



## AARHUS UNIVERSITY VARHUS UNIVERSITY

## SURESH BATTAN

Editor Journal of Aging Science

## Healthy Ageing, but What is Health and How to Maintain it?

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## What is health ...?



Health is a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity. Health in terms of Activities of Daily Living (ADL)....

Idealistic definition

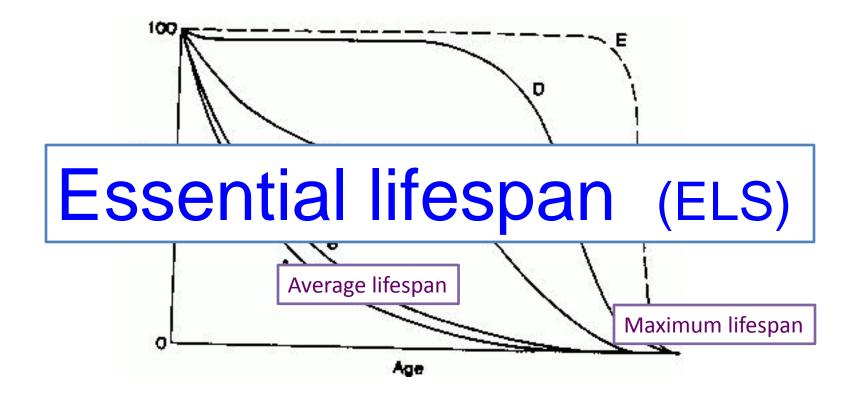
**ABSOLUTE** physical and mental independence in ADL.

Nobody has it....

Pragmatic and realistic definition

ADEQUATE physical and mental independence in ADL.

Biologically, at what point in lifespan ageing begins?



Biologically, ageing happens after essential lifespan (ELS) of the species

> Psychologically, human ageing "stops" after ELS of about 40-50 years.

### Ageing occurs at all levels of biological organisation, but differently...



**Younger Buttock** 



Younger Arm



**Older Buttock** 



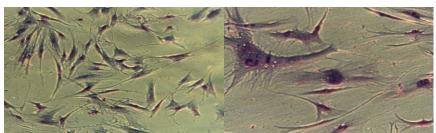
Older Arm (UV damaged)



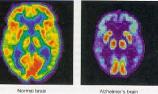




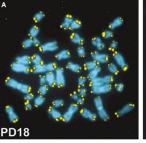








Pet scans (glucose utilization)

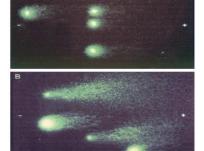


gure 1. Quantitative-FISH analysis of individual telomeres. Rep tive images of HCA2 cells at PD18 (A) and PD65 (B)

PD65







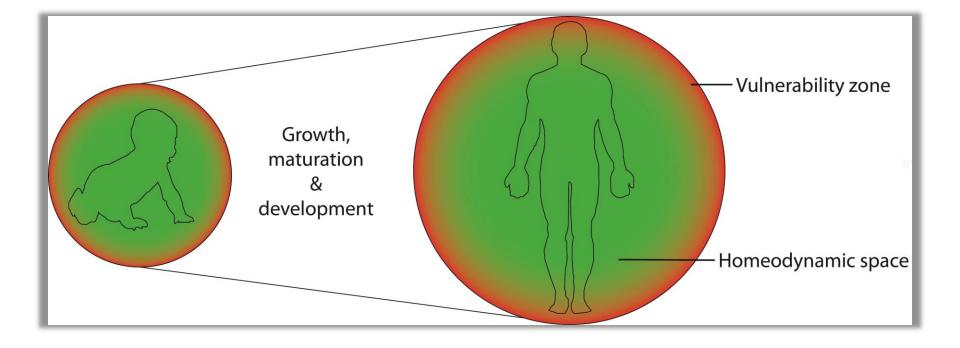
we are not programmed to age and die

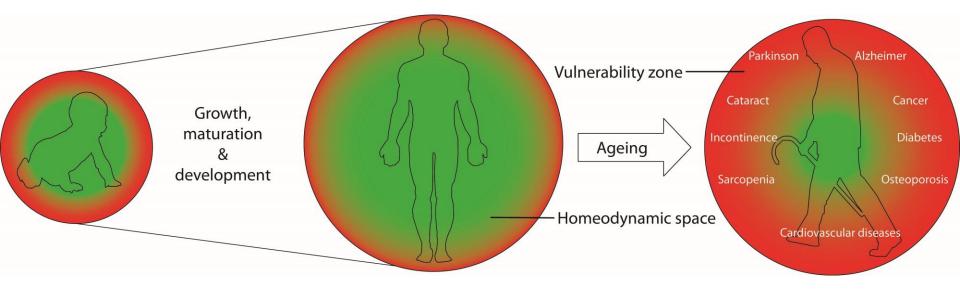
There are no gerontogenes whose sole function is to cause ageing and eventual death

## Genes determine essential lifespan of a species

(longevity-assurance genes; vitagenes)

Not homeostasis, but HOMEODYNAMICS





## Ageing is the shrinkage of the homeodynamic space

## Anti-ageing or healthy ageing?



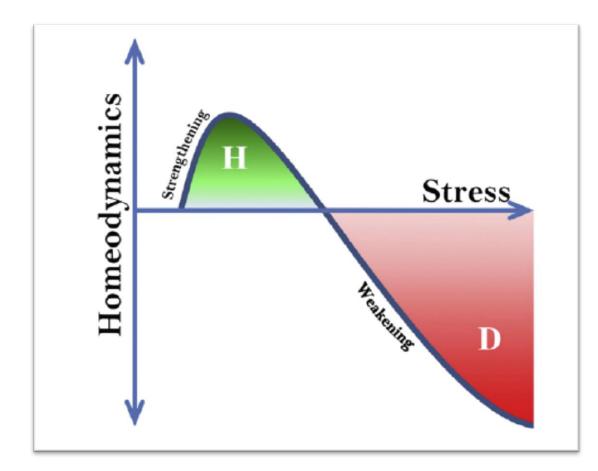
#### Ageing interventions:

- 1. Wishful thinking and miracles
- 2. Piecemeal remedies / replacements
- 3. Replenishments hormones, anti-oxidants
- 4. Wholistic interventions.



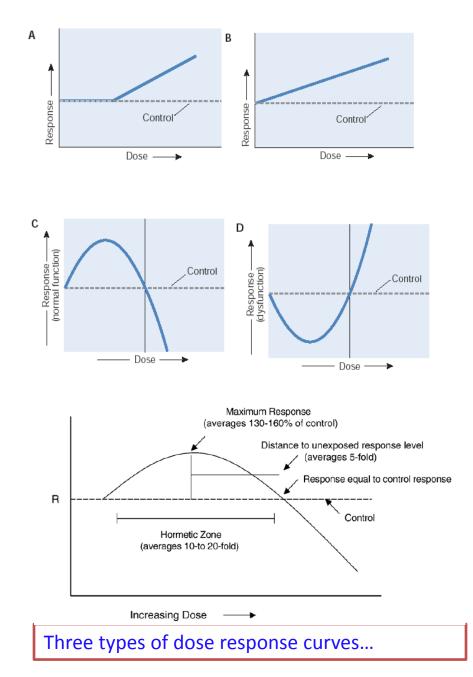


# Wholistic interventions for maintaining health



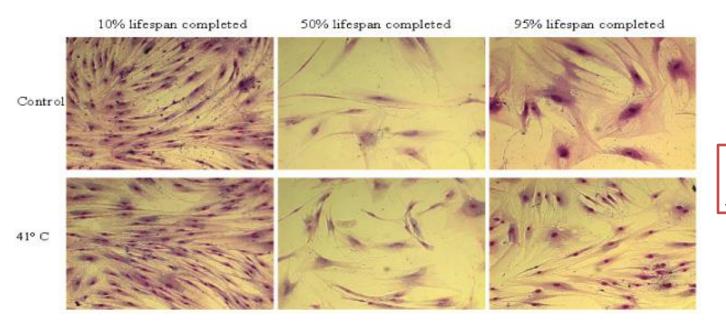
## HORMESIS

- Biphasic dose response
  - U-shaped response
    - Inverted-U shape response
  - Adaptive response
- Compensatory response



#### Strengthening the homeodynamics by mild stress-induced HORMESIS

## Challenging of homeodynamics stimulates compensatory, adaptive, and reparative processes.



Some examples from our labs

Repeated mild heat shock slows down ageing, improves angiogenesis, wound healing and healthspan

A condition that causes hormesis is: HORMETIN The science of hormesis is HORMETICS

## **Physical hormetins**

exercise, heat, cold, radiation...

### **Nutritional hormetins**

spices, micronutrients, fasting

### **Psychological hormetins**

Social and mental engagement, focussed attention (meditation)







Hormesis for humans –

## Health beneficial effects of stress of choice....

#### LIFE SCIENCE

#### HORMESIS IN HEALTH AND DISEASE

Some mild stresses have positive effects on survival and appropriate shown in arrival modes. There is also a large body of research that demonstrates these home connects effects on appropriate the solution of the solution of the solution dearses in human borgs. However, the data are dispersion in the lottation and are not always interpreted as formed; effects. *Homeses* in Health and Decease millions the existence for homes in humans as a chimed through a variety of stresses are stimula, and discusses mechanisms of homeses and the existence interpreteries.

Divided into four elections, this back presents the current state of research, including quastions, detailes, doubts, and contravense in hormesis. Section I overse the halong and deminology of hormess, describing times heatures and previding necessary background information. Section II shows that hormetic effects can be caused by arroos attenses—including physical exercise, untitional components, feating, microarutients, imidiation, heat, ischemia, and mental challenge—and can be conserved both in organs and at the organism elect-Section III evens possible mechanisms of hormess that have been electroted at this point. Section IV discusses the wider consequences hormesis may have for evenyone.

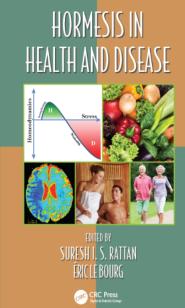
This book demonstrates that health beneficial hormetic effects do exist in human beings. It offers information to inspire key players to initiate new strategies to elucidate the strengths and limits of the dual nature of stress.





HORMESIS IN HEALTH AND DISEASE

CRC





What we need for maintaining health....

**Biological level** – food, shelter, biomedical technology

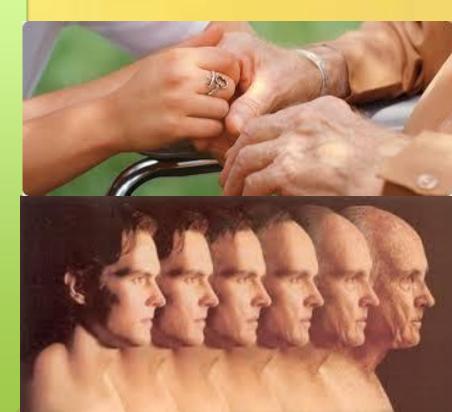
**Sociological level** – identity, contact, communication

Psychological level – attitude, ethics, connection

## **Aging Science Related Journals**

#### Anaplastology

Journal of clinical & experimental Dermatology Reasearch



## **Aging Science** Related Conferences

5th International Conference on Clinical & Experimental Dermatology



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