

The science and art of ageing

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The very act of living causes damage to our cells. Approaching old age with fear, hatred, and anti-ageing feelings only worsens the reality

MOST of us would like to live a long life, but not many would like to become old. We often associate old age with physical problems, mental slowness and social invisibility. Of course, there is some truth to all those facts about ageing. Living a long life necessarily brings in old age, because that is how our bodies are built. Preparing ourselves for this phase of life is much better than approaching it with fear, hatred and anti-ageing feelings. With scientific knowledge, we can learn, adopt, nurture and practise reliable methods towards healthy ageing and longevity.

Science behind ageing

The scientific study of ageing is called gerontology, whereas geriatrics is the term for the clinical care and treatment of age-related diseases. Biogerontology is the study of the biological basis of ageing as to why and how we become old in the first place. The past 50 years of extensive ageing research on the biology of ageing have clarified and resolved numerous issues, misunderstandings and myths about ageing and old age. For example, the most common notion that our lifespan is predetermined and is fixed by either some supernatural powers or by specific ageing-genes in our cells, is scientifically incorrect. Biogerontology teaches that there are no ageing genes or gerontogenes that cause ageing. There is no enemy within.

Genes are essential for our survival and genes do determine our ability to live and to maintain health. Our bodies, like all living systems, have evolved to survive and to reproduce. Evolution has developed numerous complex biochemical processes in each and every cell of the body for this. But these processes work efficiently for a limited period depending on the overall life history of a species. For example, animals, such as worms, insects, rats and mice, which are small in size, mature fast and reproduce in large numbers, generally have a short lifespan of a few days or weeks. On the other hand, larger animals, such as cows, horses, monkeys, and elephants, are slow-maturing, late reproducing and longer living. In scientific terms, the naturally required lifespan of a species is known as the essential lifespan (ELS). In natural conditions, it is rare that an animal survives beyond ELS because death occurs much earlier by chance owing to predation, infections and starvation. There is no need for any special genes to kill the organism.

But in highly protected conditions, such as zoos and laboratories, animals can live much longer. For example, rats and mice survive in nature for less than a year, but in the protected laboratory conditions they can live for three to four years, a lifespan much longer than their natural ELS. Signs of ageing appear and all problems of old age occur during this period of life beyond ELS. A similar situation exists for human beings. As a species, our ELS is about 45 years only. In ancient times, very few people survived beyond, and becoming old was a privilege. In modern times, however, it is the greatest success story of mankind's innovations that most of us can expect to live much longer than our species' ELS. And that is when we also face ageing and old age.

Paradox of life
If there are no genes or other biochemical



Maintaining visibility and dignity in old age is the path towards a healthy and active long life. Old age sets us free from the strict and arbitrary norms of a stressful and competitive lifestyle. TRIBUNE PHOTO: PRADEEP TEWARI

ical processes with a specific function of causing ageing, then why do we become old? The answer to this paradox lies in the processes of life itself.

The very act of living causes damage in our cells. There are three major sources of damage within a cell. The first is the oxygen, which is essential for our survival, but it is also the source of chemically very reactive free radicals of many types. These chemicals are also produced inside the cell by the sun's UV-rays and by other chemicals in the environment. Free radicals have both a good and a bad side. On the good side, these are necessary for the normal functioning of the cells in cell-to-cell communication and in the immune system. On the bad side, if free radicals are in excess and are uncontrolled, these cause significant damage to DNA, proteins and other molecules, and can kill the cell.

The second source of molecular damage is the food components, such as sugars and fats. We cannot live without them, but during their normal course of action, sugars and fats also damage

each other and proteins and DNA in the cell. This can cause serious problems in the functioning of the organs and tissues such as the brain, muscles, eyes, bones, hormones, and the immune system. The third source of damage is the errors and mistakes happening in the normal biochemical processes of DNA, RNA and protein synthesis. These mistakes, occurring by chance, then cause mutations and other harmful effects, including cancers, cell death and other diseases.

The paradox of life is balanced by the presence of complex networks of molecular, cellular and physiological systems for the maintenance, repair and defence. These defences generate "buffering capacity" or what is also called the "homeodynamic space", in the body. Homeodynamic space gives us the ability to tolerate stress, to control the amount of damage, and to be able to change and adapt. These physiological signs of a healthy body are also the psychological measures of health. Ageing is mainly a shrinkage and loss of this homeodynamic space,



Low-level stress triggered by exercise has a positive relationship with health. TRIBUNE PHOTO: S CHANDAN

which happens not due to any "enemy within", but owing to the insufficiency of the friendly processes of maintenance and repair.

Achieving healthy ageing

Ageing happens individually. No two persons become old in exactly the same way. No two parts of the body become old in exactly the same way. No two cells in the body become old in exactly the same way. Therefore the methods to maintain health in old age, and to extend healthspan, are also going to be person-specific; and no single miracle pill is going to completely stop or reverse ageing.

Although a variety of cosmetic, nutritional and other lifestyle interventions are being promoted as "anti-ageing", none of them is more than a wishful thinking at present. However, a promising scientific approach towards healthy ageing being tested and developed is that of hormesis for maintaining health and homeodynamics.

Hormesis is the positive relationship between low-level stress and health. Whereas uncontrolled and unwanted stress is negative and harmful, low level "stress of choice" is health beneficial. Moderate exercise is the best example of hormesis. Exercise initially increases the production of free radicals, acids and other harmful biochemicals in the body. In response, the repair and defence systems of the body protect and strengthen the homeodynamics. Hormesis has the potential to maintain health during ageing.

Conditions that induce hormesis are called hormetins, and are categorised as nutritional, physical and mental hormetins. Several types of foods and food components, such as spices, flavonoids, polyphenols and micronu-

Long life and old age go together

Health is not a vague and idealistic notion of a perfect state of physical, mental and social well being, as defined by the WHO. Health is a practical measure of ADEQUATE physical and mental independence in the activities of daily living. The meaning of being healthy constantly changes with age in the context of adequacy. There should be no pressure in behaving like and competing with the younger generation. Old age sets us free from the strict and arbitrary norms of a stressful and competitive lifestyle. Maintaining visibility and dignity in old age is the path towards healthy and active long life. Repeated mental and physical challenge with "stress of choice" is the latest scientific and evidence-based healthy ageing approach. Pleasure, moderation and variety in food, physical activity and mental engagement are the basis for a long life and healthy old age.

It is a great biomedical triumph that most of us can hope to live a much longer life than our species' natural lifespan of about 45 years. Living longer, however, also brings in old age along with all its good and not-so-good sides. Understanding the scientific basis of ageing and its inevitability can prepare us to accept the approaching old age in a positive and healthy manner. Correct scientific information will also help us to save ourselves from falling prey to the sellers of false promises, ineffective remedies and blind faith.

All systems in our bodies are built for survival. There are no killer genes or chemicals in our cells, which have a pre-determined job of making us old and die. But the complex nature of our bodies does not allow for unlimited survival, and sooner or later one or the other system starts becoming weaker, dysfunctional and problematic. Using various technological tools and medicines for compensating or managing those changes is perfectly OK. There are no real anti-ageing drugs, because ageing is not a disease that can be cured.

Being anti-ageing is being against an important phase of life. Pretending to be 26 when we are 62 is only going to create more mental confusion and more social and biological harms and risks. Ageing can be modulated and managed, and healthy old age can be achieved. Accepting and respecting our age is the first step towards a healthy and longer life.

trients are nutritional hormetins. Sauna, breath control, and mental challenge, including meditation, are examples of physical and mental hormetins. Novel combinations of multi-hormetins are under scientific investigation; and within the next few years, a range of scientifically tested and reliable hormetins will become available.

We surely need lifestyle adjustments, and biomedical, aesthetic and psychosocial means for maintaining health, beauty and identity in old age. Adopting an anti-ageing stance to old age is no solution to its physical, psychological and social realities. Spices, physical activity and mental engagement are very effective hormetic tools for maintaining health and for extending the healthspan.

The writer is an internationally renowned biogerontologist, based at Aarhus University, Denmark.

ON THIS DAY... 100 YEARS AGO

The Tribune.

LAHORE, FRIDAY, SEPTEMBER 11, 1914

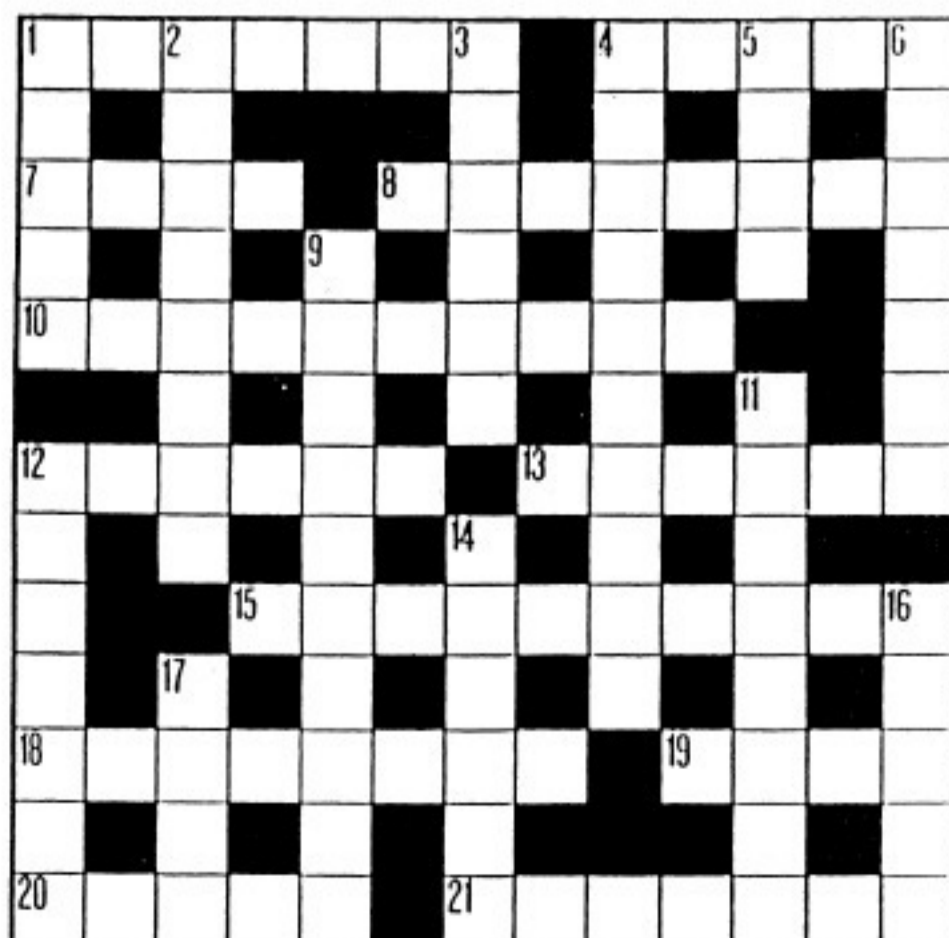
Cruelty and vandalism in war

THOSE who think that might is right and go on displaying their material strength in their career of Empire-building have always been rudely shaken in their aims and pursuits. The latest instance is the German practice of cruelty and vandalism which has already served the purpose of strengthening the Allies and arousing all their indignation against the enemy. Moral power is undoubtedly the winning factor and mere physical power is bound to break before it. Mr. Asquith's condemnation of the German barbarity at Louvain has had the effect of rousing the English nation to the highest pitch of indignation. Had the Germans known this they would probably have resisted their hands at the perpetration of excesses. From accounts published we see they believe in the strength of arms. But what about the weakness of their ethics which is the basis of all power?

Industrial labour in India

IT is an admitted fact that the wages of industrial and agricultural labourers in India have not risen in proportion to the rise in the retail price of commodities. In his report on the trade of India during 1913-14 the Director of Statistics calls attention to the fact that the cotton industry in Bombay, the woollen in Cawnpore, the jute, paper and mining in Bengal, rice in Burma and brewing in the Punjab-indicate an increase of about 3 per cent in wages. Cotton and other mills in Upper India indicate an increase of 9 per cent. But the statistics for the last three years show that the wages of industrial labour have not risen so much as those of agricultural labour. One effect of this has been that working men have gone back to agriculture or other professions and industrial profits have decreased.

QUICK CROSSWORD



- ACROSS**
1 Fail to fulfil obligation (7)
4 Loaves in one baking (5)
7 Grow weary (4)
8 Crazy (8)
10 Snobbish (5-5)
12 Breed of small hound (6)
13 Curt (6)
15 Knowing everything (10)
18 Go ahead! (4,4)
- 19 Feel the loss of (4)
20 Southern US state (5)
21 Upper hand in contest (7)
- DOWN**
1 Crash-land at sea (5)
2 Utterly ludicrous (8)
3 State of lethargy (6)
4 Consecutive (4-2-4)
5 Sort (4)

YESTERDAY'S SOLUTION

- Across**
1 Showstopper, 9 Immerse, 10 Overt, 11 Turn, 12 Rosemary, 14 Nerves, 16 Clutch, 18 Daffodil, 19 Flop, 22 Carve, 23 Caustic, 24 Rest assured.
- Down**
2 Homer, 3 Work, 4 Tremor, 5 Properly, 6 Elegant, 7 Sitting duck, 8 Stay the pace, 13 Redolent, 15 Referee, 17 Circus, 20 Lithe, 21 Guru.

SU DO KU

			9			3		
		1			5			
9		8	4				6	1
	9			3				
				1		8		
					6			7
2	1					9	7	4
				7			2	
		4				6		

Yesterday's solution

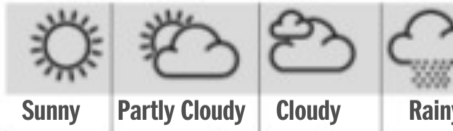
1	9	5	7	3	6	2	8	4
2	6	4	8	5	1	3	9	7
3	8	7	4	9	2	5	6	1
8	2	1	5	6	3	7	4	9
9	4	3	2	7	8	6	1	5
7	5	6	1	4	9	8	2	3
5	3	8	9	2	4	1	7	6
6	1	9	3	8	7	4	5	2
4	7	2	6	1	5	9	3	8

CALENDAR

- SEPTEMBER 11, 2014, THURSDAY
- Shri Vikrami Samvat 2071
 - Shaka Samvat 1936 (Bhadrapad Shaka 20)
 - Bhadrapad Parvati 26
 - Hijari 1435
 - Krishan Paksha tithi 3, up to 10.04 pm
 - Vridhi yoga up to 11.45 pm
 - Revti Nakshatra up to 8.42 pm
 - Moon enters Aries sign at 8.42 pm
 - Panchak ends at 8.42 pm
 - 3rd Shraddh

FORECAST

SUNSET: THURSDAY 18.34 PM
SUNRISE: FRIDAY 6.05 AM



CITY	MAX	MIN
Chandigarh	34	25
New Delhi	33	26

PUNJAB		
Amritsar	33	23
Bathinda	35	25
Jalandhar	34	24
Ludhiana	34	25
Patiala	34	26

HARYANA		
Ambala	34	25
Bhiwani	35	25
Hisar	35	25
Karnal	34	25
Sirsa	35	25

HIMACHAL PRADESH		
Dharamsala	27	16
Manali	24	13
Nahan	27	18
Shimla	24	15
Solan	28	18

JAMMU & KASHMIR		
Jammu	—	—
Leh	—	—
Srinagar	—	—

UTTARAKHAND		
Dehradun	31	23
Mussoorie	23	15
Nainital	23	15

TEMPERATURE IN °C