



Speakers on stage at the EcoBiology Summit in Croatia

Science of staying young

A two-day ecobiology summit held in Croatia explored a new approach to fight ageing while revealing some revolutionary research that could help slow down the process

BY SUREKHA S.

Ever heard about the blue zones? They are five geographical areas whose inhabitants live the longest on earth and also are the least affected by diseases. Many of the people in these areas go on to live till a healthy 100 years. But what is their secret? While many researchers have studied

the reasons for their longevity and narrowed it down to living a natural way of life as possible, some researchers are trying to find some specific anti-ageing solutions that can not only impact skin ageing but also delay onset of many ailments, including cancer.

A two-day scientific summit held in Croatia, conducted by Mediterranean

Institute for Life Science (MedILS), in partnership with N&OS, an international skin care company, focused on ecobiology, a new approach to anti-ageing and skin care with an aim to come up with an effective solution to ageing. The summit attended by many researchers including professors of dermatology, cancer researchers, doc-

tors and nobel laureates, saw experts from different fields put their minds together to answer the ageing problem, while also revealing that MedILS has made some advancement towards an effective solution.

"Okinawa, Sardinia, most blue zones are island populations," points out Miroslav Radman, cofounder of the MedILS and host of the EcoBiology Summit. "They are a sizeable population that has not been moving. No one comes in or moves out. The most likely hypothesis for their longevity is that for thousands of years, the populations have adapted to the food and the environment. Initially those who could not survive on the food may have died, resulting in stronger generations that are adapted to the food," he explains. "The same concept of adaptation has been seen in bacteria as well." Bacteria

when seen even in extremely cold conditions over time adapt and survive," says Radman, who has studied extremophile bacteria to understand what helps them survive. "We studied bacteria in small animals that are extremely robust and can survive doses of radiation that is thousand times higher than ones that can kill us. We found that these bacteria synthesise compounds that protect from oxidation. If proteins are protected, they work optimally." And this, he believes, could hold the key to the ageing problem.

New research in the field

Ageing is a natural process in which the body's functions deteriorate and one becomes more prone to age-related diseases. A commonly accepted theory of ageing is the free radical theory which states that free radicals cause ageing by a reaction with macromolecules, resulting in an accumulation of oxidatively damaged material. And oxidative damage to protein, lipids and DNA is considered a cause of ageing. Protein carbonylation, a type of protein oxidation increases with age and oxidised protein cannot be repaired. Most of our anti-ageing creams have antioxidants. This is because antioxidants can stop the oxidation of protein, thus slowing down the process of ageing.

Researchers at MedILS have found a solution where the oxidation of protein can be dealt with in two effective ways – an antioxidant that stops the oxidation and chaperones that protect the protein in its natural shape.



Miroslav Radman

"Protein carbonylation (oxidation) is deleterious to the cells because it interferes with protein function and leads to toxic accumulation. To prevent such oxidation, the two main options are antioxidants, which will catch free radicals before they oxidise proteins, and chaperones, which keep proteins in their optimum folding shape, thereby preventing their oxidation. We have found, in an extremophile bacteria called *Arthrobacter agilis*, a molecule that is both an antioxidant and a chaperone. This molecule has the particularity of binding directly to proteins which allow for a direct protection and helps the protein to keep its optimised shape. This molecule has been tested on human cells and skin against a wide range of oxidative damage from elements such as hydrogen peroxide, UVA and UVB, pollution. For every stress tested, this molecule showed a much more efficient protection than any other known antioxidant," explains Francois Xavier, Aging Research Manager at NAOS group and Group leader at MedILS. This solution has been patented by the company.

Apart from stopping protein oxidation, the researchers are also doing work on reversing the effects of ageing. "Our research also concerns the possibility of not only preventing damages but reversing them. This reversal, at the cellular level, leads to rejuvenation of the cells. To achieve such rejuvenation, we activate the recycling mechanisms of the cell such as proteasome and autophagy which will degrade oxidised proteins (but also lipids and other macromolecules of the cell) that have accumulated with age. This rejuvenation by degradation of damaged protein can also be applied for damaged mitochondria and even damaged cells by activation of other specific mechanisms," adds Xavier.

Slowing the process

In a paper published in the journal *Science* last year, researchers from Harvard Medical School found a way to reverse DNA ageing in mice. They accomplished this by giving a particu-



Peter Karran

lar compound to older mice to activate the DNA repair process. This not only protected the mice against future damage, but repaired the existing effects of ageing as well.

So, does this mean ageing can be prevented or reversed? Well, skin ageing can be slowed to some extent but not really prevented, say most experts. "Avoiding stressors like protecting from UVA and UVB and not smoking can definitely slow down the ageing process," says Peter Karran, principal scientist, Cancer Research UK/ Francis Crick Institute. "As you age the number of mutations go up. If you measure the number of mutations in the skin, it is very high. Sunlight UVA is connected to ageing, UVB reacts with

UVA to cause photoageing. Patients of Xeroderma Pigmentosum suffer from skin cancer in the first two decades and they also exhibit an accelerated photoageing. Photoageing is a process of accumulated mutations and the expression of mutated genes lead to increasing amount of oxidised protein," he says adding that if you stay out of the sun you may slow down the ageing process, but that is not really recommended. "My partner has been very careful when going out in sunlight, always using sunscreen and she does look many years younger than her age."

Pollution and stress also play an important role in ageing, says Prof Dr Brigitte Dreno, head of the department of dermatology at the University

Hospital of Nantes in France. "Apart from antioxidants, using good quality cleansers and topical retinoids can help the skin look younger," she says.

Finding a solution to the ageing problem is not just about looking young; it can increase longevity, help people stay healthy for long and improve productivity as well. "Biological ageing destroys the capacity of people to be productive. At one time the average life expectancy was 30 years. Today by 30, scientists start working, surgeons start operating. If today the life expectancy was 30 years, then in these complex professions people wouldn't have time to do much work. Knowledge doubles every seven years. So in the future, one would need more and more time to learn. In the next two centuries, people may need to get instructed till 40 or 50 then how much time is there for them to be productive?" questions Radman, stressing on the fact that finding solutions to the ageing problem is a lot more than just looking young.

Understanding ecobiology

The important part, believe most panellists at the summit, is that ageing needs to be approached holistically. And that's why the term ecobiology, which Dreno says is an integrative, scientific, and holistic approach to ageing. It is a science that looks at skin as an ecosystem in interaction with its physical and social environments. "Ecobiology is a systemic biology of the skin which aims to understand the interactions between the environment (air/light/water) and the interface of the body functionally integrated in the skin," explains Radman. This approach also believes that the skin should not be over-treated and isolating and selecting pure molecules that impact ageing may be a more effective solution.

More research and discussion on the field may not only provide an effective solution to skin ageing, but it may also help find solutions to delay or retard cancers and age-related diseases like Alzheimer's and more. □