developmental Disabilities Reviews*, *2*(4): 234-242.

Stenvers, K. L., Lund, P. K., & Gallagher, M. (1996). Increased expression of type 1 insulin-like growth factor receptor messenger RNA in rat hippocampal formation is associated with aging and behavioral impairment. *Neuroscience*, *72*(2): 505-518. PMID: 8737419.

Sugaya, K., Xu, S.-J., Kent, C., Personett, D., Chouinard, M., Pauly, T., Gallagher, M., & McKinney, M. (1996). Molecular indices of neuronal and glial plasticity in the hippocampal formation in a rodent model of age-induced spatial learning impairment. *The Journal of Neuroscience*, *16*(10): 3427-3443. PMID: 8627377.

Thai, L. Hong, J.-S., Wiley, R.G., & Gallagher, M. (1996). The regulation of hippocampal dynorphin by neural/neuroendocrine pathways: Models for effects of aging on an opioid peptide system. *Neuroscience*, *70*(3): 661-671. PMID: 9045079.

Baxter, M.G., Gallagher, M., & Holland, P.C. (1997). Disruption of decrements in conditioned stimulus processing by selective removal of hippocampal cholinergic input. *The Journal of Neuroscience*, *17*(13): 5230-5236. PMID: 9185560.

Baxter, M.G., & Gallagher, M. (1997). Cognitive effects of selective loss of basal forebrain cholinergic neurons: Implications for cholinergic therapies of Alzheimer's disease. In J. D. Brioni & M. W. Decker (Eds.), *Pharmacological Treatment of Alzheimer's Disease: Molecular and Neurobiological Foundations* (pp. 87-103). New York: John Wiley and Sons, Inc.

Berry, B., McMahan, R., & Gallagher, M. (1997). Spatial learning and memory at defined points of the estrous cycle: Effects on performance of a hippocampal-dependent task. *Behavioral Neuroscience*, *111*(2): 267-274. PMID: 9106667.

Colombo, P.J., Wetsel, W.C., & Gallagher, M. (1997). Spatial memory is related to hippocampal subcellular concentrations of calcium-dependent protein kinase C isoforms in young and aged rats. *Proceedings of the National Academy of Sciences of the United States of America*, *94*(25): 14195-14199. PMID: 9391176.

Han, J.-S., McMahan, R.W., Holland, P.C., & Gallagher, M. (1997). The role of the amygdalo-nigrostriatal pathway in associative learning. *The Journal of Neuroscience*, *17*(10): 3913-3919. PMID: 9133409.

Gallagher, M., & Rapp, P.R. (1997). The use of animal models to study the effects of aging on cognition. *Annual Review of Psychology*, 48: 339-370. PMID: 9046563.

Gallagher, M. (1997). Animal models of memory impairment. *Philosophical Transactions of the Royal Society London. Series B: Biological Sciences*, *352*(1362): 1711-1717. PMID: 9415923; PMCID: PMC1692094.

Nicolle, M.M., Shivers, A., Gill, T.M., & Gallagher, M. (1997). Hippocampal NMDA and Kainate binding in response to entorhinal cortex aspiration or 192 IgG-saporin lesions of the basal forebrain. *Neuroscience*, *77*(3): 649-659. PMID: 9070742.

Rapp, P.R., & Gallagher, M. (1997). Toward a cognitive neuroscience of normal aging. *Advances in Cell Aging and Gerontology*, *2*: 1-21.

Tanila, H., Shapiro, M., Gallagher, M., & Eichenbaum, H. (1997). Brain Aging: changes in the nature of information coding by the hippocampus. *The Journal of Neuroscience*, *17*(13): 5155-5166. PMID: 9185553.

Bucci, D.J., Holland, P.C., & Gallagher, M. (1998). Removal of cholinergic input to rat posterior parietal cortex disrupts incremental processing of conditioned stimuli. *The Journal of Neuroscience*, *18*(19): 8038-8046. PMID: 9742170.

Bucci, D.J., Rosen, D.L., & Gallagher, M. (1998). Effects of age on pilocarpine-induced *c-fos* expression in rat hippocampus and cortex. *Neurobiology of Aging*, *19*(3): 227-232. PMID: 9661997.

Chappell, J., McMahan, R., Chiba, A., & Gallagher, M. (1998). A re-examination of the role of basal forebrain cholinergic neurons in spatial working memory. *Neuropharmacology*, *37*(4-5): 481-487. PMID: 9704989.

Colombo, P.J., & Gallagher, M. (1998). Individual differences in spatial memory and striatal ChAT activity among young and aged rats. *Neurobiology of Learning and Memory*, *70*(3): 314-327. PMID: 9774524.

Gill, T.M., & Gallagher, M. (1998). Evaluation of muscarine M2 receptor sites in basal forebrain and brainstem cholinergic systems of behaviorally characterized young and aged Long-Evans rats. *Neurobiology of Aging*, *19*(3): 217-225. PMID: 9661996.

Han, J.-S., Gallagher, M., & Holland, P.C. (1998). Hippocampal lesions enhance configural learning by reducing proactive interference. *Hippocampus*, *8*(2): 138-146. PMID: 9572720.

Lund, P.K., Stenvers, K.L., & Gallagher, M. (1998). Insulin-like growth factor 1: Regulation and interactions during aging-induced cognitive decline and impairment within the Hippocampus. In E. E. Muller (Ed.), *IGFs in the Nervous System* (pp. 47-59). Milan: Springer-Verlag.

Schoenbaum, G., Chiba, A.A., & Gallagher, M. (1998). Orbitofrontal cortex and basolateral amygdala encode expected outcomes during learning. *Nature Neuroscience*, *1*(2): 155-159. PMID: 10195132.

Sisodia, S.S., & Gallagher, M. (1998). A role for the ß-amyloid precursor protein in memory? *Proceedings of the National Academy of Sciences of the United States of America*, *95*(21): 12074-12076. PMID: 9770440; PMCID: PMC33903.

Smith, D.R., Striplin, C.D., Geller, A.M., Mailman, R.B., Drago, J., Lawler, C.P., & Gallagher, M. (1998). Behavioral assessment of mice lacking D1A dopamine receptors. *Neuroscience*, *86*(1): 135-146. PMID: 9692749.

Sugaya, K., Greene, R., Personett, D., Robbins, M., Kent, C., Bryan, D., Skiba, E., Gallagher, M., & McKinney, M. (1998). Septo-hippocampal cholinergic and neurotrophin markers in age-induced cognitive decline. *Neurobiology of Aging*, *19*(4): 351-361. PMID: 9733168.

Baxter, M.G., Bucci, D.J., Holland, P.C., & Gallagher, M. (1999). Impairments in conditioned stimulus processing and conditioned responding after combined selective removal of hippocampal and neocortical cholinergic input. *Behavioral Neuroscience*, 113(3): 486-495. PMID: 10443776.

Baxter, M.G., Thornton, J.H.A., Gallagher, M., & Holland, P.C. (1999). Blocking can occur without losses in attention in rats with selective removal of hippocampal cholinergic input. *Behavioral Neuroscience*, *113*(5): 881-890. PMID: 10571472.

Bucci, D.J., Conley, M., & Gallagher, M. (1999). Thalamic and basal forebrain cholinergic connections of the rat posterior parietal cortex. *Neuroreport*, *10*(5): 941-945. PMID: 10321464.

Chiba, A.A., Bushnell, P.J., Oshiro, W.M., Gallagher, M. (1999). Selective removal of cholinergic neurons in the basal forebrain alters cued target detection. *Neuroreport*, *10*(14): 3119-3123. PMID: 10549833.

Dore, S., Sampei, K., Goto, S., Alkayed, N., Glackshaw, S., Gallagher, M., Traystman, R.J., Hurn, P.D., Guastella, D., Koehler, R.C., & Snyder, S.H. (1999). Heme oxygenase-2 is neuroprotective in cerebral ischemia. *Molecular Medicine, 5*(10): 656-663. PMID: 10602774.

Gallagher, M., & Schoenbaum, G. (1999). Functions of the amygdala and related forebrain areas in attention and cognition. *Annals of the New York Academy of Science*, 877: 397-411. PMID: 10415661.

Gallagher, M., & Schacter, D. (1999). Cognitive Neuroscience: Editorial overview. *Current Opinion in Neurobiology*, 9: 155-7.

Gallagher, M., McMahan, R., & Schoenbaum, G. (1999). Orbitofrontal cortex and representation of incentive value in associative learning. *The Journal of Neuroscience*, *19*(15): 6610-6614. PMID: 10414988.

Han, J.-S., Holland, P.C., & Gallagher, M. (1999). Disconnection of the amygdala central nucleus and substantia innominata/nucleus basalis disrupts

increments in conditioned stimulus processing in rats. *Behavioral Neuroscience*, *113*(1): 143-151. PMID: 10197914.

Holland, P.C., Lamoureux, J.A., Han, J.-S., Gallagher, M. (1999). Hippocampal lesions interfere with pavlovian negative occasion setting. *Hippocampus*, *9*(2): 143-157. PMID: 10226775.

Holland, P.C., & Gallagher, M. (1999). Amygdala circuitry in attentional and representational processes. *Trends in Cognitive Science*, *3*(2): 65-73. PMID: 10234229.

Nicolle, M.M., Colombo, P.J., Gallagher, M., & McKinney, M. (1999). Metabotropic glutamate receptor-mediated hippocampal phosphoinositide turnover is blunted in spatial learning-impaired aged rats. *The Journal of Neuroscience*, *19*(21): 9604-9610. PMID: 10531462.

Nicolle, M., Gallagher, M., & McKinney, M. (1999). Analysis of hippocampal circuitry in aging. *Neurobiology of Aging*, 20: 359-360. PMID: Unavailable.

Nicolle, M.M., Gallagher, M., & McKinney, M. (1999). No loss of synaptic proteins in the hippocampus of aged, behaviorally impaired rats. *Neurobiology of Aging*, *20*(3): 343-348. PMID: 10588583.

Rapp, P.R., Stack, E.C., & Gallagher, M. (1999). Morphometric studies of the aged hippocampus: 1. Volumetric analysis in behaviorally characterized rats. *The Journal Comparative Neurology*, *403*(4): 459-470. PMID: 9888312.

Schoenbaum, G., Chiba, A.A., & Gallagher, M. (1999). Neural encoding in orbitofrontal cortex and basolateral amygdala during olfactory discrimination learning. *The Journal of Neuroscience, 19*(5): 1876-1884. PMID: 10024371.

Gallagher, M. (2000). The amygdala and associative learning. In J. P. Aggleton (Ed.), *The Amygdala: A Functional Analysis* (pp. 311-329). New York: Oxford University Press.

Holland, P.C., Han, J.-S., & Gallagher, M. (2000). Lesions of amygdala central nucleus alter performance on a selective attention task. *The Journal of Neuroscience*, *20*(17): 6701-6706. PMID: 10964975.

Schoenbaum, G., Chiba, A.A., & Gallagher, M. (2000). Changes in functional connectivity in orbitofrontal cortex and basolateral amygdala during learning and reversal training. *The Journal of Neuroscience*, *20*(13): 5179-5189. PMID: 10864975.

Smith, T.D., Adams, M.M., Gallagher, M., Morrison, J.H., & Rapp, P.R. (2000). Circuit-specific alterations in hippocampal synaptophysin

immunoreactivity predict spatial learning impairment in aged rats. *The Journal of Neuroscience*, *20*(17): 6587-6593. PMID: 10964964.

Adams, M.M., Smith, T.S., Moga, D., Gallagher, M., Yuehua, W., Wolfe, B.B., Rapp, P.R., & Morrison, J.H. (2001). Hippocampal-dependent learning ability correlates with N-methyl-D-Aspartate (NMDA) receptor levels in CA3 neurons of young and aged rats. *The Journal of Comparative Neurology*, *432*(2): 230-243. PMID: 11241388.

Bizon, J.L., Helm, K.A., Han J.-S., Chun, H.-J., Pucilowska, J., Lund, P.K., & Gallagher, M. (2001). Hypothalamic-pituitary-adrenal axis function and corticosterone receptor expression in behaviorally characterized young and aged Long-Evans rats. *European Journal of Neuroscience*, *14*(10): 1739-1751. PMID: 11860468.

Holland, P.C., Hatfield, T., & Gallagher, M. (2001). Rats with basolateral amygdala lesions show normal increases in conditioned stimulus processing but reduced conditioned potentiation of eating. *Behavioral Neuroscience*, *115*(4): 945-950. PMID: 11508734.

Nicolle, M.M., Gallagher, M., & McKinney, M. (2001). Visualization of muscarinic receptor-mediated phosphoinositide turnover in the hippocampus of young and aged, learning-impaired Long Evans rats. *Hippocampus*, *11*(6): 741-746. PMID: 11811668.

Nicolle, M.M., Gonzales, J., Sugaya, K., Baskerville, K.A., Bryan, D., Lund, P.K., Gallagher, M., & McKinney, M. (2001). Signatures of hippocampal oxidative stress in aged spatial learning-impaired rodents. *Neuroscience*, *107*(3): 415-431. PMID: 11718997.

Smith, D.R., Hoyt, E.C., Gallagher, M., Schwabe, R., & Lund, P.K. (2001). Effect of age and cognitive status on basal AP-1 activity in rat hippocampus. *Neurobiology of Aging*, *22*(5): 773-786. PMID: 11705637.

Gallagher, M., & Nelson, R.J. (Eds.). (2002). *Handbook of Psychology, Volume 3: Biological Psychology*. Hoboken, NJ: John Wiley and Sons, Inc.

Han, J.-S., Bizon, J.L., Chun, H.-J., Maus, C.E., & Gallagher, M. (2002). Decreased glucocorticoid receptor mRNA and dysfunction of HPA axis in rats after removal of the cholinergic innervation to hippocampus. *European Journal of Neuroscience*, *14*(10): 1399-1404. PMID: 11860468.

Helm, K.A., Han, J.-S., & Gallagher, M. (2002). Effects of cholinergic lesions produced by infusions of 192 IgG-Saporin on glucocorticoid receptor mRNA expression in hippocampus and medial prefrontal cortex of the rat. *Neuroscience*, *115*(3): 765-774. PMID: 12435415.

Holland, P.C., Petrovich, G.D., & Gallagher, M. (2002). The effects of amygdala lesions on conditioned stimulus-potentiated eating in rats. *Physiology and Behavior*, *76*(1): 117-129. PMID: 12175595.

Ikonen, S., McMahan, R., Gallagher, M., Eichenbaum, H., & Tanila, H. (2002). Cholinergic system regulation of spatial representation by the hippocampus. *Hippocampus*, *12*(3): 386-397. PMID: 12099489.

Petrovich, G.D., Setlow, B., Holland, P.C., & Gallagher, M. (2002). Amygdalo-hypothalamic circuit allows learned cues to override satiety and promote eating. *The Journal of Neuroscience*, *22*(19): 8748-8753. PMID: 12351750.

Schoenbaum, G., Nugent, S., Saddoris, M.P., & Gallagher, M. (2002). Teaching old rats new tricks: age-related impairments in olfactory reversal learning. *Neurobiology of Aging*, *23*(4): 555-564. PMID: 12009505.

Schoenbaum, G., Setlow, B., & Gallagher, M. (2002). Orbitofrontal Cortex: Modeling Prefrontal Function in Rats. In L. Squire and D. Schacter (Eds.), *The Neuropsychology of Memory, 3rd Edition* (pp. 463-477). New York: Guilford Publications, Inc.

Setlow, B., Gallagher, M., & Holland, P.C. (2002). The basolateral complex of the amygdala is necessary for acquisition but not expression of CS motivational value in appetitive Pavlovian second order conditioning. *European Journal of Neuroscience*, *15*(11): 1841-1853. PMID: 12081664.

Setlow, B., Holland, P.C., & Gallagher, M. (2002). Disconnection of basolateral amygdala complex and nucleus accumbens impairs appetitive Pavlovian second-order conditioned responses. *Behavioral Neuroscience*, *116*(2): 267-275. PMID: 11996312.

Bizon, J.L., & Gallagher, M. (2003). Production of new cells in the rat dentate gyrus over the lifespan: relation to cognitive decline. *European Journal of Neuroscience*, *18*(1): 215-219. PMID: 12859354.

Bizon, J.L., Han, J.S., Hudon, C., & Gallagher, M. (2003). Effects of hippocampal cholinergic deafferentation on learning strategy selection in a visible platform version of the water maze. *Hippocampus*, *13*(6): 676-684. PMID: 12962313.

Cadacio, C.L., Milner, T.A., Gallagher, M., & Pierce, J.P. (2003). Hilar neuropeptide Y interneuron loss in the aged rat hippocampal formation. *Experimental Neurology*, *183*(1): 147-158. PMID: 12957498.

Gallagher, M. (2003). Aging and hippocampal/cortical circuits in rodents. *Alzheimer Disease and Associated Disorders*, *17*: S45-S47. PMID: 12813207.

Gallagher, M., Bizon, J.L., Hoyt, E.C., Helm, K.A., & Lund, P.K. (2003). Effects of aging on the hippocampal formation in a naturally occurring animal model of mild cognitive impairment. *Experimental Gerontology*, *38*(1-2): 71-77. PMID: 12543263.

Holland, P.C., & Gallagher, M. (2003). Double dissociation of the effects of lesions of basolateral and central amygdala on CS-potentiated feeding and Pavlovian-instrumental transfer. *European Journal of Neuroscience*, *17*(8): 1680-1694. PMID: 12752386.

Lee, H.-K., Takamiya, K., Han, J.-S., Man, H., Kim, C.-H., Rumbaugh, G., Yu, S., Ding, L., He, C., Petralia, R.S., Wenthold, R.J., Gallagher, M., & Huganir, R.L. (2003). Phosphorylation of the AMPA receptor GluR1 subunit is required for synaptic plasticity and retention of spatial memory. *Cell*, *112*(5): 631-643. PMID: 12628184.

Lindgren, J.L., Gallagher, M., & Holland, P.C. (2003). Lesions of basolateral amygdala impair extinction of CS motivational value, but not of explicit conditioned responses, in Pavlovian appetitive second-order conditioning. *European Journal of Neuroscience*, *17*(1): 160-166. PMID: 12534980.

Petrovich, G.D., & Gallagher, M. (2003). Amygdala subsystems and control of feeding behavior by learned cues. *Annals of the New York Academy of Science*, 985: 251-262. PMID: 12724163.

Pickens, C.L., Saddoris, M.P., Setlow, B., Gallagher, M., Holland, P.C., & Schoenbaum, G. (2003). Different roles for orbitofrontal cortex and basolateral amygdala in a reinforcer devaluation task. *The Journal of Neuroscience*, *23*(35): 11078-11084. PMID: 14657165.

Schoenbaum, G., Setlow, B., Nugent, S.L., Saddoris, M.P., & Gallagher, M. (2003). Lesions of the orbitofrontal cortex and basolateral amygdala complex disrupt acquisition of odor-guided discriminations and reversals. *Learning and Memory*, *10*(2): 129-140. PMID: 12663751.

Schoenbaum, G., Setlow, B., Saddoris, M.P., & Gallagher, M. (2003). Encoding predicted outcome and acquired value in orbitofrontal cortex during cue sampling depends upon input from basolateral amygdala. *Neuron*, *39*(5): 855-867. PMID: 12948451.

Setlow, B., Schoenbaum, G., & Gallagher, M. (2003). Neural encoding in ventral striatum during olfactory discrimination learning. *Neuron, 38*(4): 625-636. PMID: 12765613.

Wilson, I., Ikonen, S., McMahan, R., Gallagher, M., Eichenbaum, H., & Tanila, H. (2003). Place cell rigidity correlates with impaired spatial learning in aged rats. *Neurobiology of Aging*, *24*(2): 297-305. PMID: 12498963.

Bizon, J.L., Lee, H.J., & Gallagher, M. (2004). Neurogenesis in a rat model of age-related cognitive decline. *Aging Cell, 3*(4): 227-234. PMID: 15268756.

Brightwell, J.J., Gallagher, M., & Colombo, P.J. (2004). Hippocampal CREB1 but not CREB2 in decreased in aged rats with spatial memory impairments. *Neurobiology of Learning and Memory*, *81*(1): 19-26. PMID: 14670355

Froestl, W., Gallagher, M., Jenkins, H., Madrid, A., Melcher, T., Teicheman, S., Mondadori, C.G., & Pearlman, R. (2004). SGS742: the first GABA(B) receptor antagonist in clinical trials. *Biochemical Pharmacology, 68*(8): 1479-1487. PMID: 15451390.

Geinisman, Y., Ganeshina, O., Yoshida, R., Berry, R.W., Disterhoft, J.F., & Gallagher, M. (2004). Aging, spatial learning and total synapse number in the rat CA1 stratum radiatum. *Neurobiology of Aging*, *25*(3): 407-416. PMID: 15123345.

Helm, K.A., Ziegler, D.R., & Gallagher, M. (2004). Habituation to stress and dexamethasone suppression in rats with selective basal forebrain cholinergic lesions. *Hippocampus*, *14*(5): 628-635. PMID: 15301439.

Holland, P.C., & Gallagher, M. (2004). Amygdala-frontal interactions and reward expectancy. *Current Opinions in Neurobiology*, *14*(2): 148-155. PMID: 15082318.

Lund, P.K., Hoyt, E.C., Bizon, J., Smith, D.R., Haberman, R., Helm, K., & Gallagher, M. (2004). Transcriptional mechanisms of hippocampal aging. *Experimental Gerontology*, *39*(11-12): 1613-1622. PMID: 15582277.

McDannald, M., Kerfoot, E., Gallagher, M., & Holland, P.C. (2004). Amygdala central nucleus function is necessary for learning but not expression of conditioned visual orienting. *European Journal of Neuroscience*, *20*(1): 240-248. PMID: 15245496.

Nicholson, D.A., Yoshida, R., Berry, R.W., Gallagher, M., & Geinisman, Y. (2004). Reduction in size of perforated postsynaptic densities in hippocampal axospinous synapses and age-related spatial learning impairments. *The Journal of Neuroscience,* 24(35): 7648-7653. PMID: 15342731.

Wilson, I.A., Ikonen, S., Gureviciene, I., McMahan, R.W., Gallagher, M., Eichenbaum, H., & Tanila, H. (2004). Cognitive aging and the hippocampus:

How old rats represent new environments. *The Journal of Neuroscience*, *24*(15): 3870-3888. PMID: 15084668.

Bizon, J.L., & Gallagher, M. (2005). More is less: neurogenesis and age-related cognitive decline in long-evans rats. *Science of Aging Knowledge Environment, 7*: re2. PMID: 15716513.

Choi, S.Y., Chang, J., Jiang, B., Seol, G.H., Min, S.S., Han, J.S., Shin, H.S., Gallagher M, Kirkwood A. (2005). Multiple receptors coupled to phospholipase C gate of long-term depression in visual cortex. *The Journal of Neuroscience*, *25*(49): 11433-11443. PMID: 16339037.

McDannald, M., Kerfoot, E., Gallagher, M., & Holland, P.C. (2005). Amygdala central nucleus function is necessary for learning, but not expression, of conditioned auditory orienting. *European Journal of Neuroscience, 20*(1): 240-248. PMID: 15245496.

Helm, K.A., Haberman, R.P., Dean, S.L., Hoyt, E.C., Melcher, T., Lund, P.K., & Gallagher, M. (2005). GABA-B receptor antagonist SGS742 improves spatial memory and reduces protein binding to the cAMP response element (CRE) in the hippocampus. *Neuropharmacology, 48*(7): 956-964. PMID: 15857622.

Lee, H.J., Groshek, F., Petrovich, G.D., Cantalini, J.P., Gallagher, M., & Holland, P.C. (2005). Role of amygdalo-nigral circuitry in conditioning of a visual stimulus paired with food. *The Journal of Neuroscience*, *25*(15): 3881-3888. PMID: 15829640.

Lee, H.-K., Min, S.S., Gallagher, M., & Kirkwood, A. (2005). NMDA receptor-independent long-term depression correlates with successful aging in rats. *Nature Neuroscience*, *8*(12): 1657-1659. PMID: 16286930.

McDannald, M.A., Saddoris, M.P., Gallagher, M., & Holland, P.C. (2005). Lesions of orbitofrontal cortex impair rats' differential outcome expectancy learning but not CS-potentiated feeding. *The Journal of Neuroscience*, *25*(18): 4626-4632. PMID: 15872110.

Petrovich, G.D., Holland, P.C., & Gallagher, M. (2005). Amygdalar and prefrontal pathways to the lateral hypothalamus are activated by a learned cue that stimulates eating. T*he Journal of Neuroscience*, *25*(36): 8295-8302. PMID: 16148237.

Pickens, C.L., Saddoris, M.P., Gallagher, M., & Holland, P.C. (2005). Orbitofrontal lesions impair use of cue-outcome associations in a devaluation task. *Behavioral Neuroscience,* 119(1): 317-322. PMID: 15727536.

Saddoris, M.P., Gallagher, M., & Schoenbaum, G. (2005). Rapid associative encoding in basolateral amygdala depends on connections with orbitofrontal cortex. *Neuron*, *46*(2): 321-331. PMID: 15848809.

Wilson, I.A., Ikonen, S., Gallagher, M., Eichenbaum, H., & Tanila H. (2005). Age-associated alterations of hippocampal place cells are subregion specific. *The Journal of Neuroscience*, *25*(29): 6877-6886. PMID: 16033897.

Wilson, I.A., Ikonen, S., Gurevicius, K., McMahan, R.W., Gallagher, M., Eichenbaum, H., & Tanila, H. (2005). Place cells of aged rats in two visually identical compartments. *Neurobiology of Aging*, *26*(7): 1099-1106. PMID: 15748790.

Ziegler, D.R., & Gallagher, M. (2005). Spatial memory in middle-aged female rats: assessment of estrogen replacement after ovariectomy. *Brain Research*, *1052*(2): 163-173. PMID: 16023091.

Baskerville, K.A., Kent, C., Nicolle, M.M., Gallagher, M., & McKinney, M. (2006). Aging causes partial loss of basal forebrain but no loss of pontine reticular cholinergic neurons. *Neuroreport*, *17*(17): 1819-1823. PMID: 17164671.

Gallagher, M,. Colantuoni, C,. Einchenbaun, H., Haberman, R.P., Rapp, P.R., Tanila, H., Wilson, J.A (2006). Individual differences in neurocognitive aging of the medial temporal lobe. *Age*, *28*(3): 221-233. PMID: 22253491; PMCID: PMC3259151.

Holland, P.C., & Gallagher, M. (2006). Different roles for amygdala central nucleus and substantia innominata in the surprise-induced enhancement of learning. *The Journal of Neuroscience, 26*(14): 3791-3797. PMID: 16597732.

Lee, H.J., Youn, J.M., O, M.J., Gallagher, M., & Holland, P.C. (2006). Role of substantia nigra-amygdala connections in surprise-induced enhancement of attention. *The Journal of Neuroscience, 26*(22): 6077-6081. PMID: 16738251.

Lesne, S., Koh, M.T., Kotilinek, L., Kayed, R., Glabe, C.G., Yang, A., Gallagher, M., & Ashe, K.H. (2006). A specific amyloid-β protein assembly in the brain impairs memory. *Nature, 440*(7082): 352-357. PMID: 16541076.

Schoenbaum, G., Setlow, B., Saddoris, M., & Gallagher, M. (2006). Encoding changes in orbitofrontal cortex in reversal-impaired aged rats. *Journal of Neurophysiology, 95*(3): 1509-1517. PMID: 16338994; PMCID: PMC2430623.

Wilson I.A., Gallagher M., Eichenbaum H., & Tanila H. (2006). Neurocognitive aging: prior memories hinder new hippocampal encoding.

*Trends in Neuroscience*, *29*(12): 662-670. PMID: 17046075; PMCID: PMC2614702.

Furuyashiki, T., & Gallagher, M. (2007). Neural encoding in the orbitofrontal cortex related to goal-directed behavior. *Annals of the New York Academy of Sciences*, *1121*:193-215. PMID: 17872389.

Zhang, H.-Y., Watson, M.L., Gallagher, M, & Nicolle, M.M. (2007). Muscarinic receptor-mediated GTP-Eu binding in the hippocampus and prefrontal cortex is correlated with spatial memory impairment in aged rats. *Neurobiology of Aging, 28*(4): 619-626. PMID: 16600436.

Petrovich, G.D., Ross, C.A., Gallagher, M., & Holland, P.C. (2007). Learned contextual cue potentiates eating in rats. *Physiology & Behavior*, *90*(2-3): 362-367. PMID: 17078980; PMCID: PMC1892280.

Petrovich, G.D., & Gallagher, M. (2007). Control of food consumption by learned cues: A forebrain-hypothalamic network. *Physiology & Behavior, 91*(4): 397-403. PMID: 17498758; PMCID: PMC2001285.

Smith, D.R., Gallagher, M., & Stanton, M.E. (2007). Genetic Background Differences and Nonassociative Effects in Mouse Trace Fear Conditioning. *Learning & Memory*, *14*(9): 597-605. PMID: 17823243; PMCID: PMC1994077.

Hikida, T., Jaaro-Peled, H., Seshadri, S., Oishi, K., Hookway, C., Kong, S., Wu, D., Xue, R., Andradé, M., Tankou, S., Mori, S., Gallagher, M., Ishizuka, K., Kida, S., & Sawa, A. (2007). Dominant-negative DISC1 transgenic mice display schizophrenia-associated phenotypes detected by measures translatable to humans. *Proceedings of the National Academy of Sciences*, *104*(36): 14501-14506. PMID: 17675407; PMCID: PMC1964873.

Petrovich, G.D., Ross, C.A., Holland, P.C., & Gallagher, M. (2007). Medial prefrontal cortex is necessary for an appetitive contextual conditioned stimulus to promote eating in sated rats. *Journal of Neuroscience, 27*(24): 6436-6441. PMID: 17567804; PMCID: PMC3219438.

Furuyashiki T., Holland P.C., & Gallagher M. (2008). Rat orbitofrontal cortex separately encodes response and outcome information during performance of goal-directed behavior. *Journal of Neuroscience*, *28*(19): 5127-5138. PMID: 18463266; PMCID: PMC2693204.

Sung, J.-Y., Goo, J.-S., Lee, D.-E., Jin, D.-Q., Bizon, J.L., Gallagher, M., & Han, J.-S. (2008). Learning Strategy Selection in the Water Maze and Hippocampal CREB Phosphorylation Differ in Two Inbred Strains of Mice.

*Learning and Memory*, *15*(4): 183-188. PMID: 18353993; PMCID: PMC2327260.

Lee, H.J., Youn, J.M.,Gallagher, M., & Holland, P.C. (2008). Temporally limited role of substantia nigra–central amygdala connections in surprise-induced enhancement of learning. *European Journal of Neuroscience*, *27*(11): 3043-3049. PMID: 18588542; PMCID: PMC2853798.

Johnson, A.W., Chen, X, Crombag, H.S., Shokat, K, Smith, D.R., Zhang, C, Gallagher, M, Holland, P.C., & Ginty, D.D. (2008) The brain-derived neurotrophic factor receptor TrkB is critical for the acquisition but not expression of conditioned incentive value. *European Journal of Neuroscience*, *28*(5): 997-1002. PMID: 18671735; PMCID: PMC2825165.

Haberman, R.P., Lee, H.J., Colantuoni, C., Koh, M.T., & Gallagher, M. (2008). Rapid encoding of new information alters the profile of plasticity-related mRNA transcripts in the hippocampal CA3 region. PNAS. *Proceedings of the National Academy of Sciences of the United States of America*, *105*(30): 10601-10606. PMID: 18650386; PMCID: PMC2492487.

Crombag, H.S., Sutton, J.M., Takamiya, K., Lee, H.K., Holland, P.C., Gallagher, M., & Huganir, R.L. (2008). A necessary role for GluR1 serine 831 phosphorylation in appetitive incentive learning. *Behavioural Brain Research*, *191*(2): 178-183. PMID: 18455244; PMCID: PMC2478746.

Crombag, H.S., Sutton, J.M., Takamiya, K., Lee, H.K., Holland, P.C., Gallagher, M., & Huganir, R.L. (2008). A role for AMPA GluR1 phosphorylation in the modulatory effects of appetitive reward cues on goal-directed behavior. *European Journal of Neuroscience, 27*(12): 3284-3291. PMID: 18598267; PMCID: PMC2719880.

Robitsek, R.J., Fortin, N.J., Koh, M.T., Gallagher, M., & Eichenbaum, H. (2008). Cognitive aging: a common decline of episodic recollection and spatial memory in rats. *The Journal of Neuroscience, 28*(36): 8945-8954. PMID: 18768688; PMCID: PMC2585597.

Boric, K., Muñoz, P., Gallagher, M., & Kirkwood, K. (2008). Potential adaptive function for altered long-term potentiation mechanisms in aging hippocampus. *The Journal of Neuroscience, 28*(32): 8034-8039. PMID: 18685028; PMCID: PMC2615232.

Calhoun, M.E., Fletcher, B.R., Yi, S., Zentko, D.C., Gallagher, M., & Rapp, P.R. (2008). Age-related spatial learning impairment is unrelated to spinophilin immunoreactive spine number and protein levels in rat hippocampus. *Neurobiology of Aging, 29*(8): 1256-1264 PMID: 17353069; PMCID: PMC2614704.

Johnson, A.W., Gallagher, M., & Holland, P.C. (2009). The basolateral amygdala is critical to the expression of pavlovian and instrumental outcome-specific reinforcer devaluation effects. *The Journal of Neuroscience*, *29*(3): 696-704. PMID: 19158296; PMCID: PMC3230882.

Koh, M.-T., Wheeler, D.S., & Gallagher, M. (2009). Hippocampal lesions interfere with long-trace taste aversion conditioning. *Physiology & Behavior*, *98*(1-2): 103-107. PMID: 19394353; PMCID: PMC2743233.

Johnson, A.W., Canter, R., Gallagher, M., & Holland, P.C. (2009). Assessing the role of the growth hormone secretagogue receptor in motivational learning and food intake. *Behavioral Neuroscience, 123*(5): 1058-1065. PMID: 19824771; PMCID: PMC3325544.

Petrovich, G.D., Ross, C.A., Mody, P., Holland, P.C., & Gallagher, M. (2009). Central, but not basolateral amygdala, is critical for control of feeding by aversive learned cues. *The Journal of Neuroscience, 29*(48): 15205-15212. PMID: 19955373; PMCID: PMC3321540.

Saddoris, M., Holland, P., & Gallagher, M. (2009). Associatively learned representations of taste outcomes activate taste-encoding neural ensembles in gustatory cortex. *The Journal of Neuroscience, 29*(49): 15386-15396. PMID: 20007463; PMCID: PMC2823084.

Johnson, A.W., Sherwood, A., Smith, D.R., Wosiski-Kuhn, M., Gallagher, M., & Holland, P.C. (2010). An analysis of licking microstructure in three strains of mice. *Appetite*, *54*(2): 320-330. PMID: 20006663; PMCID: PMC3219432.

Koh M.T., Haberman R.P., Foti S., McCown T.J., & Gallagher M. (2010). Treatment strategies targeting excess hippocampal activity benefit aged rats with cognitive impairment. *Neuropsychopharmacology, 35*(4): 1016-1025. PMID: 20032967; PMCID: PMC2820138.

Liu, C.C., Ohara S., Franaszczuk P., Zagzoog N., Gallagher M., & Lenz F.A. (2010). Painful stimuli evoke potentials recorded from the medial temporal lobe in humans. *Neuroscience*, *165*(4): 1402-1411. PMID: 19925853; PMCID: PMC2815048.

Gallagher, M., Bakker, A., Yassa, M. A., & Stark, C.E. (2010). Bridging neurocognitive aging and disease modification: targeting functional mechanisms of memory impairment. *Current Alzheimer's Research, 7*(3): 197-199. PMID: 20088811; PMCID: PMC3008592.

Yassa, M.A., Stark, S.M., Bakker, A., Albert, M.S., Gallagher, M., & Stark, C.E. (2010). High-resolution structural and functional MRI of hippocampal

CA3 and dentate gyrus in patients with amnestic Mild Cognitive Impairment. *Neuroimage*, *51*(3):1242-1252. PMID: 20338246; PMCID: PMC2909476.

Hwang, Y.K., Song, J.C., Han, S.H., Cho, J., Smith, D.R., Gallagher, M., & Han, J.S. (2010). Differences in hippocampal CREB phosphorylation in trace fear conditioning of two inbred mouse strains. Brain Research, 1345: 156-163. PMID: 20501325; PMCID: PMC3219426.

Lee, H.J., Gallagher, M., & Holland, P.C. (2010). The central amygdala projection to the substantia nigra reflects prediction error information in appetitive conditioning. *Learning and Memory*, *17*(10): 531-538. PMID: 20889725; PMCID: PMC3256573.

Haberman, R.P., Colantuoni, C., Stocker, A.M., Schmidt, A.C., Pedersen, J.T., & Gallagher, M. (2011). Prominent hippocampal CA3 gene expression profile in neurocognitive aging. *Neurobiology of Aging*, *32*(9): 1678-1692. PMID: 19913943; PMCID: 2891610.

Stranahan, A.M., Haberman, R.P., & Gallagher, M. (2011). Cognitive decline is associated with reduced reelin expression in the entorhinal cortex of aged rats. *Cerebral Cortex, 21*(2): 392-400. PMID: 20538740; PMCID: 3020582.

Johnson, A.W., & Gallagher, M. (2011). Greater effort boosts the affective taste properties of food. *Proceedings of the Royal Society B: Biological Sciences,* 278(1711): 1450-1456. PMID: 21047860; PMCID: 3081738.

Gallagher, M., Stocker, A.M., & Koh, M.T. (2011). Mindspan: lessons from rat models of neurocognitive aging. *Institute for Laboratory Animal Research*, *52*(1): 32-40. PMID: 21411856; PMCID: PMC3199952.

Stranahan, A., Salas-Vega, S., Jiam, N.T., & Gallagher, M. (2011). Interference with reelin signaling in the lateral entorhinal cortex impairs spatial memory. *Neurobiology of Learning and Memory*, *9*(2): 150-155. PMID: 21492744; PMCID: 3148331.

Silverberg, N. B., Ryan, L.M., Carrillo, M.C., Sperling, R., Petersen, R.C., Posner, H.B., Snyder, P.J., Hilsabeck, R., Gallagher, M., Raber, J., Rizzo, A., Possin, K., King, J., Kaye, J., Ott, B.R., Albert, M.S., Wagster, M.V., Schinka, J.A., Cullum, C.M., Farias, S.T., Balota, D., Rao, S. Lowenstein, D., Budson, A.E., Brandt, J., Manly, J.J., Barnes, L., Strutt, A., Gollan, T.H., Ganguli, M., Babcock, D., Litvan, I., Kramer, J.H., & Ferman, T.J. (2011). Assessment of cognition in early dementia. *Alzhehimer's & Dementia*, *7*(3): e60-e76.

Yassa M.A., Lacy J.W., Stark S.M., Albert M.S., Gallagher M., Stark C.E. (2011). Pattern separation deficits associated with increased hippocampal

CA3 and dentate gyrus activity in nondemented older adults. *Hippocampus*. 21(9):968-79. PMID: 20865732; PMCID: PMC3010452.

Gallagher, M., & Koh, M. T. (2011). Episodic memory on the path to Alzheimer's disease. *Current Opinion in Neurobiology, 21*(6):929-934. PMID: 22079495; PMCID: PMC3254732.

Castellano, J.F., Fletcher, B.R., Kelley-Bell, B., Kim, D.H., Gallagher, M., & Rapp, P.R. (2012). Age-related memory impairment is associated with disrupted multivariate epigenetic coordination in the hippocampus. *PLoS ONE*, *7*(3): e33249. PMID: 22438904; PMCID: PMC3305324.

Stranahan, A.M., Jiam, N.T., Spiegel, A.M., & Gallagher, M. (2012). Aging reduces total neuron number in the dorsal component of the rodent prefrontal cortex. *The Journal of Comparative Neurology, 520*(6): 1318-1326. PMID: 22020730; PMCID: Pending.

Bakker, A., Krauss, G.L., Albert, M.S., Speck, C.L., Jones, L.R., Stark, C.E., Yassa, M.A., Bassett, S.S., Shelton, A.L., & Gallagher, M. (2012). Reduction of hippocampal hyperactivity improves cognition in amnestic mild cognitive impairment. *Neuron, 74*(3): 467-474. PMID: 22578498; PMCID: PMC3351697.

Chapman, S.B., Cotman, C.W., Fillit, H.M., Gallagher, M., & Van Dyck, C.H. (2012). Clinical Trials: New Opportunities. *Journal of Gerontology Series A: Medical Sciences, 67*(7): 773-778. PMID: 22570132; PMCID: Pending.

Haberman, R.P., Quigley, C., & Gallagher, M. (2012). Characterization of CpG island DNA methylation of impairment-related genes in a rat model of cognitive aging. *Epigenetics,* 7(9): 1008-1019. PMID: 22869088; PMCID: PMC3515010.

Koh, M.T., Rosenzweig-Lipson, S., & Gallagher, M. (2013). Selective GABAA $\propto$5 positive allosteric modulators improve cognitive function in aged rats with memory impairment. *Neuropharmacology*, 64: 145-152. PMID: 22732440; PMCID: PMC3445657.

Tomás Pereira, I., Colleta, C.E., Perez, E.V., Kim, D.H., Gallagher, M., Goldberg, I.G., & Rapp, P. (2013). CREB-binding protein (CBP) levels in the rat hippocampus fail to predict chronological or cognitive aging. *Neurobiology of Aging,* 34(3): 832-844. PMID: 22884549; PMCID: PMC3518677.

Yang, S. Megill, A. Ardiles, A, Ransom, S. Koh, M.T., Tran, T., Lee H-K., Gallagher, M. Kirkwood, A. (2013) Integrity of mGluR-LTD in the associative/commissural inputs to CA3 correlates with successful aging in

rats. *Journal of Neuroscience,* 33(31): 12670-12678. PMID: 23904603; PMCID: PMC3728684.

Johnson, A.W., Jaaro-Peled, H., Shahani, N., Sedlak, T. W., Zoubovsky, S., Burruss, B., Emiliani, F., Sawa, A., & Gallagher, M. (2013). Cognitive and motivational deficits together with prefrontal oxidative stress in a mouse model for neuropsychiatric illness. *Proceedings of the National Academy of Sciences.* 110(30): 12462-12467. PMID: 23840059; PMCID: PMC3725079.

Xu R., Paul B.D., Smith D.R., Tyagi R., Rao F., Khan A.B., Blech D.J., Vandiver M.S., Harraz M.M., Guha P., Ahmed I., Sen N., Gallagher M., & Snyder S.H. (2013). Inositol polyphosphate multikinase is a transcriptional coactivator required for immediate early gene induction. *Proceedings of the National Academy of Sciences.* 110(40):16181-6. PubMed PMID: 24043835; PMCID: PMC3791727.

Spiegel, A.M., Koh, M.T., Vogt, N.M., Rapp, P.R., & Gallagher, M. (2013). Hilar interneuron vulnerability distinguishes aged rats with memory impairment. *Journal of Comparative Neurology. 521*(15): 3508-3523. PMID: 23749483; PMCID: pending.

Haberman, R.P., Colantuoni, C., Koh, M.T., & Gallagher, M. (2013). Behaviorally activated mRNA expression profiles produce signatures of learning and enhanced inhibition in aged rats with preserved memory. *PLoS One.* 8(12):e83674. PMID: 24349543; PMCID: PMC3862806.

Mayse, J.D., Nelson, G.M., Park, P., Gallagher, M., & Lin, S.-C. (2014). Proactive and reactive inhibitory control in rats. *Frontiers in Neuroscience*. 2014 May 8; 8:104. doi: 10.3389/fnins.2014.00104. [eCollection 2014]. PMID: 24847204; PMCID: PMC4021122.

Koh, M.T., Spiegel, A.M., Gallagher, M. (2014). Age-associated changes in hippocampal-dependent cognition in Diversity Outbred mice. *Hippocampus*. 24(11):1300-7. PMID: 24909986.

Fletcher, B.R., Hill, G.S., Long, J.M., Gallagher, M., Shapiro, M.L., Rapp, P.R. (2014). A fine balance: Regulation of hippocampal Arc/Arg3.1 transcription, translation and degradation in a rat model of normal cognitive aging. *Neurobiology Learn & Memory.* 2014 Aug 23. pii: S1074-7427(14)00146-4. doi: 10.1016/j.nlm.2014.08.007. [Epub ahead of print]. PMID: 25151943.

Bakker, A., Albert, M. S., Krauss, G., Speck, C. L., Gallagher, M. (2015). Response of the medial temporal lobe network in amnestic mild cognitive impairment to therapeutic intervention assessed by fMRI and memory task performance. *NeuroImage: Clinical*. 2015 Feb 21;7:688-98. doi:

10.1016/j.nicl.2015.02.009. [eCollection 2015]. PMID: 25844322; PMCID: PMC4377841.

Zoubovsky, S., Oh, E., Cash-Padgett, T., Johnson, A., Hou, Z., Mori, S., Gallagher, M., Katsanis, N., Sawa, A., Jaaro-Peled, H. (2015). Neuroanatomical and behavioral deficits in mice haploinsufficient for Pericentriolar material 1 (Pcm1) (2015). *Neuroscience Research.* 2015 Sep; 98:45-9. doi: 10.1016/j.neures.2015.02….002. PMID: 25697395. PMCID: PMC4522364

Mayse, J., Nelson, G. Avila, I., Gallagher, M., Lin, S.C. (2015). Basal forebrain neuronal inhibition enables rapid behavioral stopping. *Nature Neuroscience,* 18:1501–1508. doi: 10.1038/nn.4110. PMID:26368943; PMCID: PMC4583818

Pereira, I.T., Gallagher, M. and Rapp, P.R., 2015. Head west or left, east or right: interactions between memory systems in neurocognitive aging. *Neurobiology of aging*, *36*: 3067-3078. PMID: 26281759; PMCID: PMC5843194.

Wang, H., Ardiles, A.O., Yang, S., Tran, T., Posada-Duque, R., Valdivia, G., Baek, M., Chuang, Y.A., Palacios, A.G., Gallagher, M., Worley, P., Kirkwood, A. (2016). Metabotropic glutamate receptors induce a form of LTP controlled by translation and arc signaling in the hippocampus. *The Journal of Neuroscience.* 36(5):1723-9. PMID: 26843652

Koh, M.T., Smith, D., Gallagher, M. (2016). Impaired hippocampal-dependent memory and reduced parvalbumin-positive interneurons in a ketamine mouse model of schizophrenia. *Schizophrenia Research.* 171(1-3):187-94. PMID: 26811256; PMCID: PMC4762714

Fukudome, D., Kondo, M., Gallagher, M., Smith, D., Sawa, A., Kamiya, K., Lema, Y. (2016). Dimensional assessment of behavioral changes in the cuprizone short-term exposure model for psychosis. *Neuroscience Research.* 107:70-4. PMID: 26869217; PMCID: PMC4884492

Tran, T., Speck, C., Pisupati, A., Gallagher, M., Bakker, A. (2016) Increased hippocampal activation in ApoE-4 carriers and non-carriers with amnestic mild cognitive impairment. *NeuroImage: Clinical.* 13:237-245. PMID: 28070483

Haberman, R., Koh, M.T., Gallagher, M. (2017) Heightened cortical excitability in aged rodents with memory impairment. *Neurobiology of Aging*. 54:144-151. PMID: 28104309; PMCID: PMC5401793

Haberman, R., Branch, A., Gallagher, M. (2017) Targeting neural hyperactivity as a treatment to stem progression of late-onset Alzheimer's

Disease. *Neurotherapeutics.* 14:662-676. PMID: 28560709; PMCID: PMC5509635

Tward, D. J., Sicat, C. S., Brown, T., Bakker, A., Gallagher, M., Albert, M., Miller, M., Alzheimer's Disease Neuroimaging Initiative. (2017). Entorhinal and transentorhinal atrophy in mild cognitive impairment using longitudinal diffeomorphometry. *Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring*, *9*, 41-50. PMID: 28971142; PMCID: PMC5608074

Koh, M.T., Shao, Y., Rosenzweig-Lipson, S., Gallagher, M. (2017) Treatment with levetiracetam improves cognition in a ketamine rat model of schizophrenia. *Schizophrenia Research.* Epub ahead of print. PMID: 28634087; PMCID: PMC5733713

Tran, T., Gallagher, M., Kirkwood, A. (2018). Enhanced postsynaptic inhibitory strength in hippocampal principal cells in high performing aged rats. *Neurobiology of Aging*. 70. PMID: 30007169

Koh, M. T., Ahrens, P., Gallagher M. A greater tendency for representation mediated learning in a ketamine mouse model of schizophrenia *Behavioral Neuroscience*. 2018; 132(2). PMID: 29672108; PMCID: PMC5912702

Liu, C.F., Ratnanather, J.T., Younes, L., Bakker, A., Gallagher, M., Albert. M., Miller, M.I. (2018) Cortical thickness atrophy in the transentorhinal cortex in mild cognitive impairment. *NeuroImage: Clinical*. Epub ahead of print. PMID: 30552075

Spiegel, A. M., Salas-Vega,S., Stranahan, A., Rapp, P., Gallagher, M. Voluntary exercise modifies interneuron protein expression in the rat dentate hilus. In prep.

Gallagher, M., Knierim, J. "Neurocognitive Aging (Gallagher/Knierim)". Invited Neuron review on neurocognitive aging. In prep.

Gallagher, M., Okonkwo, O., Resnick, S., Jagust, W., Benzinger, T., Rapp, P., What are the threats to successful brain and cognitive aging? *Neurobiology of Aging.* In press.