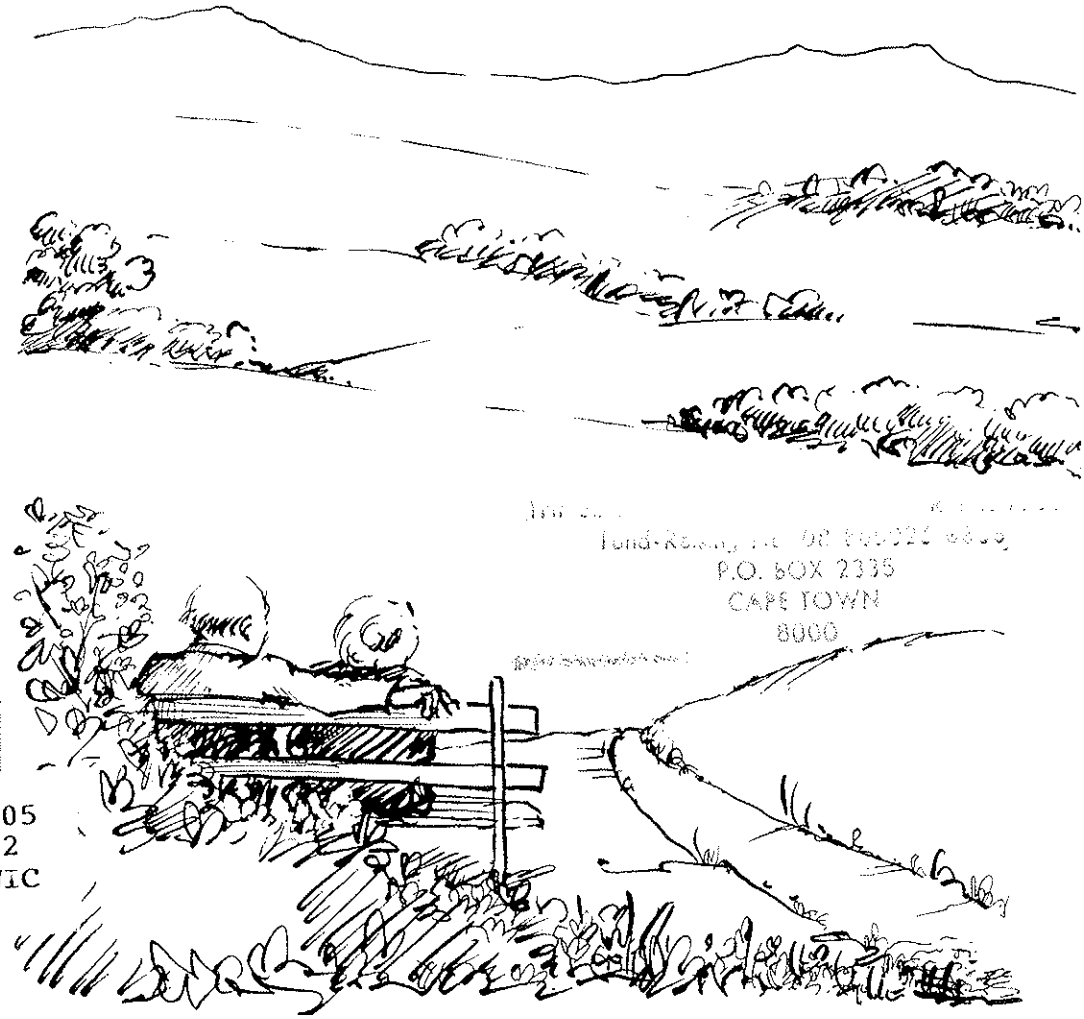
NEVER TOO OLD *to* LEARN



UNDERSTANDING THE AGEING PROCESS

THE S.A. NATIONAL COUNCIL FOR THE AGED
Fund-Raising No. 08 800026 0006
P.O. BOX 2335
CAPE TOWN
8000

96/579

FOREWORD

Metropolitan Life is well aware of the ignorance and even misconceptions that exist with regard to the elderly and the ageing process. I therefore regard it a privilege for my company to be involved in the publication of this booklet, written by Prof. Wicht at the request of the South African National Council for the Aged. The purpose is to present scientifically sound information on the ageing process in an easily understandable manner. We trust that all who are involved in the care of the aged will find this booklet useful, and that it will give the elderly themselves and those for whom senior citizenship is not too far away, insight and peace of mind.

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Sketches by Sandy Houston-Brown

THE AGEING PROCESS

The older brigade acknowledges the ageing process and is aware of the changes taking place in outward appearance, such as changes in posture, of the skin, loss of hair, the joints (which don't move so easily anymore), the eyes (that don't see so well anymore) and loss of hearing (causing us to think that the old chap is mumbling so much), to mention just a few.

But why do we experience these changes and what causes them to develop? It is a known fact that the changes that accompany the ageing process result from loss of body cells. But we still don't know *why* this happens; in spite of the fact that the Biblical Methusala reached such a ripe old age, even now, towards the end of the twentieth century, there are still only theories on what causes the ageing process.

The reduction in cell number occurs when cells divide to form new cells and faults occur, resulting in the death of and loss of cells. This leads to the ageing changes which take place, for example, in bone marrow and digestive tract cells. However, there is also a reduction in cells which do not divide, i.e. where the individual already has his full quota of cells at birth. With advancing age, cells are continually lost and not replaced, contributing to the ageing process.

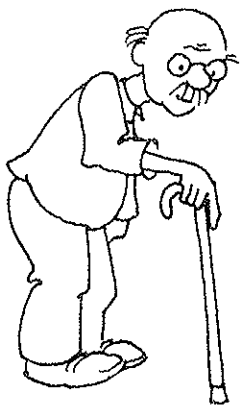
Examples are the brain and nerve cells of the body. Other tissues, such as the liver and skin, consist of both dividing and non-dividing cell types.

Posture and body contour

As a person becomes older, his body posture changes – he becomes shorter and smaller. The back and lower limbs become bent and the neck becomes stiffer and less mobile.

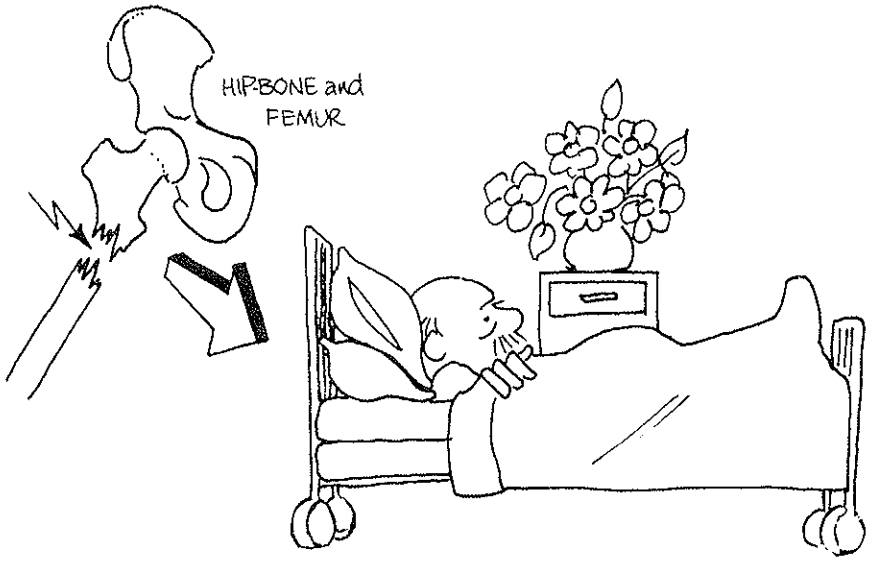
These changes may be ascribed to a general loss of calcium in the body's bony tissue, which results in the bending of limbs, and the vertebrae (bones of the spine) bearing more heavily on one another. They become compressed and cause the spine to curve.

We must also remember that the vertebrae and limbs have borne the body's weight over all the years. Elderly people are more susceptible to falls and, when this happens, the bones are likely to



By Golly, I'm shrinking and becoming shorter.

break more easily because of the decalcification. The neck of the hip bone, especially, fractures very easily.



I hardly fell and look at me now!

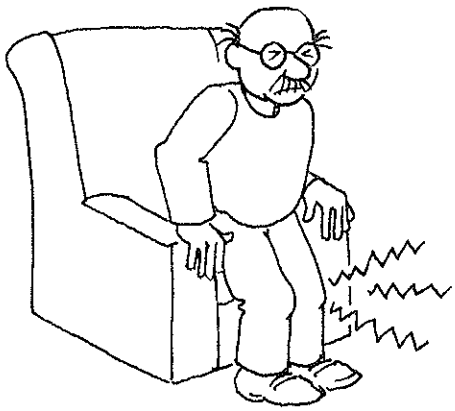
Changes in posture have an adverse influence on balance.

Who is not aware of the fact that the jaw also becomes more prominent and, in closing the mouth, the lower jaw closes in front of the upper jaw? This is understandable when one considers that for many years the chewing action has widened the angle of the lower jaw. This prevents the mouth from closing completely.

There's a tendency for men and women to gain weight from about 40 years of age. Interestingly, the redistribution of body fat occurs from the face, legs and the buttocks to the abdomen, the shoulders and the hips. The fatty covering of bony protrusions is also reduced. Typical examples of this are the ribs, the vertebrae, the small bones of the feet and also in cavities such as the orbit of the eye, the armpit and spaces between the ribs. The woman's breast decreases in size because of the reduction in fat and glandular tissues.

The joints

With ageing, changes also take place in the joints. They become stiffer, due to the reduction of fluid in the joints and the thinning of the cartilage (cushion between



And now what is that creaking in my knees?

bone ends). Because of this, the cartilaginous cushion no longer functions efficiently and a grating instead of a smooth, gliding movement occurs.

The muscle tissue around the joints becomes thicker and stiffer, because it is replaced by an inferior, less elastic connective tissue. All of these changes make the joints more difficult to move and, although they take place in all joints, they are of particular importance in the knee, ankle and other foot joints, making movement not only more difficult but less accurate and so adversely influence balance.

The skin

The ageing skin often requires expensive cosmetic preparations and treatments. Just as in other organs, cell loss leads to characteristic changes in the skin: it becomes flabby, less elastic, drier and thinner. This leads to the formation of wrinkles and baggy skin, which are more pronounced in the exposed parts of the body. Wrinkles are most noticeable in the face, while bagginess, due to the loosening of the skin and the effects of gravity, causes sagging of the cheeks. Some people also develop a double chin due to the deposit of fat, sagging of the skin and subcutaneous connective tissue. The sweat glands become inactive. (It is generally known that a person perspires less as he becomes older.) Subcutaneous tissue becomes thinner, providing less support for small blood vessels which lie under the skin. As a result, even mild injuries cause unsightly bruises. These injuries might be so small that the elderly person is initially unaware of them but, later, he may start to worry that the bruises indicate an underlying illness. Because of the vulnerability of arms and legs, bleeding most commonly occurs in these parts. Wounds also heal slower when one is older.

There is a tendency for skin warts (senile keratosis) to develop, becoming darker and larger in time. They occur particularly on the back, chest and face. Brown spots (senile lentigo) occur on the back of the hands, forearms and face. These spots are completely harmless, yet the elderly frequently refer to them as "burial flowers".

Small, superficial veins in the lower limbs enlarge and can become star-shaped in appearance. Some elderly people develop small, raised, red lesions particularly

on the breast, abdomen and upper limbs. These look like little ripe berries but are actually small, protruding blood vessels. In the same areas one might also find small, protruding, clearly visible blood vessels in the shape of spiders.

It is interesting that the loss of head hair and the greying of hair is more noticeable in men and is largely due to hereditary factors. Greying is caused by the loss of pigment and hair loss typically occurs on the frontal and crown parts of the head. Both in men and women there is general loss of body hair such as in the armpits, legs and pubic regions.

Brain and nerves

With cell loss, the brain becomes smaller and examination of brain tissue under a microscope reveals that there are also age-related changes in the cells. The cells tangle and aggregate, having the appearance of and giving rise to the term "crow's nest". The more crow's nests, the less the power of memory and comprehension.

The loss of mental ability among the aged does not follow a standard pattern and is thus unpredictable. Even at the age of ninety, some people possess remarkable mental ability. Think of elderly prime ministers such as Sir Winston Churchill, Dr D F Malan and General J C Smuts.

The loss of memory is part of the ageing process and it is apparent that the memory of recent events is more affected than long-term memory.

This explains the elderly's habit of repeating things and quoting happenings from the past such as from their childhood days and their student and working days, yet they are not completely sure of what happened yesterday, last week or even a year ago. This explains why the elderly frequently repeat events from the past and are often long-winded in recounting an event. A normal feature of the aged is the temporary disorientation of time and place. They're often not sure what day, month or year it is. This uncertainty explains the confusion which frequently occurs with the transfer from home environment or old age home to, for example, a hospital or institution. However, a day or so later, after becoming accustomed to the staff, having repeated contact with family members and familiarisation with the surroundings, acceptance and orientation may occur.

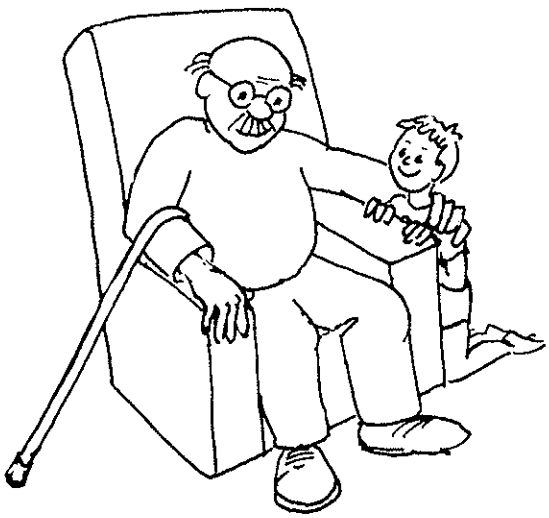
Other important aspects are that, with increasing age, one does not adapt easily to new ideas. Most elderly people would like more attention paid to them, and they often feel lonely. It explains the complaint of "no one is interested in me anymore". Due to limited fields of interest, new hobbies aren't cultivated, e.g. "I do not like reading - it has always bored me".

It is not easy for an elderly person to adapt to a new environment, something

which even a young person would find difficult, for example when an old person moves to an old age home. To crown it all, and apart from the death of family members or the changing from home environment, there is an inherent tendency to depression.

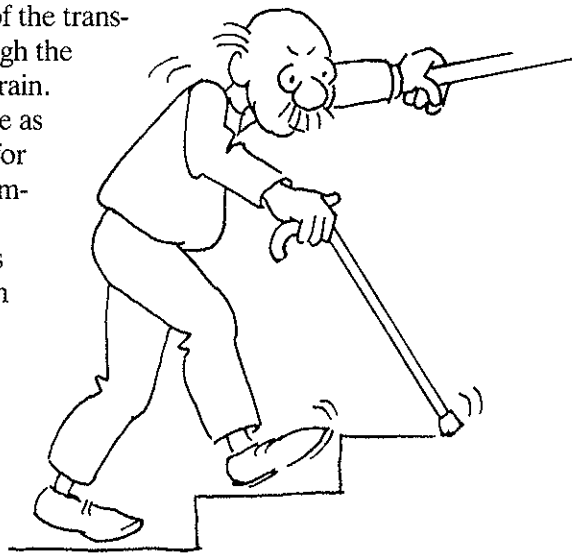
It is interesting that certain personal characteristics that have been carried over from the individual's past, such as getting his own way in everything, or being short-tempered or, as his friends would say, "he is a difficult man", become more pronounced with age. There are, however, mitigating qualities such as wisdom, good judgement and insight which come with age and experience and partially compensate for these short-comings. These characteristics give the elderly a unique quality, which can be used by the younger generation to the advantage of both parties. On one hand, the knowledge of the elderly about life's problems, such as career planning and problems at work, can be to the advantage of the young person and, on the other, it can give the elderly a sense of acknowledgement, worth and feeling of importance.

Doesn't anybody love me anymore? I feel so lonely!



Gramps, you're the bestest grandpa in the whole world.

With age, there is a slowing of the transmission of nerve impulses through the limbs' nerves, spinal cord and brain. Thus, movement time for simple as well as complex tasks is slower for the older person. The nervous impulses which convey a person's position in space and the reflexes which influence his co-ordination and balance are also reduced. These sensations (perceptions) ensure that the person is aware of the body's position in the space in which he is moving. Am I standing upright? How far is my foot from the ground when I walk? Am I falling over (position in space)? What must I do to stop myself falling (recovery reflex)? It is clear that when there is a reduction in these sensations, an elderly person will fall much more easily.



With some, there is an accompanying muscle stiffness, with the result that movements are not only slower but also poorer – hence a slower gait with a characteristic shuffle and problems in standing when getting out of a chair or climbing out of bed. The muscle stiffness further contributes to decreased facial expression and general bent posture.

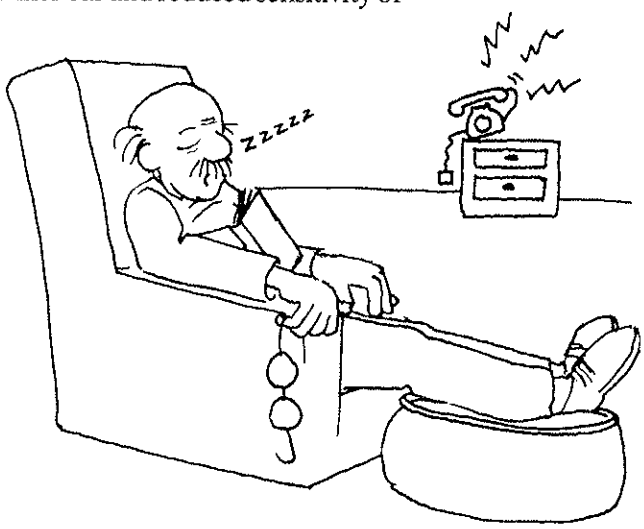
The senses

It is well known that, as a person becomes older, although he can see reasonably well at a distance, he has problems seeing objects nearby. This is particularly so for reading and recognition of objects. It is during middle-age that these changes begin and, by

45, most people need glasses with corrective lenses for the purpose of reading and performing their daily tasks. Another aspect of ageing is the slowing down of dark accommodation (becoming used to the dark), because the pupil cannot easily contract or relax. Thus, when an elderly person moves from a light to a dark environment, he experiences a period of almost complete blindness before his eyes begin to adjust. This is a very important contributory cause for falling in the elderly. In some cases age causes a grey-white ring to develop around the cornea of the eye.

Most people of 45 years of age have already begun to experience changes in hearing. This can be ascribed to reduced conduction through the auditory (hearing) nerve, brought about by the loss of organ cells, reduced blood flow to the sound receptors in the inner ear and reduced sensitivity of the hearing organs of the inner ear to sound.

Some people also experience an annoying ringing in the ears, characterised by a gradual decline in the ability to hear sounds of a high frequency, e.g. a woman's voice and the ringing of a telephone. Further, noise builds up in the ears, making it more difficult for the elderly person to adapt to a noisy environment and also making it more difficult to listen attentively.



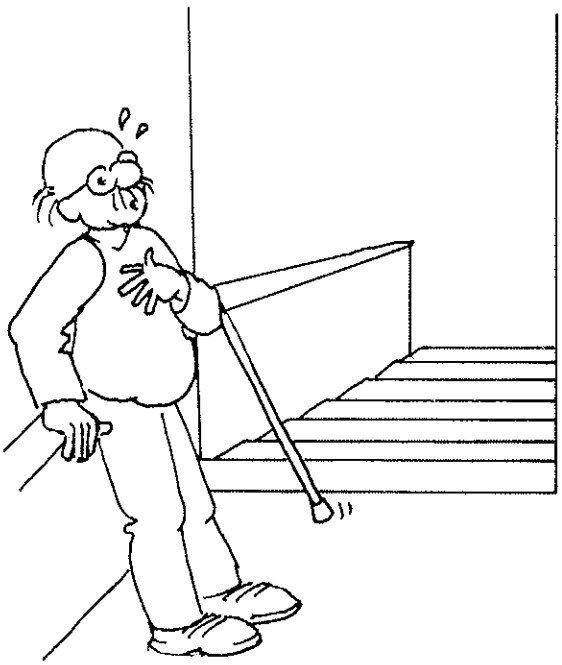
No-one phones me anymore...

Frequently the elderly accept this condition as being normal for their age, although the shortcoming may be of such a serious nature that it may contribute to isolation brought about by the lack of understanding of conversations of friends and family. The enjoyment provided by good music and television programmes, which are important contributions to providing relaxation, are not so meaningful anymore. There is poor comprehension of the content of speech, and danger signs, such as the hooter of a motorcar, may not be heard. Deafness may also create the false notion that the individual is not being included in a conversation, and leads to misconceptions, such as that secrets are being kept from him or that he is being slandered.

This auditory loss must be viewed against the background of years of exposure

lume of blood pumped by the heart is smaller and shortness of breath develops more quickly and returns to normal more slowly than in the case of the younger person.

This is another reason why the elderly cannot participate in strenuous activity, as they could at a younger age.



However, an additional abnormal load may be placed on an elderly person's heart, such as when there is a period of infection and fever. Because there are fewer heart cells than in the younger person, the heart reserves are lower and heart insufficiency might develop. This simply means that the heart can no longer function as an effective pump and blood congests in the organs, depriving them of oxygen. The patient complains of exceptional breathlessness, enlargement of the liver and swelling of the legs. The blood flow to the brain might also be reduced, affecting the degree of consciousness and causing drowsiness and confusion. This condition of heart failure is a serious complication in the elderly. Viral influenza and lung infections may have heart failure as a complication.

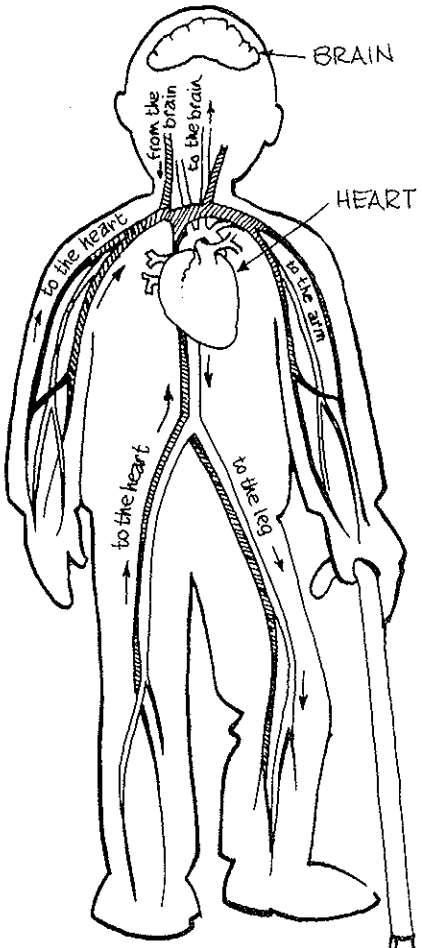
The heart does not only consist of muscular tissue; there are also heart valves present which have an important role in the distribution of blood in the heart itself and to the body's organs. With increasing age, the heart valves become calcified, but this is not of any significance. There may even be a heart murmur, which, in the elderly, is usually attributed to age-related calcification of heart valves. (The murmur is caused by blood flow over and through the calcified valves.)

The process of calcification occurs in the outer, rather than the inner, walls of the body's blood vessels and is of no importance. However, where this process occurs in the inner lining of the arterial walls, blood clotting may occur on the rough sur-

to industrial noise, military activity and the background noise of the modern community with its vehicles, lawn mowers and vacuum cleaners. The age-related deterioration of hearing is more common and pronounced in men.

As important as having the eyes tested regularly with a view to correction through the use of glasses, are auditory tests, which must be performed by professionals and hearing corrected by the use of hearing aids.

The taste buds in the mouth decrease in number and thus the taste of food is not as good as it was. Likewise, the olfactory (smell) cells decrease in number and sensitivity with increasing age. This might contribute to a loss of appetite.



THE HEART, BLOOD VESSELS and BLOOD FLOW

The heart and blood vessels

The heart functions as a pump, to convey both oxygenated blood to the different parts of the body and to take venous blood (blood from the body received by the veins) to the lungs where it can be re-oxygenated. This means that carbon dioxide is released and oxygen taken up by the blood. This new oxygen-containing blood from the lungs is then pumped by and through the heart to the rest of the body.

With age, the cells of the heart muscle reduce in number and are not replaced by new muscle cells, so that the heart functions less efficiently as a pumping organ. There is no difference in the resting heart rate, nor is there any obvious change in heart size, as indicated on x-ray or electrocardiogram, when comparing elderly and younger people. What is important is the reduced ability of the heart, due to the decrease in number of heart cells, to respond to an increased work load, such as exercise. The result is that, during exercise, the pulse rate increases and returns to normal more slowly. The vo-

face, causing thrombosis of blood vessels.

If you observe the pulse of an elderly person, you will see the definite beat and outline of the artery, and the wall of the calcified artery may also be clearly felt. The elasticity of the artery is reduced, causing a definite increase in blood pressure, particularly the systolic (upper) blood pressure. This is a normal feature of old age and requires no treatment.

Due to the above-mentioned decrease in the heart's activity, there is a reduced blood flow to the different organs. A comparison of the blood flow to the brain of a 75 year old with that of a 30 year old indicates a reduction in flow of 20% to the brain and 50% to the kidney.

The muscles

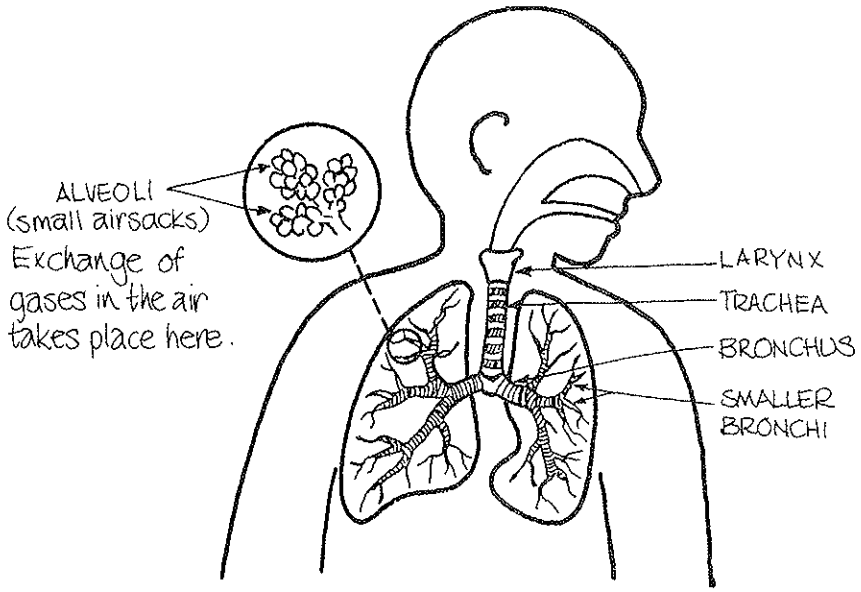
With advancing age, the skeletal muscle loses cells, which are gradually replaced by connective tissue and fat cells. The connective tissue is a less valuable type of tissue which cannot take an active part in muscle movements. This is evident in reduced strength and stamina, and in the visible wasting of musles of the aged. For example, one can compare the leg and arm muscles of a 75 year old with those of a 30 year old. It is also one of the reasons that a 75 year old cannot complete the one hundred metres or five thousand metres in the same time as a 30 year old can. There is a 45% decrease in the strength of the handgrip of a 75 year old when compared with that of a 30 year old.

The respiratory system

Mention has already been made of the curving of the vertebral (spinal) column. Due to this curvature, there is a reduction in the height of the vertebral column and thus the chest cavity. This leads to the ribs lying more horizontally and an increase in the anterior-posterior dimension of the chest. The muscles between the ribs shrink and weaken, with the result that the chest becomes stiffer and less moveable with breathing. Before the influence of age on the lungs can be discussed, the build and function of the respiratory system must first be considered. This system consists of a series of airways, comprising the throat, the larynx and the main airway (trachea), which divides into two branches and then divides repeatedly until it ends in true lung tissue which consists of millions of air sacs.

The upper airways, i.e. the throat, the larynx and air tubes (trachea and bronchii), serve as a passage for the air to reach the true respiratory parts of the lungs, i.e. the little air sacs (alveoli), which are in close contact with the blood vessels, so

promoting the exchange of gases. When air is breathed in, it moves to these little sacs where it comes into contact with the blood vessels and gaseous exchange can take place.



THE RESPIRATORY SYSTEM

It is in this way that oxygen is taken up from the inspired air, carried by the blood in the blood vessels to the heart and then pumped to the various body tissues and organs. During exhalation, the carbon dioxide coming from the tissues passes from the venous blood to the air sacs and is then exhaled.

With ageing, the walls of these air sacs become stretched and thinner, while the walls of the air passages become thicker and stiffer. This, together with the above-mentioned changes in the shape of the chest, leads to respiratory insufficiency. In other words, the chest cage cannot move as well, or to the same degree, as it did at a younger age. Gaseous exchange is also less efficient and thus less oxygen is taken up and less carbon dioxide is released. Thus, on exertion, the elderly person not only becomes short of breath more readily, but also shows the effects of oxygen deficiency and carbon dioxide accumulation. This is a further reason why the elderly person cannot participate in strenuous activities, as can the younger person.

Bronchopneumonia, or, as it is known in layman's terms, double pneumonia, is – although a common illness in the elderly and particularly in the weak elderly – also a very serious illness.

With age, there is a decrease in the lungs' resistance to organisms (germs) such as bacteria and viruses which cause infections, as well as a decrease in the cough reflex, mucous production and production of antibodies which destroy bacteria and viruses. (Antibodies are cells that ingest, process and destroy germs.)

As has already been mentioned, the lung function of the elderly is already reduced, and infections, which tend to develop readily in the elderly, will have serious consequences and may even lead to death. As already indicated, lung movement is reduced, as is oxygen uptake to and carbon dioxide release from the lungs. The brain cells may therefore not obtain sufficient oxygen from the blood and this may lead to mental confusion. To ensure a better exchange of gases, the heart must work much harder to pump more blood to the lungs. This is achieved by increasing the heat rate. A younger person's heart can easily cope with this, but, in the older person where there is cardiac insufficiency because of the decrease in heart muscle cells, heart failure could develop quite easily. This is a very serious and life threatening complication.

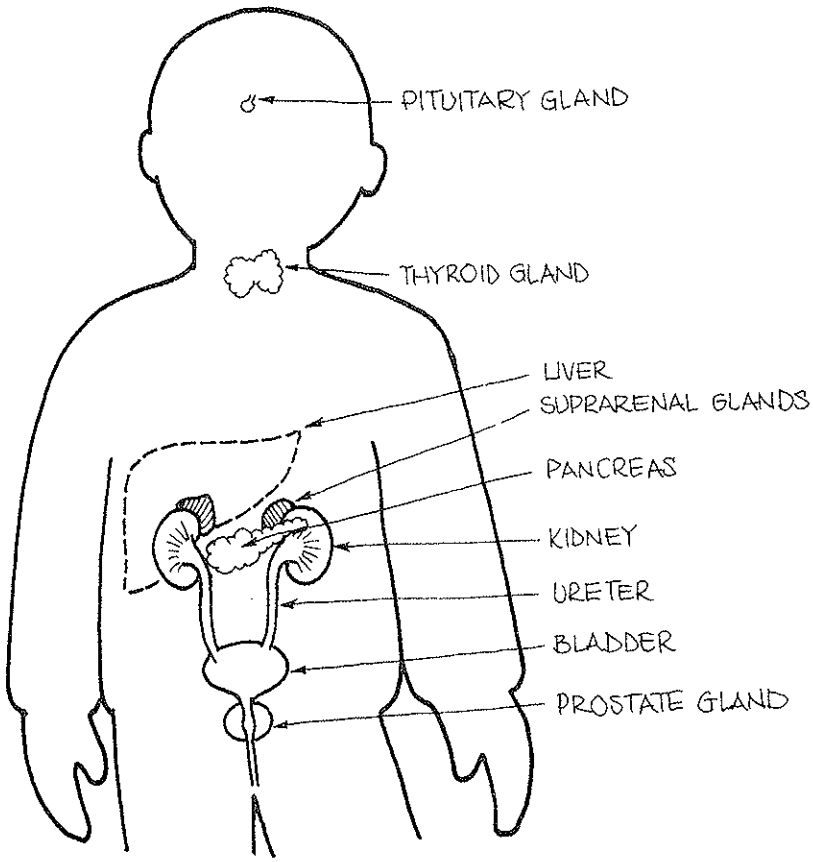
Lung infections might also give rise to respiratory distress (the lungs give in and can no longer function properly), without heart failure. This simply means that there is not enough oxygen taken up or carbon dioxide released by the lungs. The rate of breathing is very high and there are symptoms of drowsiness, mental confusion and even convulsions and blueness of the skin (accumulation of oxygen - poor blood). The nature of this might be so serious that death results.

Urinary tract

As one ages, there is a loss of kidney tissue which causes a reduction in the weight of the kidneys. The kidneys function as filters, with products being excreted in the urine. In the kidney there are millions of little filtering organs known as glomeruli. Waste products are filtered from the blood and collected in ducts (kidney tubules),

excreted via the kidney tubes (ureters) as urine, which accumulates in the bladder.

With age, these small kidney filters (glomeruli) decrease in number by as much as 50% at 75 years of age and, simultaneously, the small kidney tubules (collecting ducts) also decrease. The other kidney tissue is replaced by a non-functional connective tissue (lower quality tissue). It has already been mentioned that the blood



THE URINARY TRACT
LIVER and ENDOCRINE GLANDS.

flow to the kidneys is reduced by as much as 50% at 75 years, because of the reduced pumping action of the heart. This simply means that the kidneys become less effective excretory organs. To demonstrate this: we know that when it is hot, we sweat; when we take in less liquid or participate in strenuous exercise, we produce less urine and the urine becomes more concentrated. Concentrated urine contains more waste products and is therefore darker in colour. In the elderly, because of the kidneys' decreased function, there is a reduction in the kidneys' concentrating abilities with a resultant accumulation of waste products in the blood. Therefore, there must be enough fluid to excrete the waste products. These patients frequently have a reduced appetite, show listlessness, drowsiness and confusion. Temporary loss of consciousness and death might follow. This results because of the poisoning of the body by waste products which are not excreted and, in particular, it is urea, a break-down of dietary and body protein, which poisons the body (in medical terms this is known as uraemia). Uraemia can develop very easily in the elderly due to causes which lie outside the kidney: the loss of water and salts from the digestive tract due to, for example, diarrhoea caused by germs, overdoses of purgatives, vomiting and/or a reduced fluid intake.

Frequently the elderly person does not take in enough liquid (does not become thirsty, or forgets, or is scared that he will wet his pants).

This is particularly so when diurectic drugs (water pills) are being taken and there is a greater loss of liquid; on hot days when there is an insufficient intake of liquid; or when an elderly person has an infection such as flu which is accompanied by fever. Under the above circumstances it is important to ensure that liquid intake is sufficient.

Thus, kidney function in the aged is sufficient for normal everyday circumstances but, because there is such a small reserve, renal failure (the kidneys cannot perform their excretory function) can easily develop and even for reasons which are not directly related to the kidney. Renal failure may have serious consequences.

Further, of particular importance and applicable to all elderly people:

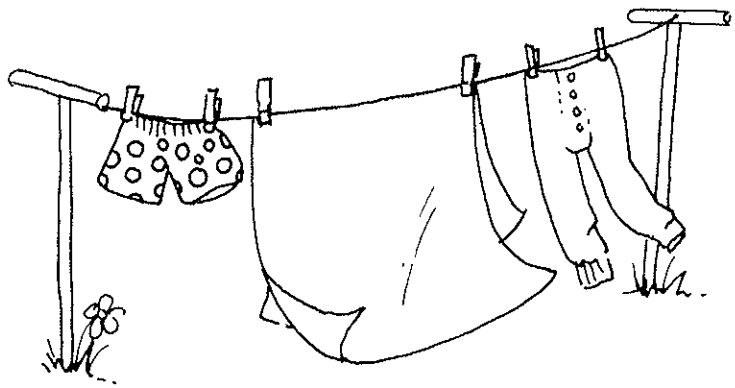
Reduced blood flow to and filtration by the kidneys of waste products contributes to the reduced excretion of drugs. This results in an increased accumulation of drugs in the blood stream and body tissues, e.g. the brain, heart, liver and holds great danger for the elderly and may even lead to death. This condition is further aggravated, as already mentioned, when insufficient fluid reaches the kidneys or, obviously, when there is a kidney disease. Drug doses must therefore be lower in elderly people.

With age, control of the bladder is reduced. The higher centres, brain or spinal

cord, control the awareness of a full bladder and the delay of bladder emptying until time and place are appropriate for passing urine. Should there be no such control, one would continuously wet oneself.

The consequences of this are that the elderly person cannot postpone the passing of urine in the same way that a younger person can, but must respond to the call within minutes. This is further aggravated by the reduced bladder capacity in the elderly.

It can therefore be understood that, for reasons of reduced mobility, e.g. rheumatism of the joints, the elderly person finds it difficult to get out of bed and, where the toilet is far away, urine will be accidently passed on the way to the toilet. The problem is further aggravated by the elderly taking diuretic drugs, causing increased urine production. In addition, where the brain function is weakened (reduced memory and comprehension), the elderly person will be even less aware of the stimulus that indicates that the bladder is full and will therefore accidentally wet the bed or his pants.



The bladder tube (urethra) exit is surrounded and supported by the muscles of the pelvis. These muscles fulfil an important function in the closing mechanism of the bladder tube. This support is often lost with the weakening of the pelvic muscles, as occurs in elderly women where the muscles have been repeatedly weakened by childbirth. Involuntary loss of urine, which frequently leads to embarrassment, follows a sudden increase in abdominal pressure due to laughter, coughing or sneezing.

With age, women experience reduced hormone activity which, in the late forties, causes the menstrual cycle to stop and this is associated with hot flushes.

The reasons for this are the following:

The female glands (ovaries) no longer secrete the hormones which influence the genital tract (womb and vagina) and this leads to the ceasing of menstruation and the shrinking and thinning of the womb muscle and drying of the womb mucous membrane. There is also a reduction in the vaginal cells with shrinking and thinning of the vaginal mucous membrane and reduction in the mucous glands. Thus there is an increase in susceptibility to infection.

The testes (sperm glands) of a man are partially replaced by an increase in connective tissue but, in spite of this, sperm formation continues to a ripe old age and, with it, the ability to have children.

The prostate gland (old man's gland) enlarges with age. This is of no importance unless it presses on the bladder tube (urethra) with symptoms such as incomplete bladder emptying and the frequent need to pass urine.

The water, muscle and fat content of the body

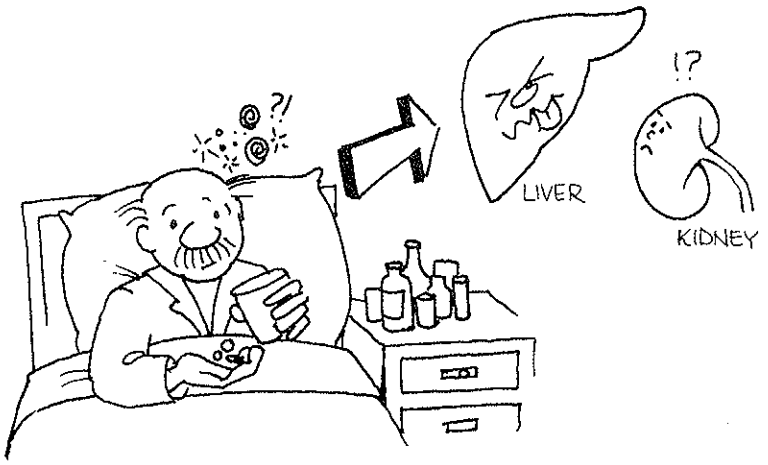
The fact that almost 70% of the body consists of water, is easily understood if one considers the amount of blood and fluid present in all the tissues. As has already been mentioned, there is, with age, a general reduction in body size as the tissue cells decrease.

This is the reason that total volume of body water decreases by 10% – 15%. This is of importance where the elderly, because of reduced fluid intake and increased fluid excretion, become dehydrated, show signs and symptoms of dehydration much more quickly and with much more detrimental consequences. Think of the consequences of decreased cells in, and blood supply to, both brain and kidneys. In modern day living, the use of a multitude of medications, many of which are water-soluble, will, due to the decreased body water, result in an increased concentration of the drug in the blood and body tissues. There is thus a risk of poisoning by the drug. Further, due to a reduction in cells, there is a decrease in the ratio of muscle to fat mass, which may be from 10% – 20%. This has important consequences for drugs which spread through and work on muscles, as the tissues will be poisoned more easily and quickly than in the younger person. Pills that are known to have such effects are those for the heart, digestive tract and bladder. Some drugs are fat-soluble and may spread through and be stored in the fat tissue. They will have greater effect and longer duration of drug activity. Examples are some sleeping and calming drugs (tranquilisers).

The sensitivity of tissues towards drugs is also greater in the elderly than in young

people, for example, the sensitivity of the central nervous system (brain) to certain calming and sleeping drugs. (They have a longer duration of activity and lead to drowsiness, confusion, listlessness and might even lead to falls and consequent hip fractures.)

Due to this increase in sensitivity of the nervous system, certain drugs might lead to postural hypotension. This means that the blood pressure will fall to very low levels when a person changes from a lying to a standing position, causing the blood



Have I taken all my pills? I musn't forget the one Peter gave me for my rheumatism

to drain away from the brain, because the blood vessels in the abdomen and limbs have not contracted to maintain the blood circulation to the brain. Under such circumstances the person will feel dizzy and, if he does not immediately sit or lie down, will lose consciousness and fall. This low blood pressure might not only be the cause of falls, but might also be a contributory factor in the development of a stroke or heart attack. Milder, non-specific side effects such as dizziness, mental confusion and a feeling of weakness, will be experienced. Certain blood pressure, tranquiliser and sleeping drugs have these effects.

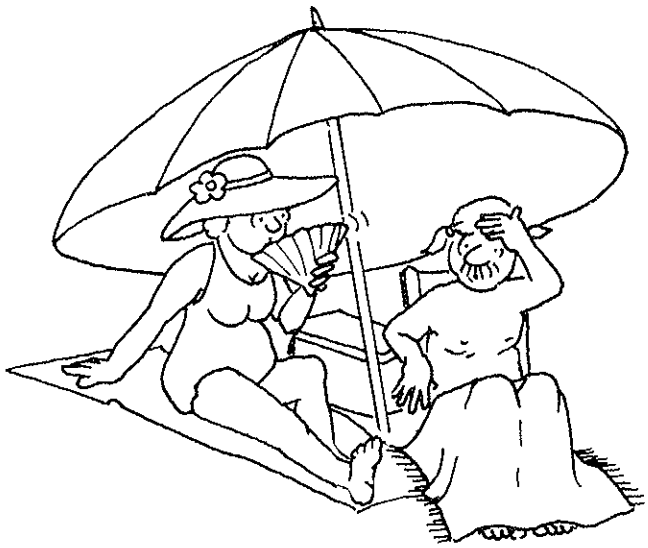
In this day and age, anti-coagulant drugs are used extensively to reduce the clotting tendency of the blood, especially for those who have had a heart attack or venous thrombosis (clot in the veins of the leg). Elderly people are much more sensitive to these drugs and serious bleeding may be a consequence of use.

Body temperature

There is no significant difference between the body temperature of a healthy old person and that of a younger person.

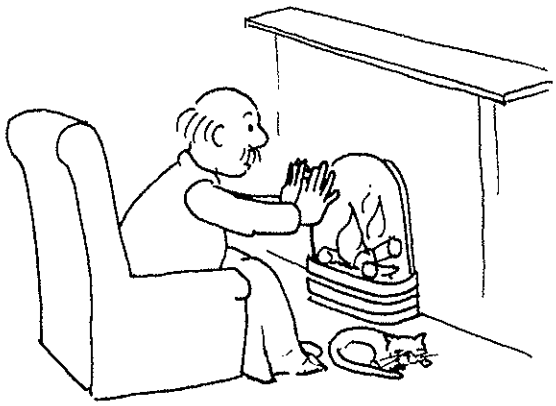
The temperature-regulating mechanism, however, does not operate as effectively in older people, with the result that they are more sensitive to environmental temperature changes.

Elderly people experience decreased production of sweat and less dilation of the superficial blood vessels which normally allow heat loss through the skin. These changes occur due to the reduced activity of the brain temperature-regulating centre.



I can't take this heat any longer.

Besides the discomfort of increased body temperature, symptoms of heat exhaustion – fatigue, listlessness, cramps due to dehydration and salt loss and even heat stroke – can develop. In heat stroke, the brain is affected because of the high temperature and this may lead to confusion and loss of consciousness.



I can't get warm these days

In cold environments, elderly folk experience a greater loss of body and body organ heat than do younger people. One of the reasons for this is that the shivering action, a normal response to cold in younger people, occurs to a much

lesser extent in older people. Shivering results in more heat being produced by the body and, due to this, a reduced sensitivity to the cold and fewer adverse consequences of exposure to cold.

Exposure to environmental cold is an important cause of loss of body heat. The lower the environmental temperature and the longer the exposure time, the greater the chance of serious effects on the body's organs.

It may happen that, on a cold winter's night, an elderly person wearing little clothing falls out of bed and the following morning is found by a fellow resident to be suffering from a reaction of exposure to cold (hypothermia).

Symptoms of hypothermia are a low body temperature, drowsiness, confusion or even unconsciousness, a slow pulse and slow, shallow breathing. (Death may even result.)

It must be remembered that certain of the calming and anti-depressant drugs might have an influence on the brain's heat-regulating mechanism and thereby increase sensitivity to cold.

On very warm days, preventative action or protective measures against the heat can be taken by avoiding long periods of exposure to the heat and maintaining sufficient fluid intake. (This will mean a greater fluid intake than normal.) With very low environmental temperatures, sufficient warm clothing must be worn and extra caution must be taken against falling, particularly during the night when, for example, climbing out of bed or out of the bath.

On the other hand, there is a change in the body's ability to react to temperature and, even with serious infections such as kidney, bladder and lung infections, there may not be a great change of temperature. In some serious infections there may be no increase in temperature at all. In younger people, serious infections, such as bladder infections, are often accompanied by temperature fluctuation, from high body temperatures to episodes of shivering. However, these shivering episodes do not often occur in the elderly and it is in such cases where symptoms of fatigue, heart palpitations, weight loss and shortness of breath present themselves that the doctor might find, for example, a serious lung infection. Frequently, on hearing the diagnosis, the patient will comment that it cannot be so, because he took his temperature and it was normal.

The endocrine glands *(see page 13)*

The thyroid gland

There appear to be no significant changes in the thyroid gland with ageing. The thyroid hormone that is produced remains the same. However, although certain

signs and symptoms that occur in the elderly are attributed to the ageing process, they may, in fact, be due to reduced thyroid function.

This confusion can be understood if we consider the signs and symptoms generally occuring in elderly people, such as slow speech, sensitivity to the cold, little sweat production, hair loss, dry skin, constipation and forgetfulness. However, where these signs and symptoms are particularly evident, special tests to determine the function of the thyroid gland should be performed.

The adrenal glands

These are two little glands situated at the upper end of each kidney. They consist of two parts: an inner, known as the medulla and an outer, the cortex. The adrenal medulla (inner part) produces a substance known as adrenaline. Some of the functions of adrenaline are to increase the blood pressure, to accelerate the heart and to contract or relax muscles in the body, for example, to relax the breathing muscles and thus improve breathing, while muscles in the blood vessels contract and increase the blood pressure. Although adrenaline is continuously produced, there is an increased demand during times of crisis, such as shock, fear and sudden increase in activity. There is apparently no reduction in the production of this substance during ageing.

The cortex of the adrenal gland produces different hormones which have important effects on metabolism (the burning of food substances). Some of the hormones affect the provision of energy for activities and others store proteins for the build-up and maintenance of the body's water and salt content. It ensures the retention of salts and water. Another hormone has an important role in sexual functions. Although there is a slight reduction in the production of cortical hormones with ageing, it appears, by reason of the reserve present, to be of little significance in the ageing process.

The hypophysis

The hypophyseal or pituitary gland is situated deep in the brain. This gland has an important influence on the ductless glands of the body. The gland's secretory product, known as a hormone, is released directly into the blood stream. The hypophyseal gland, together with its secretory products, must be seen as the conductor of an orchestra and all of the other ductless glands, the members of the orchestra. When the need arises, the hypophyseal gland ensures that the target glands (i.e. the orchestral members) increase their hormone secretions. For example, during conditions of stress, the hypophyseal gland will ensure that more adrenal and thyroid hormones are secreted.

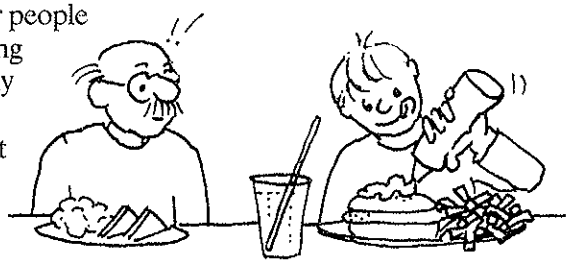
It appears that, with ageing, a change in the production of certain hormones occurs. However, there is no decrease in the secretion of the hormones that stimulate the thyroid or the adrenal gland. There is an increase in the hormone that stimulates the female sex cells because these target organs (i.e. ovaries) are no longer functioning in the elderly. It is the increased production of this hormone that is held responsible for the hot flushes that occur during menopause and which disappear later.

The pancreas

One of the most important functions of this gland is to secrete insulin which is produced by special cells in the pancreas called Islands of Langerhans. It has an important effect on the combustion of carbohydrates (starch and sugars) taken up by the digestive tract, transported by the blood to the body's tissues and then taken up by tissue cells. The combustion of carbohydrates provides energy which is necessary for life. Carbohydrates can also be stored in a different form in the liver, to serve as a source of energy when the need arises.

Where there is a shortage of insulin present, as in a person who suffers from diabetes, the combustion and storage of carbohydrates in the liver does not take place and the blood sugar level rises. Under these circumstances, another source of energy must be found and fats are thus used to provide energy.

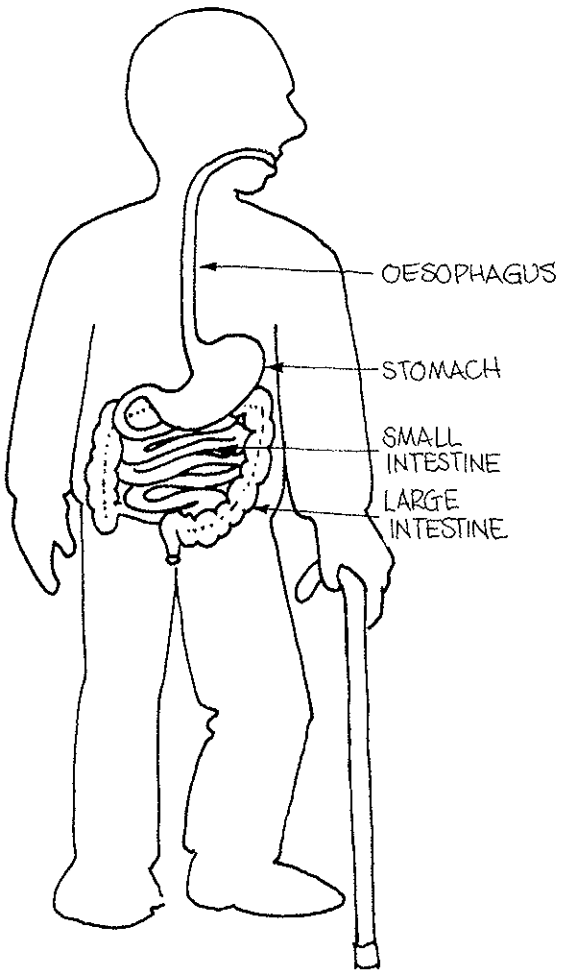
Due to the breakdown and combustion of fats, substances (acetones) that are harmful to the body are produced, which cause the person to feel drowsy and may eventually lead to a coma (loss of consciousness) and even death. Good control of the diabetes prevents this happening. A high blood sugar (glucose) level also occurs with this condition and, as a result, there is an increased excretion of glucose by the kidneys. The person will need to pass urine more frequently and will therefore lose fluids and become very thirsty. As part of the ageing process, the Islands of Langerhans decrease in number and thus, too, the insulin secretion. This results in a reduced ability to cope with dietary sugars and fats than was the case at a younger age. It is because of this that older people have a greater chance of developing diabetes. It is a further reason why the elderly person must watch his diet, be careful not to gain weight and avoid eating too much fatty meat, rich creamy cakes and tarts.



Those were the days... I could eat anything and everything!

The digestive tract

Complaints are commonly heard about the digestive tract, and the reasons for these may often be ascribed to the normal ageing process. The changes in the sensitivity to smell and taste which affect the appetite have already been explained. So, too, the changes in the shape of the jaw which frequently cause the lower teeth to close in front of the upper teeth. These factors, together with the loss of teeth and the shrinking of the gums due to cell loss, could cause problems in chewing and the fitting of dentures. The salivary glands shrink, become less active and produce less



THE DIGESTIVE TRACT

saliva, causing older people to complain of a dry mouth. The commonly occurring mouth-breathing also contributes to this.

Decreased secretion of saliva also influences preparation, digestion and swallowing of food.

Problems related to swallowing and movement of food through the oesophagus (gullet) are more common with age. This develops due to the decreased number of cells in the oesophagus, with the result that the propulsion of food cannot occur as easily as it did at a younger age. At the lower end of the oesophagus, there is a ring of muscle cells which close the opening between the oesophagus and the stomach. When food reaches this point, the ring of muscle relaxes and food enters the stomach.

In the elderly, this relaxing mechanism does not function as readily as it did at a younger age and, in some people, this causes a delayed emptying and expansion of the oesophagus in the presence of food. This causes discomfort in the chest and may be of such a serious nature that it causes food to accumulate, to be vomited and even aspirated (inhaled) into the lungs. The mucous membrane and muscle layers of the digestive tract become thinner as age increases and there is also a decreased production of the stomach's digestive juices. Movements of the stomach pulverise food to a liquid state, thoroughly mix it with the stomach juices and finally pass the food to the following section of the digestive tract, the small intestine. The reduced digetive tract (peristalsis) movements and reduction in the gastric (stomach) juices, including the gastric acid, lead to delayed and incomplete digestion with resulting discomfort, particularly after a large meal.

The movements of the small intestine slowly move the stomach content forward, thoroughly mix the food with digestive juices in the small intestine and then promote absorption of digested food through the intestinal wall. These digestive juices are secreted by the pancreas and the gall bladder. With advanced age, it appears that there is, to a certain extent, a decrease in these pancreatic enzymes which are necessary for the further digestion of the food and particularly those which influence fat absorption.

It would also appear that there is a slight decrease in absorption of sugar, fat, calcium, vitamins and iron. However, these change are not of vital importance for the elderly who follow a well-balanced diet.

Where there is an insufficient or unbalanced diet, or where the elderly person does not eat regularly, this reduction in absorption might cause malnutrition, often found in the elderly today.

Age related changes of the large intestine include the already mentioned thinning of the mucous membrane, reduction of the mucous secreting glands, increase

in the connective tissue and thinning of the muscle layer. The function of the large intestine is to move the residual portion of food forward so that it can be excreted as faeces. For the above-mentioned reasons, the contractions or peristalsis necessary for the propulsion of food become fewer and slower than at a younger age.

This leads to the tendency for elderly people to become constipated, a condition which can be greatly aggravated by the nature of the diet. There will be a greater tendency to become constipated where there is a lower intake of fluid and where the diet has little fibre, such as is found in fruits, vegetables, wholegrain breakfast foods, bran, etc. The large intestine also becomes lazy where there is regular use of laxatives, especially where these have been used for many years. This results in a need for greater doses of laxative to ensure defaecation and, in some elderly, even this does not have the desired results.

At the lower end of the large intestine (rectum) there is a circular layer of muscle which closes the end of the large intestine to prevent unconscious discharge of faecal material.

When the urge to defaecate arises, the muscle relaxes, the intestine contracts and with voluntary contraction of the abdominal muscles the person defaecates. With age, this circular muscle layer at the lower end of the intestine does not function as well as it used to and, in many aged people, this leads to a small degree of incontinence (leaking of faecal material into the clothing). This condition is worse where piles (haemorrhoids) are present.

Taking this into account, it is understandable that abdominal complaints such as flatulence, upper abdominal discomfort, nasty or empty feeling in the stomach, a heavy feeling of the abdomen, abdominal distension and constipation, are common. The diet of the elderly is usually the same as it was at a younger age and therefore the age related changes mentioned, which adversely influence the digestion of food, will contribute to these symptoms without a serious underlying disease of the digestive tract.

Contrary to this, it must be borne in mind that a person with sudden onset and persistence of the above complaints/symptoms should consult a doctor, as a serious underlying disease of the digestive tract may be present.

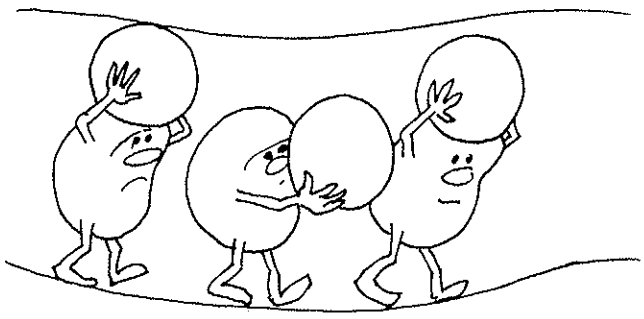
Although the liver's weight reduces with age because of a reduction of liver cells, there is no functional reduction in digestion. What is important is that the liver has a detoxifying function which reduces with age. This is especially important nowadays because of the increased use of drugs. This means that medicines which are detoxified (inactivated) by the liver will have a longer duration of activity and a higher concentration in the aged. Poisoning may occur more easily than in the younger person. Examples of such medicines are certain sleeping pills, tranquilisers

(calming) and anti-coagulating drugs.

Although there is a greater tendency towards gall stones, the gall bladder function is usually not disturbed.

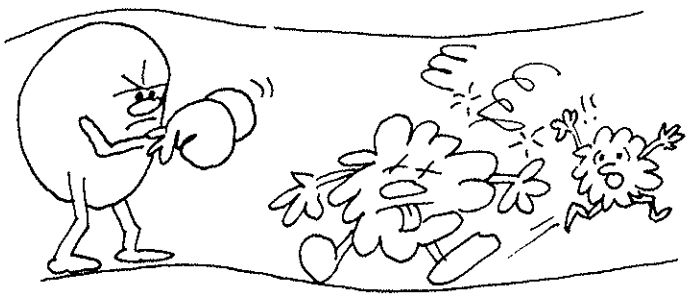
The blood and blood forming organs

Blood is formed in the normal way and anaemia is not necessarily associated with age. Where anaemia is present, it is usually due to an underlying blood disease, another disease in the body or some other cause, for example, concealed intestinal bleeding. An elderly person's healthy red blood cells cannot be distinguished from those of a younger person. The function of the red blood cells is to carry oxygen to the body's tissues and carbon dioxide away from the body's tissues, back to the lungs. The lifespan of a red blood cell is 110 to 130 days, after which the worn out red blood cells are destroyed by the spleen and replaced by new cells, released into the circulation from the bone marrow. Iron is necessary for the formation of these red blood cells. It has already been mentioned that the iron absorption and storage ability of the body is slightly reduced, which results in a tendency for the elderly to develop anaemia (iron deficiency). Insufficient iron in the diet or small concealed haemorrhages of the digestive tract may be the cause of this.



RED BLOOD CELLS
CARRY OXYGEN IN THE BLOOD

No morphological differences are apparent between the white blood cells of an older person and those of a younger person. There is, however, a tendency

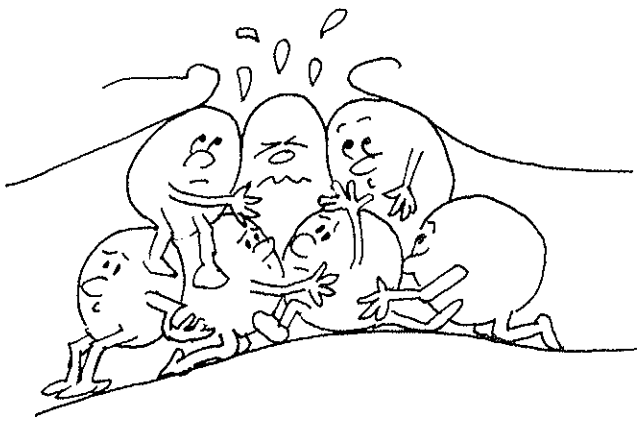


WHITE BLOOD CELLS COMBAT
GERMS and thus INFECTION.

to fewer white blood cells. Some types of white blood cells are replaced by the bone marrow while others are produced by the lymph glands and the spleen. The lifespan of white blood cells generally ranges from 19 to 21 days, but some live as long as 100 days. The function of the white blood cells is to protect the body against infections, varying from skin abscesses to serious infections of the organs, such as lung and bladder infections.

Other types of white blood cells provide immunity (resistance) against infections and even cancer. With age, the function of these cells weakens and resistance decreases and is one of the reasons that cancer occurs more frequently in the elderly.

A third type of cell produced by the bone marrow is the blood platelet. Blood platelets play an important role in the clotting of the blood, e.g. where there is an injury with bleeding, the platelets collect and ensure that the blood clots, a scab is formed and, thereby, blood loss prevented. The lifespan of the blood platelet is about 9 days. Although the number of platelets does not decrease with age, their adhesiveness increases. They adhere to each other more easily and cause the blood to clot around themselves. This is one of the reasons that illnesses caused by blood clotting, such as heart attacks and strokes, occur more frequently in the elderly. Nowadays, certain drugs are given to patients who have had a heart attack or stroke to reduce the adhesiveness of the platelets and prevent their blood from clotting.



PLATELETS ARE INVOLVED IN THE CLOTTING OF BLOOD.

With age, the bone marrow, where the blood cells are produced, is gradually replaced by fatty tissues, but there are enough reserves to see the elderly person through to a ripe old age.

The spleen shrinks, as do the lymph glands, which are gradually replaced by fat. The tonsils become smaller and eventually dissappear completely. These changes contribute to a decreased resistance to infections. Not only do infections occur more frequently, but they are also of a more serious nature in the elderly person.

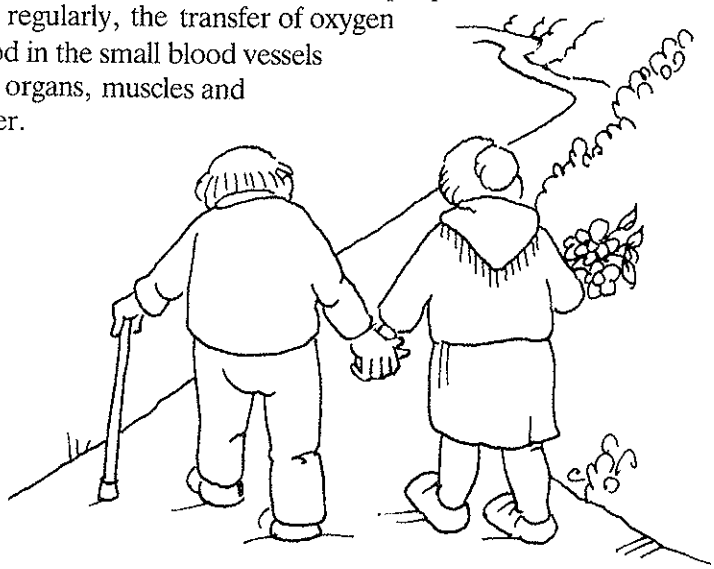
Sleep

With some elderly people, sleep is a problem. Depression and worry are some reasons for waking early and then remaining awake. Some experience difficulty in falling asleep because often the brain, without cause, becomes more active at this time. On the other hand, there may be obvious reasons, e.g. anxiety and worry about family members, a noisy environment, etc. Other physical factors which influence sleep include the need to pass urine during the night and the occurrence of leg cramps. Early retiring and sleeping during the afternoon are other reasons for the elderly not readily falling asleep.

It is also not true that the aged require more sleep. On the contrary, the opposite is true. In the absence of good reason, the administering of sleeping drugs is not to the advantage of the elderly person and is, in fact, dangerous in that it may, for example, cause mental confusion, instability, falls and all the associated complications.

Exercise and the elderly

It appears that regular physical exercise throughout life may protect health and lengthen life. Furthermore, deterioration in muscle strength and heart function is counteracted. Reaction and movement time (muscle movement) is also better in active persons. Likewise, it is found that, in people who exercise regularly, the transfer of oxygen from the blood in the small blood vessels supplying the organs, muscles and tissues is better.



Participation in sporting activities which were practised at a younger age, e.g. tennis and golf, can be continued to an advanced age. Playing bowls, which is not strenuous, is of great value. However, walking remains the best, least dangerous and most beneficial exercise which can be enjoyed to an advanced age. It is dangerous for the elderly to suddenly participate in strenuous exercise which was not previously practised, e.g. running, weight-lifting, etc.

Conclusion

It appears that, with advancing age, the body generally maintains the ability to function normally. There is, however, a definite decrease in the ability to adapt to extreme changes. During earlier life, there is a large reserve of resources, but, with age, there is a decrease in this reserve and demands made by even daily tasks might exceed the reserves.

Physiological changes which accompany the ageing process and which develop as a result of the age-associated loss of cells and cell functions, have been discussed above. Yet there are still only theories as to the actual cause of these physiological changes which lead to a decrease in the body's strength and in the efficiency of the body's organs which result in the body's reduced ability to function as an efficient machine.

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