advancing age, cataract may develop at any time in life, even before birth. Cataract may be a consequence of diabetes, other metabolic disorders, or toxic environmental agents such as radiation and light or may be inherited or congenital in nature. At present, surgery to remove the opaque lens, one of the safest and most successful of all major operations, is the only effective way of treating cataracts.

The past 5 years have witnessed a phenomenal change in the focus and scope of cataract research. This research has evolved in three main directions: basic research into the mechanisms of lens transparency or opacification, clinical and epidemiological research into patterns of cataract formation in humans, and research aimed at improving techniques of cataract extraction and correction of resultant aphakia (absence of lens). The NEI has identified as a national vision research priority the need to develop means for preventing or slowing the development of cataracts and for treating them nonsurgically. Current emphasis is on investigating the mechanisms of lens transparency or opacification and on clinical and epidemiological research into patterns of cataract formation.

**Lens Structure and Function.** NEI-supported studies of the normal lens are concerned with development and structure of the lens; growth of the epithelial layer; both in culture and in the lens itself; molecular genetics; physiology; cell communication; the physical and chemical bases of transparency; and those metabolic processes related to the formation and breakdown of proteins, lipids, and carbohydrates. Only by gaining a better understanding of these normal functions will it be possible to understand the mechanisms involved in the development of cataract.

Oxidation of protein and lipid components of the lens has been shown to play a role in the onset of senile cataract. Some epidemiological studies have implicated ambient ultraviolet (UV) light radiation in sunlight as a factor leading to this oxidative damage. Currently, NEI is supporting 4 epidemiologic studies and 12 laboratory projects seeking to define the effects of UV light on ocular tissue. Other factors such as the accumulation of byproducts of oxidative metabolism also have been shown to alter important lens proteins and cause cataract.

A clinical trial has demonstrated the visual benefits of early surgical treatment, accompanied by the use of a corrective contact lens, of infants born with bilateral cataracts. Using a special visual measurement technique to test the eyes of very young, preverbal children, researchers determined that visual acuity was better in eyes corrected with a contact lens before 4 months of age than in those eyes that received correction later.

Considerable progress has been made in the development of sensitive, objective methods for measuring cataract formation in the living human eye. These methods involve the application of specialized

![NEI intramural researchers are using sophisticated molecular biological techniques to study crystallins, the major structural proteins in the lens, and the genes that direct their production. An important finding of these studies is that, although many of the crystallins found in various animal species are actually active enzymes employed in a structural role, many maintain their enzymatic function.](image-url)