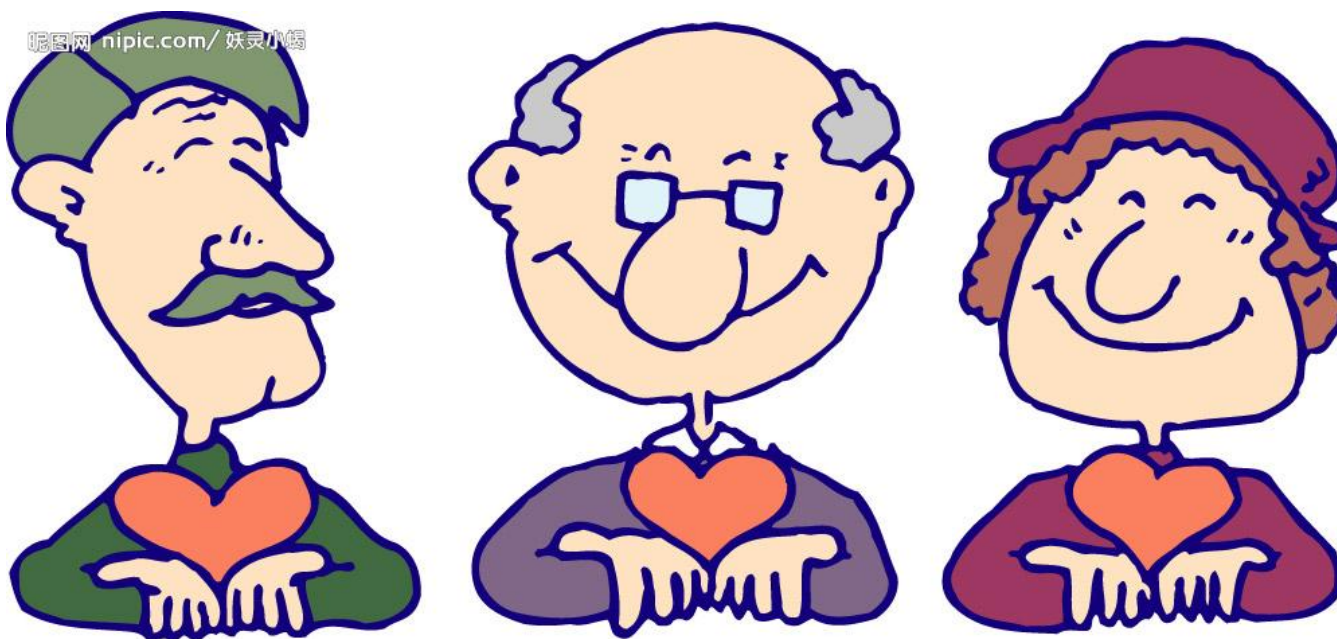


營養與老化 (00070115)

Nutrition and Aging

Introduction



http://pica.nipic.com/2008-03-10/200831010541577_2.jpg

保健營養學系三年級

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Learning Objectives

- **Definition of Aging**
- **Life Expectancy**
- **Possible Hypotheses of Aging**

Reference

- **Geriatric Nutrition: The Health Professional's Handbook (2006, 3rd ed) Ronni Chernoff, Jones and Bartlett Publishers, Inc.**
- **Nutrition in Aging (1997, 3rd ed) Schlenker, ED. William C. Brown**

Definition of Aging

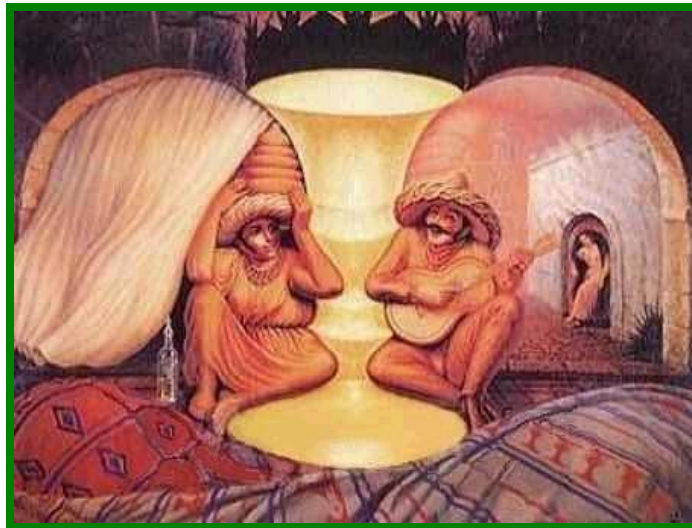
- **English:** implies deterioration
- **Japanese:** sometimes means just the advancement of age
growing process: maturation of infant into an adult
- **Regression** of physiological function accompanied by advancement of age
- All of the structural and functional changes that occur through the life span from embryonic development through maturation and **senescence**

Definition of Aging

- **usual aging:** the changes occurring in older people that represent the aging process exacerbated by disease and adverse environmental and life-style factors
- **successful aging:** the age-related changes have not been augmented or accelerated as a result of disease, environmental influences, or life-style

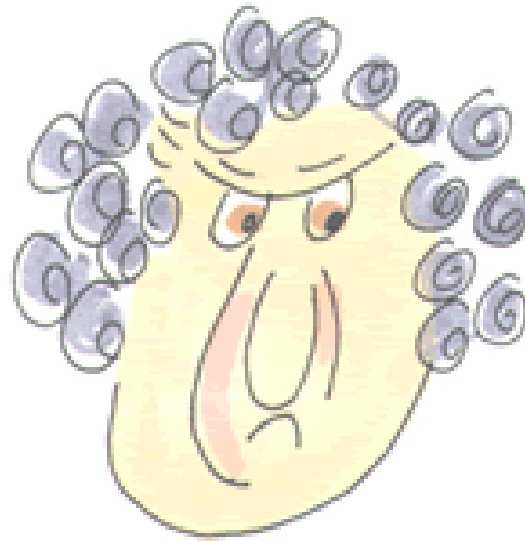
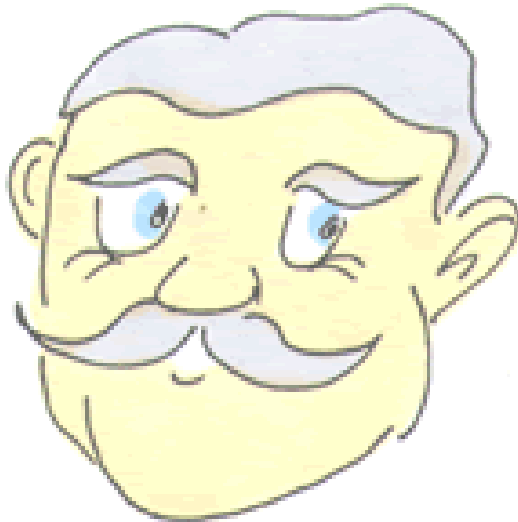
Definition of Terms

- **elderly:** ≥ 65 yr in USA (medicare & full social security benefits, retirement)
- ≥ 55 yr: law protecting the older worker against age discrimination become effective
- **young-old elderly:** 65~74 yr
- **oldest-old elderly:** ≥ 85 yr



Definition of Terms

- **gerontology:** the study of aging
physiologic or behavioral changes
environmental factors – biological, sociological,
psychological
- **geriatrics:** the study of the medical problems of
the aged



人的壽命可以活幾歲？

人的壽命，根據醫學的研究，約可活100-150歲

(1) 哺乳動物自然壽命是生長發育期的5-7倍

人的生長發育期是20-22歲

故人的壽命為100-150歲

(2) 哺乳動物自然壽命是性成熟的8-10倍

人的性成熟為 14-15 歲

故人的壽命為 110-150 歲

(3) 人的壽命與體細胞分裂的次數有關

人的體細胞平均分裂週期為 2-3 (2.4) 年

人的體細胞平均可分裂 50 次

故人的壽命為 100-150 (120) 歲

Life Expectancy Data

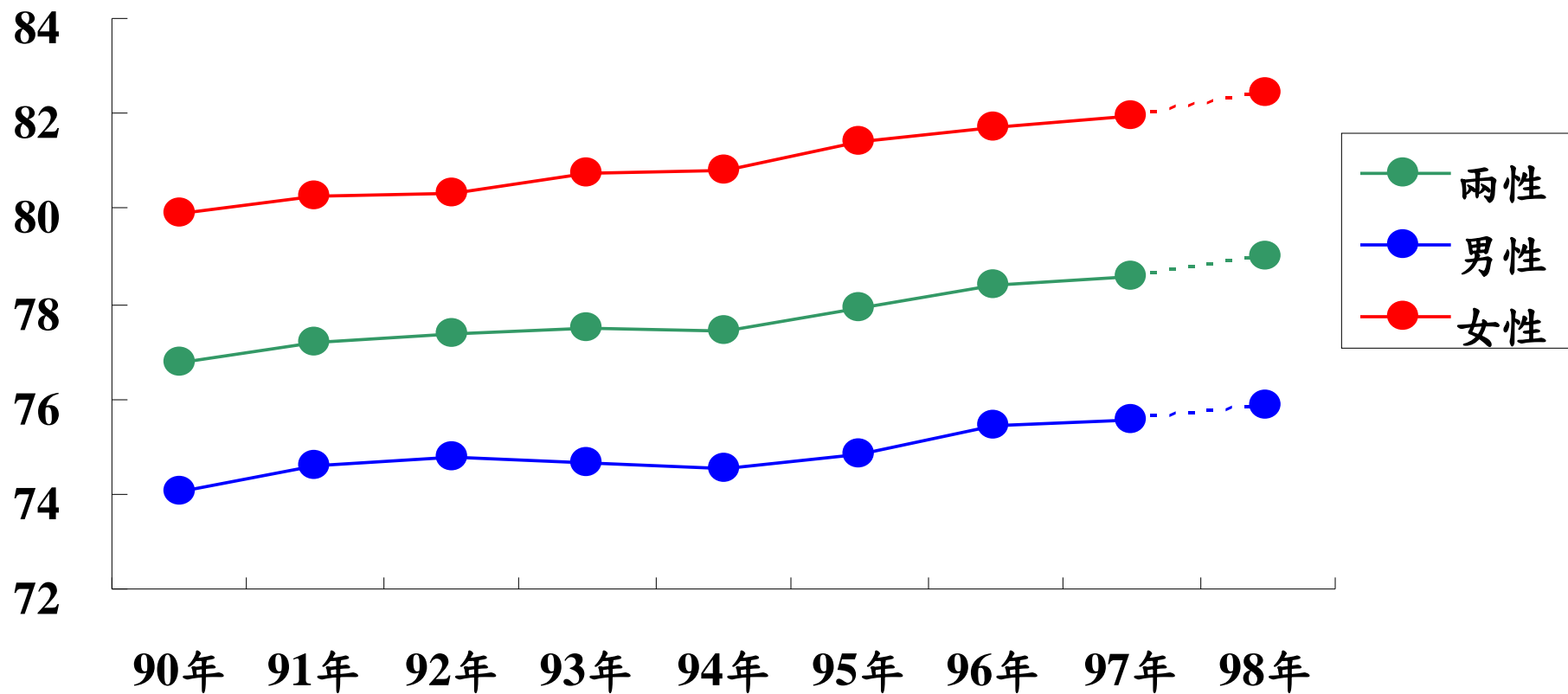
- **Taiwan:** M 75.88 yr; F 82.46 yr; all 78.97 yr (2009)
M ↑ 0.29 yr, F ↑ 0.52 yr, all ↑ 0.4 yr (vs. 2008)

	98年(估測數) (1)	97年 (2)	變動值 (3)=(1)-(2)
兩 性	78.97	78.57	+0.40
男 性	75.88	75.59	+0.29
女 性	82.46	81.94	+0.52

http://www.moi.gov.tw/stat/news_content.aspx?sn=3754

臺閩地區零歲平均餘命趨勢

年齡(歲)



<http://www.moi.gov.tw/stat/index.aspx>

零歲平均餘(歲)	2008年	
	男性	女性
冰島、聖瑪利諾(M)	80	86
香港、日本(F)		
日本	79	86
法國	78	84
新加坡	78	83
加拿大	78	83
英國	77	82
德國	77	82
南韓	76	83
中華民國	75	82
美國	75	80
馬來西亞	72	77
中國大陸	71	74

資料來源：美國 “2008 World Population Data Sheet”

<http://www.prb.org/Datafinder/Topic/Bar.aspx?sort=v&order=d&variable=121>

<http://www.prb.org/Datafinder/Topic/Bar.aspx?sort=v&order=d&variable=122>

HIGHEST LIFE EXPECTANCY (in years): 2009 est.

1. Macau	84.36
2. Andorra 安道爾(西班牙&法國間)	82.51
3. Japan	82.12
4. Singapore	81.98
5. Hong Kong	81.86
6. Australia	81.63
7. Canada	81.23
8. France	80.98
9. Sweden	80.86
10. Switzerland	80.85
....
51. Taiwan	77.96

LOWEST LIFE EXPECTANCY (in years): 2009 est.

1. Angola	38.20
2. Zambia	38.63
3. Lesotho	40.38
4. Mozambique	41.18
5. Liberia	41.84
6. Afghanistan	44.40
7. Central African Republic	44.47
8. Zimbabwe	45.77
9. Nigeria	46.94
10. Chad	47.70

<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2102rank.html>

Animal	Gestation or incubation , in days (average)	Longevity, in years (record exceptions)
Cat	52–69 (63)	10–12 (26+)
Cow	280	9–12 (39)
Dog	53–71 (63)	10–12 (24)
Elephant	510–730 (624)	30–40 (71)
Horse	329–345 (336)	20–25 (50+)
Human	253–303	65 (120)
Mouse	19–31	1–3 (4)
Pig	101–130 (115)	10 (22)
Rat	21	3 (5)

Possible Hypotheses

- each organ **independently** loses its function, and as a result, the body becomes senescent

Hayflick proposed (1965): the growth potential of cultured cells is inversely proportional to the donor's age

- the deterioration of **supervising organ**, such as the central nervous system, will cause the regression of other organs

the growth potential of a living organ is affected by its **environment**, which is probably under the control of a supervising organ

the brain shrinks with aging, esp. > **65** yr

Physiological Aspect

- breakdown of steady state (homeostasis)

↑↑ age → homeostatic capacity ↓↓

↓↓ synthesis & ↑↑ degradation

e.g. ↓↓ acetylcholine and hormone levels

→ can not keep a constant body temperature or blood sugar level

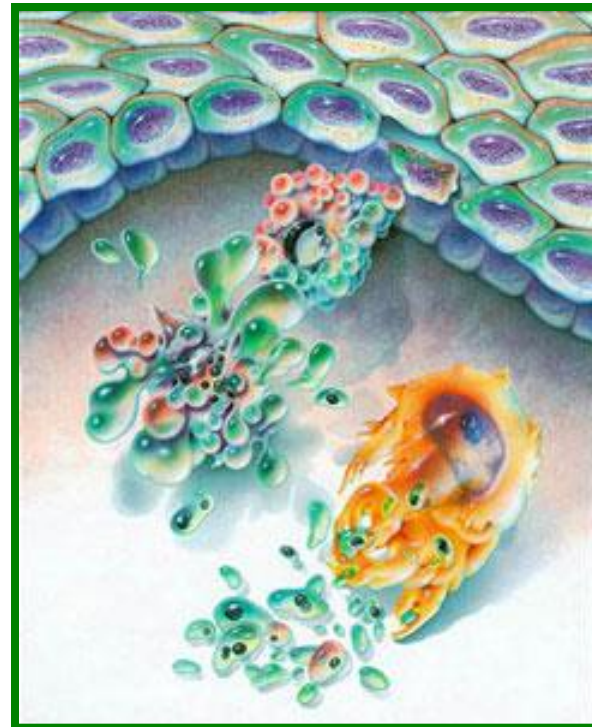
↓↓ immunological capacity

e.g. atrophy of the thymus

except the brain, the **immune** system may also be one of the supervising organs

Why dose cell death take place?

- cells are genetically programmed to die
lethal or senescence gene leads to cell death
- cells eventually succumb to wear and tear
intra- or extra-environmental deterioration causes
cell death
e.g. hormones disuse



Characteristics of Aging

- breakdown over synthesis

shrinkage of **muscle fibers** (loss of protein)

→ ↓ muscle strength

bone is lost (matrix and minerals)

→ ↓ bone density

↑ % body **fat**

↓ **respiratory** function

↓ **mobility** and ambulatory capacity

↓ production of **neurotransmitters**

e.g. dopamine, serotonin, acetylcholine



[http://www.freefoto.com/images/41/01/41_01_52---Elderly-People_web.jpg?&k=Elderly+P
eople](http://www.freefoto.com/images/41/01/41_01_52---Elderly-People_web.jpg?&k=Elderly+People)



by Judy Somerville

<http://www.newyorkartists.net/somerville/>

Summary

- **Each organ independently loses its unction, and as a result, the body becomes senescent.**
- **Cells are genetically programmed to die.**