



Why do we age?

KS3

KS4

Ages 11-16 ⌚ 4 min read

Ageing is the gradual deterioration of cells, tissues, and systems over time, ultimately leading to death. It happens to almost every complex animal (some species age far more slowly than others, a few barely at all), and for a long time we didn't really understand why. Scientists now have several strong explanations.

Telomeres: biological shoelace tips

At the ends of every chromosome (the structures that carry your DNA) are protective caps called **telomeres**. Every time a cell divides and copies its DNA, the telomeres get slightly shorter — they can't fully copy their own ends. Eventually, after 50–70 divisions or so, telomeres become too short and the cell can no longer divide safely. It either stops dividing (called senescence) or destroys itself (apoptosis). As more and more cells reach this state, tissues and organs begin to function less well.

Shoelaces have plastic tips (called aglets) on their ends to prevent fraying. As they wear away, the lace starts to fray, unravel, and eventually fall apart. Telomeres are like those plastic tips on your chromosomes. Each cell division wears them down a little. When they're too short, the chromosome starts to "fray," and the cell can no longer function properly.

DNA damage accumulates

Your DNA is under constant attack — from UV radiation, chemicals, metabolic byproducts, and copying errors during cell division. Your cells have repair mechanisms, but they're not perfect. Over decades, small amounts of unrepaired damage accumulate. Eventually, enough errors build up in enough cells that things start to go wrong — cells malfunction, tumours can develop, organs gradually decline.

The mitochondrial theory

Mitochondria are the energy-producing structures inside cells. They generate energy through a process that produces reactive oxygen molecules (free radicals) as a byproduct. These free radicals can damage DNA, proteins, and cell membranes. Over

a lifetime, this oxidative damage accumulates — which is one reason antioxidants (found in fruit and vegetables) are linked to healthy ageing.

Can we slow ageing?

Yes, to some extent. Not smoking, regular exercise, a good diet, not getting obese, and managing stress all meaningfully slow the biological ageing process. Scientists are also working on more direct interventions — drugs that clear senescent cells, therapies that extend telomeres, and drugs that mimic the effects of calorie restriction (which robustly extends lifespan in many animals). Whether radical life extension is achievable in humans remains genuinely unknown.