AGEING

Ageing is the process of becoming older. The term refers especially to human beings, many animals, and fungi, whereas for example bacteria, perennial plants and some simple animals are potentially biologically immortal. In the broader sense, aging can refer to single cells within an organism which have ceased dividing (cellular senescence) or to the population of a species (population ageing).

In humans, aging represents the accumulation of changes in a human being over time, encompassing physical, psychological, and social changes. Aging is among the greatest known risk factors for most human diseases: of the roughly 150,000 people who die each day across the globe, about two thirds die from age-related causes. The causes of aging are uncertain; current theories are assigned to the damage concept, whereby the accumulation of damage (such as DNA oxidation) may cause biological systems to fail, or to the programmed aging concept, whereby internal processes (such as DNA methylation) may cause aging. Programmed aging should not be confused with programmed cell death (apoptosis).

Aging versus immortality

Aging and mortality of the individual organism became possible with the evolution of sexual reproduction. The sexual organism could henceforth pass on some of its genetic material to produce new individuals and could itself become disposable with respect to the survival of its species. This classic biological idea has however been perturbed recently by the discovery that the bacterium *E. coli* may split into distinguishable daughter cells, which opens the theoretical possibility of "age classes" among bacteria.

Even within humans and other mortal species, there are cells with the potential for immortality: cancer cells which have lost the ability to die when maintained in a cell culture such as the HeLa cell line, and specific stem cells such as germ cells (producing ova and spermatozoa). In artificial cloning, adult cells can be rejuvenated to embryonic status and then used to grow a new tissue or animal without aging. Normal human cells however die after about 50 cell divisions in laboratory culture (the Hayflick Limit, discovered by Leonard Hayflick in 1961).

Effects

Enlarged ears and noses of old humans are sometimes blamed on continual cartilage growth, but the cause is more probably gravity. A number of characteristic aging symptoms are experienced by a majority or by a significant proportion of humans during their lifetimes.

- Teenagers lose the young child's ability to hear high-frequency sounds above 20 kHz.
- Wrinkles develop mainly due to photoageing, particularly affecting sun-exposed areas (face).
- After peaking in the mid-20s, female fertility declines.
- After age 30 the mass of human body is decreased until 70 years and then shows damping oscillations.

- Muscles have reduced capacity of responding to exercise or injury and loss of muscle mass and strength (sarcopenia) is common. VO2 max and maximum heart rate decline.
- People over 35 years of age are at increasing risk for losing strength in the ciliary muscle which leads to difficulty focusing on close objects, or presbyopia. Most people experience presbyopia by age 45–50. The cause is lens hardening by decreasing levels of α-crystallin, a process which may be sped up by higher temperatures.
- Around age 50, hair turns grey. Pattern hair loss by the age of 50 affects about 30–50% of males and a quarter of females.
- Menopause typically occurs between 44 and 58 years of age.
- In the 60–64 age cohort, the incidence of osteoarthritis rises to 53%. Only 20% however report disabling osteoarthritis at this age.
- Almost half of people older than 75 have hearing loss (presbycusis) inhibiting spoken communication. Many vertebrates such as fish, birds and amphibians do not suffer presbycusis in old age as they are able to regenerate their cochlear sensory cells, whereas mammals including humans have genetically lost this ability.
- By age 80, more than half of all Americans either have a cataract or have had cataract surgery.
- Frailty, a syndrome of decreased strength, physical activity, physical performance and energy, affects 25% of those over 85.
- Vessel aging causes vascular remodeling and loss of arterial elasticity and as a result causes the stiffness of the vasculature.

Dementia becomes more common with age. About 3% of people between the ages of 65 and 74, 19% between 75 and 84, and nearly half of those over 85 years of age have dementia. The spectrum ranges from mild cognitive impairment to the neurodegenerative diseases of Alzheimer's disease, cerebrovascular disease, Parkinson's disease and Lou Gehrig's disease. Furthermore, many types of memory decline with aging, but not semantic memory or general knowledge such as vocabulary definitions, which typically increases or remains steady until late adulthood (see Aging brain). Intelligence declines with age, though the rate varies depending on the type and may in fact remain steady throughout most of the lifespan, dropping suddenly only as people near the end of their lives.

A distinction can be made between "proximal aging" (age-based effects that come about because of factors in the recent past) and "distal aging" (age-based differences that can be traced to a cause in a person's early life, such as childhood poliomyelitis). Aging is among the greatest known risk factors for most human diseases. Of the roughly 150,000 people who die each day across the globe, about two thirds—100,000 per day—die from age-related causes. In industrialized nations, the proportion is higher, reaching 90%.

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