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Research Interests:

- 1.) Lipids Involved in Signal Transduction Mechanisms in the Eye
- 2.) Cell signal transduction events during corneal wound healing, particularly how specific growth factors that are released during injury activate kinase to communicate their signals from the cell membrane to the nuclei.

Selected Publications:

1. Kakazu A, Sharma G, **Bazan HE**. Association of protein tyrosine phosphatases (PTPs)-1B with c-Met receptor and modulation of corneal epithelial wound healing. *Invest Ophthalmol Vis Sci*. 2008 Jul;49(7):2927-35.
2. He J, **Bazan HE**. Epidermal growth factor synergism with TGF-beta1 via PI-3 kinase activity in corneal keratocyte differentiation. *Invest Ophthalmol Vis Sci*. 2008 Jul;49(7):2936-45.
3. Esquenazi S, He J, Li N, Bazan NG, Esquenazi I, **Bazan HE**. Comparative *in vivo* high-resolution confocal microscopy of corneal epithelium, sub-basal nerves and stromal cells in mice with and without dry eye after photorefractive keratectomy. *Clin Experiment Ophthalmol*. 3007 Aug;35(6):545-9.
4. Sharma GD, Kakazu A, **Bazan HE**. Protein kinase C alpha and epsilon differentially modulate hepatocyte growth factor-induced epithelial proliferation and migration. *Exp Eye Res*. 2007 Aug;85(2):289-97. Epub 2007 May 26.
5. Taheri F, **Bazan HE**. Platelet-activating factor overturns the transcriptional repressor disposition of Sp1 in the expression of MMP-9 in human corneal epithelial cells. *Invest Ophthalmol Vis Sci*. 2007 May;48(5):1931-41.
6. He J, **Bazan HE**. Synergistic effect of platelet-activating factor and tumor necrosis factor-alpha on corneal myofibroblast apoptosis. *Invest Ophthalmol Vis Sci*. 2006 Mar;47(3):883-01.
7. **Bazan HE**, Tao Y, Bazan NG. Platelet-activating factor induces collagenase expression in corneal epithelial cells. *Proc Natl Acad Sci U S A*. 1993 Sep15;90(18):8678-82.

Neurotrophins and DHA induce nerve regeneration

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The cornea has the highest nerve density and the highest sensitivity among tissues. Damage of the nerves after trauma, surgery or infection leads to neurotrophic keratitis, a condition characterized by decreased blink reflex and reduction of tear flow that, in turn, produces dry eye and consequently damage to the corneal epithelium. In severe cases, damage could lead to corneal ulceration.

Docosahexaenoic acid (DHA) is the precursor of neuroprotectin D1 (NPD1), a newly-discovered lipid mediator that protects retinal pigment epithelial (RPE) cells and neural cells from oxidative stress. Synthesis of NPD1 in RPE cells is stimulated by several mechanisms (*Bazan NG, Adv Exp Med Biol, 2008*).

We have found that treatment with nerve growth factor (NGF) or pigment epithelial-derived growth factor (PEDF) in conjunction with DHA enhances nerve regeneration of corneal nerves damaged post surgery. At 2 and 4 weeks post surgery, there was a 2.5 increase in corneal nerve area, and further increase was seen after 8 weeks. Epithelial cell proliferation also was increased after treatment. Neurotrophins or DHA alone do not have the same effect. NPD1 synthesis was four times higher in the PEDF+DHA-treated group compared to control.

This data demonstrates a new mechanism by which neurotrophin-mediated NPD1 synthesis is involved in nerve regeneration. This signaling mechanism may be targeted in neurotrophic keratitis as well as in other diseases where nerve repair is needed. (Supported by NIH-RO1 EY19465).