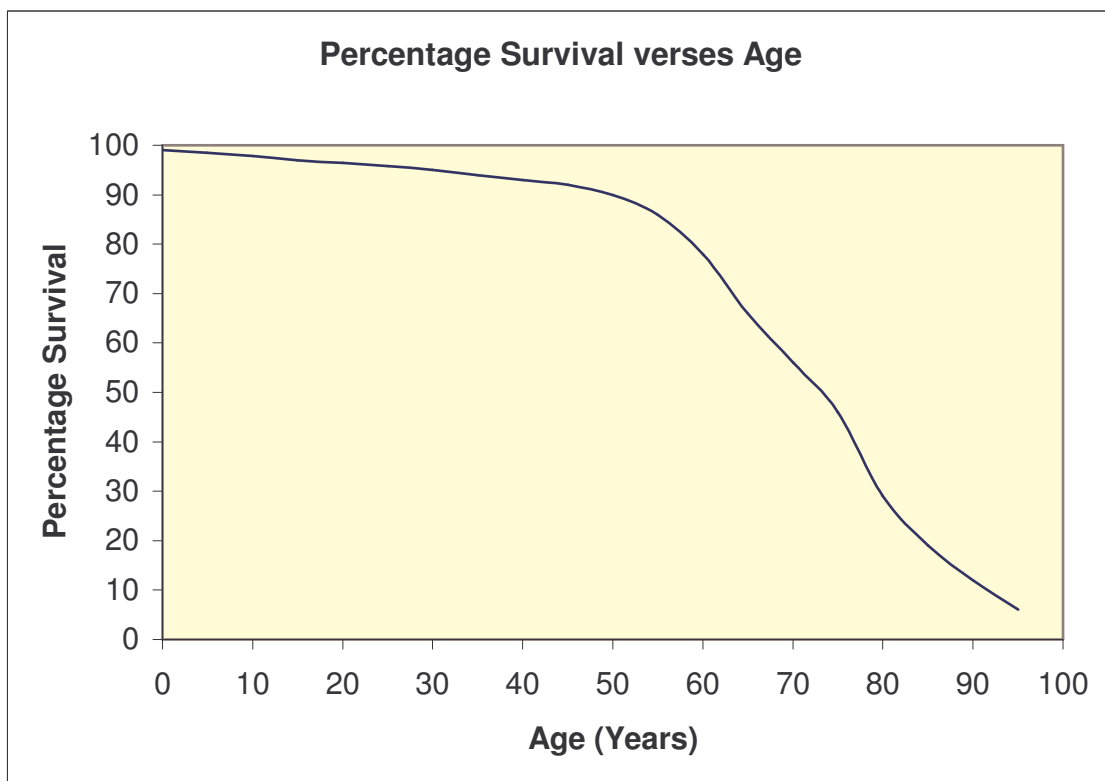


Ageing and the Nervous System

Ageing and its problems

Ageing: the progressive decline in function and performance which accompanies advancing years

The survival rate against age can be shown in the following graph:



Adapted from: Pathology and Understanding Disease, S. Mera 1997

Genetics can explain a number of consequences of ageing.

- The decreases in cell division can be explained by the theory about the role of the telomeres on the chromosomes
- The accumulation of random mutations can lead to greater problems at older age, due to affecting the proteins produced by the cell, e.g. cancer

Physical Effects associated with age:

- Skin becomes dry, thin, wrinkled and loses elasticity
- The hair becomes white and sparse
- The bones become brittle
- Curvature of the spine
- Loss of normal senses, e.g. vision, smell, taste, hearing.

Ageing is also associated with decreased protein synthesis, which affects the production of a wide range of chemicals including enzymes, hormones, receptors, neurotransmitters and antibodies. The reduced availability of enzymes has several consequences:

- Reduces functioning of cells and organs
- Reduces maintenance of cells and tissues
- Accumulation of abnormal, inactive or damaging macromolecules.

Physiological effects of ageing on specific organ systems:

Respiratory System:

- Decreased lung surface area
- Decreased elasticity of alveoli
- Reduced muco-ciliary clearance

The main significance of these problems is that the vital capacity is reduced, hence rate of gaseous exchange is reduced.

Cardiovascular System:

- Loss of elasticity of arterial walls and arteriosclerosis
- Work output and maximum pulse rate decreases
- Reduction in Cardiac muscle function

The main significance of these problems is that the cardiac output is reduced.

Excretory System:

- The liver and kidneys decrease in size
- Reduction in number of nephrons affecting filtration and reabsorption
- Decreased capacity for the metabolism of drugs and hormones

The main significance of these problems is the impairment of elimination or break down of metabolic or other wastes.

Immune System:

- Decrease in the number of T lymphocytes circulating in the lymph
- Reduced immune function
- Greater probability of developing auto-immune diseases

The main significance of these problems is that the bodies become more susceptible to illness.

Drug metabolism

Changes in the GIT, liver and kidney due to ageing affect:

- Ability to metabolise and eliminate drugs
- Absorption and distribution of the drug to the tissues are altered
- Adverse reactions and side effects are more frequent

The main significance of these problems is that drug doses should be modified, in order to cause as less as possible problems to the already weak organism.

Ageing and Nervous system

Changes in the nervous system:

- The number of nerve cells decreases, and each cell has fewer branches (Dendrites).
- Some nerve cells lose their coating myelin sheet.
- Decrease in the number of receptors
- Loss in brain mass occurs

Effects of these changes are:

- The speed with which the signal travels down the axon of neurons is reduced, causing a decrease in conduction velocity.
- The numbers of contacts or synapses decrease causing a decrease in the amount of information transferred between neurons.
- Speech spoken rapidly becomes more difficult to understand with age due to the slowing in nerve cell conduction velocity.

Changes in the Senses

Vision

- Elasticity of the lens is reduced, therefore elderly have trouble focusing their eyes.
- The cornea become less transparent and more flat causing images distortion.
- Cataracts may occur, causing a decrease in the amount of light that passes though the lens.
- Changes in the ANS alter the ability of older people to dilate the pupil.

Olfaction

- Changes in the nasal mucosa, contribute to impaired odour recognition.

Taste

- Reduction in the number of taste buds, reducing the taste ability.

Audition

Hearing loss in the elderly may result from:

- Loss of nerve fibres from the cochlea to the brain.
- Loss of neurons in auditory areas of the brain.
- Atrophy of small ear muscles.
- Degeneration of hair cells and support cells in the cochlea.

Touch

Changes in the ability to perceive tactile stimuli may due to:

- Loss of various receptors in the skin.
- Reductions in the number of sensory fibres innervating the skin.

Brain related disorders

- Dementia is a deterioration of intellectual functions affecting orientation, memory and judgement. The principal causes of Dementia are Alzheimer's disease and multiple infarcts in the brain.
- Alzheimer's disease is degenerative condition of the brain in which some nerve cells gradually lose function and die. Death is usually caused by pneumonia, accidents and, occasionally, respiratory arrest. Symptoms that may occur are confusional state, loss of memory and ultimately frank dementia.
- Parkinson's disease is very distinct from Alzheimer's disease because different nerve cells are affected and there is a loss of motor co-ordination, which usually unimpaired in Alzheimer's disease. With this disease, the brain shows loss and generation of dopaminergic neurons. It is believed that some of the neurons degeneration is caused by an excess of free radicals.