



Eyes: Window to the Brain

BY EILEEN MCCLUSKEY

If Clement Trempe, MD, has his way, optometrists will play a critical role in detecting Alzheimer's Disease and other neurodegenerative afflictions before they have a chance to wreak havoc. Indeed, these clinicians would become the nerve center of reliable and affordable tests that would be as routine as colonoscopies, mammograms, and cholesterol blood tests.

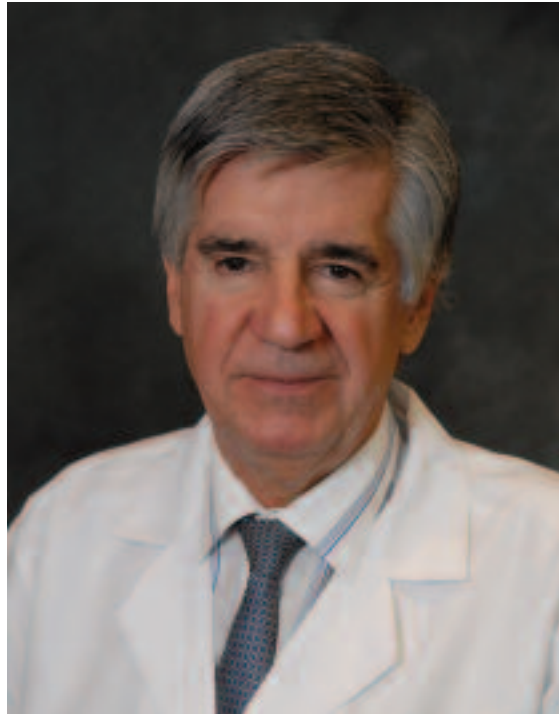
“The eye is the canary of the mind,” says Trempe, a distinguished clinician, educator, and researcher, who recently joined NECO and the New England Eye Institute as professor of optometry and head scientist with the newly-established Center for Healthy Aging at NEEI.

“Everybody says the eye is the window to the brain, but that wisdom is not being practiced. That’s why I’m here, so I can teach 400 optometry students how to recognize the early ocular signs of neurodegenerative and other systemic diseases.

Optometrists see over 50 million American patients every year. They are the only ones in a position to detect the early signs of AD in the general population.

Trempe, who moved his private practice to New England Eye Commonwealth, NEEI’s flagship facility last summer, wants to blaze a trail leading to research funding that would prove his theory about the eye as a rich source of biomarkers.

“Stem cells are present in every tissue of the eye,” says Trempe, who since the 1970s has specialized in advanced diseases of the retina.



Clement Trempe, MD

“For example, they can be found in the lens, the cornea, the retina, the optic nerve, and on capillaries in the brain.

“Cortical cataracts are the Rosetta Stone of Alzheimer’s Disease,” Trempe continues. The lens, he explains, retains a stem cell population that proliferates and differentiates throughout life. “The lens functions essentially as a single gigantic stem cell and a time capsule. It does not destroy old cells by apoptosis but uses young stem cells to continually nurture older cells. So the lens provides a record of the life history of the individual from embryo to old age.”

In his decades of clinical practice, Trempe has focused on retinal diseases such as macular degeneration, diabetic retinopathy, and retinal vein occlusion. He has also trained over 100 retinal and other fellows at the Schepens Eye Research Institute and Massachusetts Eye and Ear Infirmary, who are now practicing in nearly every country in the world.

Trempe’s clinical trials have been funded continuously for over 25 years by the National Eye Institute. These clinical trials have addressed the role of laser photocoagulation in diseases of

the eye. He was also a principal investigator in the National Eye Institute-funded Collaborative Ocular Melanoma Study.

In one of his hallmark clinical contributions, Trempe – who plans to maintain his long-standing clinical, teaching, and research appointments at Harvard Medical School, the Eye Research Institute of the Retina Foundation, Massachusetts Eye and Ear Infirmary, Massachusetts General Hospital, and Beth Israel Hospital – demonstrated the effectiveness of treating patients medically for diabetic retinopathy instead of performing laser photocoagulation treatment and vitrectomy.



Dorothy Hitchmoth, OD '96 and Dr. Trempe

Trempe's ideas about early detection of Alzheimer's also center on non-invasive techniques. Gazing into the eye using equipment they already have in their offices, optometrists can spot the telltale signs of neurodegenerative diseases.

"The molecular pathological findings associated with Alzheimer's Disease overlap in the lens and the brain," explains Trempe.

"Alzheimer's characteristic dementia is preceded by a long asymptomatic period that may last for decades. During this time, amyloid plaques and neurofibrillary tangles gradually accumulate in the brain. Eventually, these lesions cause so

much brain damage that cognitive impairment can be observed. Many studies have demonstrated decreased density of synapses in a variety of regions in the AD brain."

Early ocular biomarkers for Alzheimer's and other neurodegenerative diseases, as well as a variety of chronic infections that affect the brain, include changes in the supranuclear portion of the lens. Abnormal lens proteins, another red flag, can be measured "using the quasi-elastic light scattering analysis of the lens," Trempe notes. "Various types of cataracts produce very different types of early aberrations, and this is especially true for the cortical type of cataract. This is where the abnormal misfolded protein accumulates in the lenses of AD patients.

"Most eye care professionals are not aware of these early biomarkers," Trempe continues. "I am often told that we should not tell the patients and the public because it will make them nervous, but we do not have the same philosophy about breast cancer or high cholesterol."

Nor would it be time to panic if an optometrist saw signs of disease. Since neurodegenerative and other disease processes would not have progressed to a debilitating stage when the optometrist first spots it, says Trempe, "it is a wake-up call for patients to review their habits and see if there are any modifiable factors that might be increasing their risk of Alzheimer's Disease and mortality."

For such individuals, Trempe would advise them to heed common sense advice about regular exercise and eating fresh fruits and vegetables. "There is evidence that fish oil and a number of vitamins, drugs, and lifestyle factors can help to reduce the risk for developing AD," he notes.





Dr. Hitchmoth and Dr. Trempe

Trempe sees a golden opportunity to mine research dollars that would help to prove his points and move his vision to reality. The National Institutes of Health recently announced it will distribute \$60 million in research grants for studies on early biomarkers of Alzheimer's Disease.

"The eye is not included in the NIH grant-making parameters," says Trempe who, not surprisingly, sees red when he thinks of this missed chance to profoundly influence medical outcomes. He would issue a rallying cry, urging optometrists to insist, through the American Optometric Association, that the NIH allocate some of that \$60 million to eye research.



"Today, in the US alone, we have 30,000 optometrists who could help with a massive study using equipment that every optometrist already has in their offices," he says. "Everyone is talking about biomarkers, but not about finding them through simple optometric exams. It's astounding, really. What are we waiting for?"