Researchers can now determine when a human was born by looking into the eyes of the dead

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Using the radiocarbon dating method and special proteins in the lens of the eye, researchers at the University of Copenhagen and Aarhus can now establish, with relatively high precision, when a person was born. This provides a useful tool for forensic scientists who can use it to establish the date of birth of an unidentified body and could also have further consequences for health science research. The findings are published in the online, open-access journal PLoS ONE on January 30.

The lens of the eye is made up of transparent proteins called crystallins. These are packed so tightly together and in such a particular way, that they behave like crystals, allowing light to pass through the lens of the eye so that we can see. From conception and up until a human being is 1-2 years of age, the cells in the lens build these crystalline proteins. Once this organic construction work is done, however, the lens crystallins remain essentially unchanged for the rest of our lives. This is a fact that researchers can now put to good use.

A minute quantity of Carbon (C-12) in the carbon-dioxide content of the atmosphere contains two extra neutrons and is therefore called Carbon-14 (C-14). This isotope is radioactive, but decays so slowly and harmlessly into nitrogen, that this small carbon element, which occurs quite naturally in nature, is in no way harmful to humans, plants or animals.

At the same time, carbon is one of the principal organic elements, and constantly moves in and out of the food chain. The same is true for the tiny quantity of C-14 in the atmosphere. As long as an organism is part of the food chain, the amount of C-14 in its cells will remain constant and stay at the same level as the C-14 atmospheric content. When the organism dies, however, the quantity of C-14 will slowly but surely drop over the course of thousands of years, while it transforms into nitrogen. This is they key to the Carbon 14 method known as radiocarbon dating, which scientists use to date up to 60, 000 year old biological, archaeological finds.

From the end of World War II and up until about 1960, the superpowers of the Cold War era, conducted nuclear tests, detonating bombs into the atmosphere. These detonations have affected the content of radioactive trace materials in the air and created what scientists refer to as the C-14 bomb pulse. From the first nuclear detonation and, until the ban on nuclear testing was evoked, the quantity of C-14 in the atmosphere doubled. Since 1960, it has only slowly decreased to natural levels.

This sudden curve has left an impression in the food chain and therefore also in the lens crystallins of the eyes, which have absorbed the increased carbon content through food stuffs. Since the crystallins remain unchanged once they have been created, they reflect the content of C-14 present in the atmosphere at the time of their creation. An event occurring shortly after birth. Using a large nuclear accelerator, physicists at Aarhus University can now determine the amount of C-14 in as little as one milligram of lens tissue and thereby calculate the year of birth.

Associate Professor Niels Lynnerup from the Department of Forensic Sciences developed the forensic method, together with the Department of Eye Pathology and the Department of Physics and Astronomy at Arhus University, Denmark.

Professor Lynnerup explains that the technique can have several other applications: “As has been pointed out by other researchers, we think that the carbon dating of proteins and other molecules in the human body can also be used to study when certain kinds of tissue are generated and regenerated,” he explains. “This could, for example, be applied to cancer tissue and cancer cells. Calculating the amount of C-14 in these tissues could perhaps tell us when the cancerous tissues formed, and this could further the understanding of cancer.”

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