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http://www.medschool.lsuhsc.edu/faculty/docs/Neuroscience Retreat Brochure - Gordon - CV 090210 (2).pdf

Degrees

1977-1980: Postdoc (Ophthalmology); Baylor College of Medicine, Houston, TX

1970-1977: Ph.D. (Biology); University of South Florida, Tampa, FL

1968-1970: M.Sc. (Biology) (all but thesis); SUNY, Fredonia

1966-1968: B.Sc. (Biology); SUNY, Fredonia, NY

1964-1967: A.Sc.; Jamestown Comm College, Jamestown, NY

Bio

Awards/Recognitions:

2006: Distinguished Alumnus Award; Jamestown Community College, Jamestown, NY

1987: Nominated *Teacher of the Year*; University of Kansas, Lawrence, KS

1977-1980: NRSA Postdoctoral Fellowship; Baylor College of Medicine, (SF Basinger, preceptor)

1967: Inducted into Beta Beta Beta, the Biological Honor Society; SUNY, Fredonia, NY

Research Interests

Keywords:
cell biology of retina and hippocampus under normal and pathological conditions, neuronal cell death and neuroprotection, rod and cone photoreceptors

Research Interests:
Retinal morphology, physiology, and biochemistry
Mitochondrial response during photoreceptor stress
Mechanisms of photoreceptor cell death and protection
Information processing for retinal maintenance

Current Research:
Retinal Inflammation, Neovascularization, and Neuroprotection in Human and a Murine Model of Age-related Macular Degeneration

Age-related Macular Degeneration (AMD) is a disease in which photoreceptors in the central region of the human retina begin to degenerate. As the disease slowly progresses, the resulting central blind spots expand, fuse, and eventually lead to clinical blindness. A hallmark of this disease is the compromise of Bruch's membrane behind the retina and its associated monolayer of retinal pigment epithelial (RPE) cells, which leads to the growth of capillaries (neovascularization) from the choriocapillaris at the back of the eye into the spaces between the RPE and photoreceptors. This spreading disruption triggers photo-receptor cell death. There are at least two components of this disease: *inflammation* (both initial and chronic) and *neovascularization*. Our working hypothesis is that regulation or

inhibition of these processes will attenuate or halt the spread of photoreceptor death across the retina.

Beginning with our work with MALDI imaging mass spectrometry, I have been interested primarily in characterizing the phospholipid profile of the retinal pigment epithelium (RPE) and the cells of the retina to better define events that lead to retinal degeneration. Our laboratory has found that the very abundant phospholipid, phosphatidylcholine (PC), can contain two molecules of docosahexaenoic acid (DHA) – an omega-3 fatty acid – or a single DHA and a molecule elongated from DHA – a Very Long Chain-PolyUnsaturated Fatty Acid (VLC-PUFA). Under conditions of stress, these molecules can be released and converted to highly neuroprotective forms (Neuroprotectin D1 and an Elovanoid (ELV), respectively) that aid in repair and/or maintenance of the RPE/retina complex. (This emphasizes the importance of DHA in retinal health.) However, little is known about the synthesis, incorporation, and protective nature of these molecules or the cells involved in retinal protection.

There are two studies that best highlight our mass spectrometric investigation of retinal degeneration: 1) Utilizing MALDI imaging mass spectrometry we have shown in mutant mice incapable of taking up DHA into the RPE/retinal complex, that there is a compensatory attempt to substitute omega-6 fatty acids. Moreover, VLC-PUFAs cannot be synthesized (no DHA), their lack impairing production of the protective ELVs, which subsequently initiates photoreceptor death. 2) In human retinas, we have shown that VLC-PUFAs are more abundant in the rod-rich periphery than in the cone-rich macula, and in retinal disease (e.g., Age-related Macular Degeneration, AMD), VLC-PUFAs are significantly depressed in retina, even more so within the periphery, suggesting that AMD may initiate within peripheral rod photoreceptor cells. (There is evidence that DHA is reduced in AMD patients.) This reduction in peripheral VLC-PUFAs is greater in the female retina, which may relate to the NIH study showing 66% of AMD patients are female.

Teaching Activities

2004 – present: ***Associate Professor, Research; Ophthalmology and Neuroscience***, LSU Health Sciences Center, New Orleans, LA

1994-2004: ***Assistant Professor, Research***; Department of Ophthalmology and Neuroscience Center of Excellence, LSU Health Sciences Center, New Orleans, LA

1987-1994: ***Instructor;*** Department of Ophthalmology and Neuroscience Center of Excellence, LSU Medical Center, New Orleans, LA

1981-1987: ***Assistant Professor***; Department of Physiology & Cell Biology, University of Kansas, Lawrence, KS

1980-1987: ***Assistant Professor***; Department of Entomology, University of Kansas, Lawrence, KS

1977-1980: ***Postdoctoral Fellow***; Department of Ophthalmology, Baylor College of Medicine, Houston, TX

1975-1977: ***Instructor***; Department of Biology, Hillsborough Community College, Tampa, FL

1970-1977: ***Graduate Research Assistant***; Dept of Biology, University of South Florida, Tampa, FL

1968-1970: ***Graduate Research Assistant***; Archbold Biological Station, Lake Placid, FL; Summer 1968, 1969 Smithsonian Tropical Research Institute, Barro Colorado Island, Panama Canal Zone; Summer 1970

1966-1970: ***Director of Planetarium***; State University of New York, Fredonia, NY

Selected Publications

Relevant Papers and Chapters:

Li S, Gordon WC, Bazan NG, and **Jin M.** (2020) Inverse correlation between fatty acid transport protein 4 and vision in Leber congenital amaurosis associated with RPE65 mutation. ***Proc Natl Acad Sci U S A***, 117: 32114-23.

Bazan HA, Bhattacharjee S, Burgos C, Recio J, Abet V, Pahng AR, Jun B, Heap J, Ledet AJ, **Gordon WC**, Edwards S, Paul D, Alvarez-Builla J, Bazan NG. A novel pipeline of 2-(benzenesulfonamide)-N-(4-hydroxyphenyl) acetamide analgesics that lack hepatotoxicity and retain antipyresis. E J Med Chem. 2020 Jun 30;202:112600 (1-19).

Leslie CE, Rosencrans RF, Walkowski W, **Gordon WC**, Bazan NG, Ryan MJ, Farris HE. Reproductive state modulates retinal sensitivity to light in female túngara frogs. 2020. Frontiers Behav Neurosci. 13;Article 293:1-13.

Kautzmann MI, **Gordon WC**, Jun B, Do KV, Matherne BJ, Fang Z, Bazan NG. Membrane-type frizzled-related protein regulates lipidome and transcription for photoreceptor function. 2020. FASEB J. 34(1):912-929. PMID:31914617.

Do KV, Kautzmann MI, Jun B, **Gordon WC**, Nshimiyimana R, Yang R, Petasis NA, Bazan NG. Elovanoids counteract oligomeric β-Amyloid-induced gene expression and protect photoreceptors. Proc Natl Acad Sci U S A. 2019 Nov 26;116(48):24317-24325. PMID: 31712409.

Nicolas G. Bazan and William C. Gordon, Learning from the Fly Photoreceptor on How Synapses Integrate Gene Expression to Sustain Retina and Brain Function, ***Neuron*** 101:548-550, 2019. https://doi.org/10.1016/j.neuron.2019.02.004.

Gordon WC, López VG, Bhattacharjee S, Gil DR, Díaz JA, Pineda de la Losa F, Peláez RP, Ferrer CT, Bacchini GS, Jun B, Varoqui H, Bazan NG. A Nonsteroidal Novel Formulation Targeting Inflammatory and Pruritus-Related Mediators Modulates Experimental Allergic Contact Dermatitis. ***Dermatology and Therapy***, 2018; 8 (1): 111 DOI: 10.1007/s13555-018-0223-8.

Jun B, Mukherjee PK, Asatryan A, Kautzmann M-A, Heap J, **Gordon WC,** Bhattacharjee S, Yang R, Petasis NA, Bazan NG. Elovanoids are novel cell-specific lipid mediators necessary for neuroprotective signaling for photoreceptor cell integrity, ***Scientific Reports***, 7:5279, 2017.

Rice, D.S. Calandria, J.M., **Gordon, W.C**., Jun, B.K., Zhou, Y.D., Gelfman, C.M., Li, S.H., Jin, M., Knott, E.J., Chang, B., Abuin, A., Issa El-Samman, T., Potter, D., Platt, K.A., and Bazan, N.G. Adiponectin Receptor 1 Conserves Docosahexaenoic Acid and Promotes Photoreceptor Cell Survival, ***Nature*** *Communications*, 2015 1-14.

Kanan, Y., **Gordon, W.C.**, Mukherjee, P.K., Bazan, N.G., Al-Ubaidi, M.R: Neuroprotectin D1 is synthesized in the cone photoreceptor cell line 661W and elicits protection against light-induced stress. (2014) ***Cellular and Molecular Neurobiology***.

Zemski-Berry, K.A., **Gordon, W.C.**, Murphy, R.C., Bazan, N.G: Spatial distribution of phospholipids in the human retina by MALDI imaging mass spectrometry. *J Lipid Res*. Dec 23. [Epub ahead of print]. (2014) ***J Lipid Res***. 55(3):504-515.

Songhua Li, Jungsoo Lee, Yongdong Zhou, William C. Gordon, James M. Hill, Nicolas G. Bazan, Jeffrey H. Miner, and **Minghao Jin**; Fatty Acid Transport Protein 4 (FATP4) Prevents Light-Induced Degeneration of Cone and Rod Photoreceptors by Inhibiting RPE65 Isomerase; (2013) ***The Journal of Neuroscience***, **3178:**33(7):3178 –318933.

Bazan, N.G., Calandria, J.M., **Gordon, W.C:** Docosahexaenoic acid and its derivative neuroprotectin D1 display neuroprotective properties in the retina, brain and central nervous system. (2013) In: *The Importance of Immunonutrition: Lipids. Nestlé Nutr Inst Workshop Ser.* Makrides M, Ochoa JB, Szajewska H (eds). Nestec Ltd., Vevey/S. Karger AG, Basel. 77:121-131.

Li, S., Lee, J., Zhou, Y., **Gordon, W.C.**, Hill, J., Bazan, N.G., Miner, J., Jin, M: Fatty Acid Transport Protein 4 (FATP4) Prevents Light-Induced Degeneration of Cone and Rod Photoreceptors by Inhibiting RPE65 Isomerase. (2013) ***J Neurosci***. 33:3178-3189.

Li, S., Yang, Z., Hu, J., **Gordon, W.C.**, Bazan, N.G., Haas, A.L., Bok, D., Jin, M: Secretory defect and cytotoxicity: the potential disease mechanisms for the retinitis pigmentosa (RP)-associated interphotoreceptor retinoid-binding protein (IRBP). (2013) ***J Biol Chem*.** 288:11395-11406.

Sheets, K.G., Jun, B., Zhou, Y., **Gordon, W.C.**, Bazan, N.G: Microglia Ramification and Redistribution Concomitant with Attenuation of Choroidal Neovascularization by Neuroprotectin D1. (2013) ***Mol Vis*.** 19:1747-1759.

Gordon, W.C., Bazan, N.G: Mediator Lipidomics in Ophthalmology: Targets for Modulation in Inflammation, Neuroprotection, and Nerve Regeneration. (2013) ***Cur Eye Res***. 38:995-1005.

Sato, K., Li, S., **Gordon, W.C.**, He, J., Liou, G.I., Hill, J.M., Travis, G.H., Bazan, N.G., Jin, M: Receptor interacting protein kinase-mediated necrosis contributes to cone and rod photoreceptor degeneration in the retina lacking interphotoreceptor retinoid-binding protein. (2013) ***J Neuroscience***. 33:17458-17468.

Bazan, N.G., Molina, M.F., **Gordon, W.C:** Docosahexaenoic Acid Signalolipidomics in Nutrition: Significance in Aging, Neuroinflammation, Macular Degeneration, Alzheimer's and other Neurodegenerative Diseases. ***Annual Review of Nutrition*** *(*2011) 31:321-51.

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Sheets, K.G., Zhou, Y., Ertel, M.K., Knott, E.J., Regan, C.E. Jr., Elison, J.R., **Gordon, W.C.**, Gjorstrup, P., Bazan, N.G: Neuroprotectin D1 attenuates laser-induced choroidal neovascularization in mouse. *(*2010) ***Mol Vis*.** 16:320-329.

Knott, E.J., Sheets, K.G., Zhou, Y., **Gordon, W.C.**, Bazan, N.G: Spatial correlation of mouse photoreceptor-RPE thickness between SD-OCT and histology. (2010) ***Exp Eye Res*.** 92:155-160.

Lentz, J.J., **Gordon, W.C.**, Farris, H.E., MacDonald, G.H., Cunningham, D.E., Robbins, C.A., Tempel, B.L., Bazan, N.G., Rubel, E.W., Oesterle, E.C., Keats, B.J: Deafness and retinal degeneration in a novel USH1C knock-n mouse model. *(*2010) ***Dev Neurobiol*.** 70:253-267.

Belayev, L., Khoutorova, L., Atkins, K., **Gordon, W.C.**, Alvarez-Builla, J., Bazan, N.G: LAU-0901, a novel platelet-activating factor antagonist, is highly neuroprotective in cerebral ischemia. ***Exp Neurol***. (2008) 214:253-258.

Mukherjee, P.K., Marcheselli, V.L., Vaccari, J.CdR., **Gordon, W.C.**, Jackson, F., Bazan, N.G: Photoreceptor outer segment phagocytosis selectively attenuates oxidative stress-induced apoptosis with concomitant neuroprotectin D1 synthesis. ***PNAS, USA*.** (2007) 104:13158-13163.

Cortina, M. S., **Gordon, W. C.**, Lukiw, W.J., Bazan, N.G: Oxidative stress-induced retinal damage up-regulates DNA polymerase gamma and 8-oxoguanine-DNA-glycosylase in photoreceptor synaptic mitochondria. ***Exp Eye Res*.** (2005) 81:742-750.

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Cortina, M.S., **Gordon, W.C** , Lukiw, W.J., Bazan N.G: Light-induced photoreceptor damage triggers DNA repair: Differential fate of rods and cones, *Retinal Degenerations*: Mechanism and Experimental Therapy *(LaVail MM, Hollyfield JG, Anderson RE, eds)* pp. 229-240. Kluwer Academic/Plenum Publishers: New York, (2003).

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Lukiw, W.J., **Gordon, W.C.**, Rogaev, E.I., Thompson, H., Bazan, N.G: Presenilin-2 (PS-2) expression up-regulation in a model of retinopathy of prematurity and pathoangiogenesis. ***Molecular Neuroscience***(2001) 12:53-57.

Rodriguez de Turco, E.B., Jackson, F.R., Parkins, N., **Gordon, W.C**: Strong association of unesterified [3H]docosahexaenoic acid and [3H-docosahexaenoyl] phosphatidate to rhodopsin during in vivo labeling of frog retinal rod outer segments. ***Neurochem Res*** **(**2000) 25:695-703.

Gordon, W.C., Colangelo, V., Bazan N.G., Klatzo, I: Aspects of the maturation phenomenon observed by the TUNEL method. In:, Maturation Phenomenon in Cerebral Ischemia III (I to U *et al*, eds). pp 15-23. Springer-Verlag: Berlin, (1999).

Gordon, W.C. and Bazan, N.G: Retina. In: Biochemistry of the Eye. John J. Harding (ed). Chapman and Hall, London (1997). pp. 144-275.

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Gordon, W.C., Bazan, N.G: Visualization of [3H]docosahexaenoic acid trafficking through photoreceptors and retinal pigment epithelium by electron microscopic autoradiography. ***Invest Ophthalmol Vis Sci*** (1993) 34:2402-2411.

Rodriguez de Turco, E.B., **Gordon, W.C.**, and Bazan, N.G. Light stimulates *in vivo* inositol lipid turnover in frog retinal pigment epithelial cells at the onset of shedding and phagocytosis of photoreceptor membranes. ***Exp. Eye Res***. (1992) 55:719-725.

Gordon, W.C., Rodriguez de Turco, E.B., and Bazan, N.G. Retinal pigment epithelial cells play a central role in the conservation of docosahexaenoic acid by photoreceptor cells after shedding and phagocytosis. ***Current Eye Res***. (1992) 11:73-83.

Dahl, N.A. and **Gordon, W.C.** Photomembrane turnover in frog: Light intensity and spectral correlates. ***Exp. Eye. Res***. (1992) 55:839-852.

Baudouin, C., Peyman, G., Fredj-Reygrobellet, D., **Gordon, W.C.**, Lapalus, P., Gastaud, P., and Bazan, N.G. Immunohistological study of subretinal membranes in age-related macular degeneration. ***Jpn. J. Ophthalm****ol*. (1992) 36:443-451.

Baudouin, C., Fredj-Reygrobellet, D., Peyman, G., Lapalus, P., **Gordon, B.**, Bazan, N.G., and Gastaud, P. Etude immunohistologique des membranes néovasculaires sous-rétiniennes au cours des dégénérescences maculaires liées à l'âge. ***Ophtalmolgie***. (1991) 5:61-64.

Rodriguez de Turco, E.B., **Gordon, W.C.**, and Bazan, N.G. Rapid and selective uptake, metabolism, and differential distribution of docosahexaenoic acid among rod and cone photoreceptor cells in the frog retina. ***J. Neurosci***. (1991) 11:3667-3678.

Baudouin, C., **Gordon, W.C.**, Fredj-Reygrobellet, D., Baudouin, F., Peyman, G., Gastaud, P., and Bazan, N.G. Class II antigen expression in diabetic preretinal membranes. ***Am. J. Ophthalmol***. (1990) 109:70-74.

Baudouin, C., **Gordon, W.C.**, Fredj-Reygrobellet, D., Baudouin, F., Peyman, G., Gastaud, P., and Bazan, N.G. Expression von Klasse-II-Antigen in diabetischen praretinalen Membranen. ***Ophthalmol. Digest.*** (1990) 4:7-8.

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Baudouin, C., Gastaud, P., **Gordon, W.C.**, Lapalus, P., Bazan, N.G., Righini, M., and Peyman, G.A. Etude immunohistologique des membranes épirétiniennes au cours de la

rétinopathie diabétique proliférative et du décollement de rétine avec prolifération vitréo-rétinienne. ***Ophtalmologie.*** (1990) 4:53-55.

Browman, H.I., **Gordon, W.C.**, Evans, B.I., and O'Brien, W.J. Correlation between histological and behavioral measures of visual acuity in a zooplanktivorous fish, the white crappie (*Pomoxis annularis*). ***Brain, Behavior, and Evolution***. (1990) 35:85-97.

Gordon, W.C. and Bazan, N.G. Docosahexaenoic acid utilization during rod photoreceptor cell renewal. ***J. Neurosci***. (1990) 10:2190-2202.

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Rodriguez de Turco, E.B., **Gordon, W.C.**, and Bazan, N.G. Preferential uptake and metabolism of docosahexaenoic acid in membrane phospholipids from rod and cone photoreceptor cells of human and monkey retinas. ***J. Neurosci. Res***. (1990) 27:522-532.

Gordon, W.C. and Keith, M.E. D-Tubocurarine chloride inhibits rod outer segment shedding in the frog retina. ***Invest. Ophthalmol. Vis. Sci.*** (1987) 28:118-120.

Basinger, S.F. and **Gordon, W.C.** Local stimulation induces shedding throughout the frog retina. ***Vision Res***. (1982) 22:1533-1538.

Basinger, S.F., **Gordon, W.C.**, and Lam, D.M.K. Differential labeling of retinal neurons by 3H-2-deoxyglucose. ***Nature***. (1979) 280:682-684.

Additional Info

Recent Funding:

Retinal pigment epithelium messengers, transcription, and photoreceptor renewal.
National Institutes of Health/National Eye Institute.
(Co-PI with N.G. Bazan)

Prior Funding:

Defense Advanced Research Projects Agency (DARPA)
Bio-magnetics interfacing concepts: A microfluidic system using magnetic nanoparticles for quantitative detection of biological species.
University of New Orleans,
Advanced Materials Research Institute College of Science
(PI, C.J. O'Connor),
LSU Neuroscience Center of Excellence

(PI, N.G. Bazan),
LSU Center for Advanced Microstructures and Devices
(PI, F. Hormes).
LSU Neuroscience Center - Nanobiotechnological approaches to laser-induced retinal damage. *Retinal protection against laser-induced injury*.
(April 2003, a 5-year program).