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Wrinkles, thinning hair, spotted hands, high blood pressure, poor memory and weaker bones: decline and disease often precede death. Anti-ageing therapies abound but are unlikely to work until we understand what causes ageing.

“From hour to hour we rot and rot,” wrote Shakespeare when considering old age. Distasteful language, perhaps, but his words tell the truth. As the hours, days and years go by, the cells in our body become progressively more damaged, resulting in the signs of ageing.

“Grow old with me, the best is yet to be”

Some of the damage is unavoidable: your DNA naturally accumulates damage over time, affecting how well your cells can function. Interestingly, blood tests from centenarians show that their cells are particularly good at repairing DNA.

Much of the damage to your cells, however, arises from wear and tear and external factors such as those listed below.

Cigarette smoke

According to Dr Graham Cope, smoking expert, cigarette smoke contains 96 dangerous chemicals. These damage cells in the brain, increasing the risk of Alzheimer’s and vascular dementia, and in the heart, leading to inflammation.

Skin cells [4] are also damaged by smoking; wrinkles form as the cells make less collagen (the protein that makes skin strong and elastic).

Some cells turn cancerous when damaged by smoke: 90% of head and neck cancers are thought to result from smoking.

Air pollution

Dark spots, wrinkles and rosacea afflict the skin when its cells are damaged by tiny particles of pollution known as polyaromatic [5] [5]hydrocarbons [5]. These invade the skin, causing inflammation and damage to the DNA.

Sugar

A study [6] at Harvard University showed that sugar intake increases the risk of dying from heart disease, perhaps because sugar raises blood pressure, or triggers the liver to release harmful fats into arteries, clogging them. The Alzheimer's Society [7] also recognise a possible link between sugar and the development of the disease.

Teeth bacteria

In one study [8], gum disease was associated with increased risk of Alzheimer's. Teeth bacteria [9] are thought to trigger your immune system to attack cells, causing inflammation.

Food

Your body burns its carbohydrates and fats for fuel. 'Free radicals' are dangerous molecules produced as waste during metabolism. They charge around your body, damaging cells. The more you eat, the more free radicals are produced.

When rats consumed less, they lived longer. Whether calorie restriction works to avert ageing in humans is not known. Some [10] scientists [10] think it's not that simple.

Stress hormones

Doctors wonder whether stress causes Alzheimer's [11]: stress hormones may attack cells in the hippocampus (the part of your brain responsible for memory). Stress reduction through art, music or countryside walks often improves symptoms in people with mild dementia.

Stress hormones can also damage cells in the heart; loneliness is associated with a 29% increase in risk of heart disease and a 32% increase in stroke - possibly linked to increased stress.

Averting the assault

"Life repairs and replaces its components at an amazing rate. If every part in your car were replaced each year, theoretically it could run forever," says Dr Michael Fosser, author on ageing.

For a while, your body does deal with the damage. Like an army losing its tanks, however, the human body loses an important part of its weaponry later in life, and that's your hormones. For women, the abrupt loss of oestrogen [12] at the menopause is thought to increase risk of heart attack and bone fracture; testosterone [13] in men, meanwhile, may reduce likelihood of stroke, diabetes and angina, and its levels slowly decline with ageing.

Hormone replacement, however, has not helped to alleviate ageing – though it has been tested. In the 1930s, the Russian-born scientist Serge Veronoff gained worldwide fame for transplanting chimpanzee testicles into human males, and monkey ovaries into human females – without anti-ageing results.

Losing the battle

Having accrued damage and lost hormonal protection, your body cells are in a precarious position later in life. And

it seems that they wave the white flag of surrender.

According to Nancy Shute, science journalist, “some internal clock primes us to self-destruct”. She was referring here to a discovery made by cell biologist Leonard Hayflick in 1961. He discovered that human cells divide some 80 or 90 times and then stop. Although they can continue to live for years, they are battle-weary and succumb to damage. When this happens to cells in your immune system, for example, they begin to “fail, splutter and blunder with gradually ebbing effectiveness”. Conditions such as rheumatoid arthritis, cellulitis, shingles and even some cancers may result.

An enzyme exists that can effectively turn off this internal cellular clock. It’s called telomerase and some scientists see it as the cure for ageing; others are more wary, recognising that too much telomerase [14] could cause cancer as cells divide continuously.

Anti anti-ageing?

If our cells are programmed to lose resilience in old age, should we not accept ageing as a natural process and embrace it (whilst taking reasonable care of ourselves)?

Robert Browning said, “Grow old with me, the best is yet to be” and Shakespeare recognised the “honour, love, obedience and troops of friends” that can accompany old age. As a nurse, I am acutely aware of those to whom old age is denied. Whatever your age or your stage, cherish life.

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