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Scientists at UCSB Link Brain Plaques in Alzheimer's Disease to Eye Disease

Scientists at the Center for the Study of Macular Degeneration at the Neuroscience Research Institute of the University of California, Santa Barbara have found a link between the brain plaques that form in Alzheimer's disease and the deposits in the retina that are associated with age-related macular degeneration (AMD). AMD is a disease that leads to loss of central vision and affects 5 to 10 percent of the population over age 60.

Don H. Anderson and Lincoln V. Johnson, the scientists who head the study, said that both diseases appear to begin with the development of inflammation and the appearance of a type of plaque. Yet no one knows their exact causes.

"Epidemiological evidence gathered in

Europe suggests that those with advanced AMD are at somewhat greater risk of developing Alzheimer's disease," said Anderson. "But, at this point, it is not clear whether the elevated risk is attributable to common pathogenic factors, or to common risk factors including smoking and atherosclerosis."

The latest findings were presented at the annual meetings of the Association for Research in Vision and Ophthalmology (ARVO) in Ft. Lauderdale, Fla. on May 8. The comparison between these disease processes was first outlined by the scientists in the Proceedings of the National Academy of Sciences (PNAS) in September and in an

article in the American Journal of Ophthalmology, also in September.

Lincoln Johnson, senior research biologist who is first author of the PNAS paper, explained that the protein amyloid beta is thought to stimulate the inflammation process. He said that many researchers believe it is the culprit in the Alzheimer's disease process. Amyloid beta is a toxic protein that tends to stick together and kill neighboring cells in the brain. The same toxic

protein builds up in the deposits known as drusen that are located adjacent to the photoreceptor cell layers in the retina.

Regarding age-related macular degeneration, Johnson said, "Many of the pieces have been identified, we just have to figure out how they go together. Inflammation seems to be one factor that contributes to vision loss."

Visual perception begins when light from our surroundings enters our eyes and passes through the transparent cornea and lens. The curvatures of the cornea and lens bend the rays of light, like the lens of a camera and bring them into focus upon a thin, transparent layer of nerve tissue, called the retina, that lines the inner surface of the eye.

The retina is actually part of the central nervous system. It is connected to the brain by a cable called the optic nerve that is made up of approximately one million nerve fibers.

Macular degeneration is a blinding disease caused by the death of the photoreceptor cells in that part of the retina known as the macula. The macula is a circular area, approximately 5 millimeters or about 2/10 of an inch in diameter, that is located next to the optic nerve. In the age-related form of macular degeneration (AMD), photoreceptor cells within the macula die off slowly, thus accounting for the progressive loss of vision that usually begins after the fifth or sixth decade of life.

Drusen, a type of plaque, are regarded by many ophthalmologists as the hallmark clinical sign of early AMD. The appearance of numerous drusen and/or large drusen, especially in the macular region, is a significant risk factor for the subsequent development of the most prevalent type of AMD. Identifying the origin and molecular composition of these drusen deposits, therefore, has remained an important but elusive objective for many decades.

The presentation at the ARVO meetings covered how the scientists used electron microscopy to examine the organization and distribution of amyloid beta and other drusen-associated molecules.

For their studies the scientists examined tissue specimens from one or both eyes of more than 400 human donors. The work was supported by the National Institutes of Health.

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Center for the Study of Macular Degeneration

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