

2018 여시재 강연

미래의료와 도시

서울대학교 의과대학
홍윤철

Disease Transition

Table 1. Daily age-standardized mortality rate (per 1,000,000 person) in Seoul, Incheon, and Daejeon. Study periods are separated by 2 year interval and baseline periods are between 2004 to 2005.

		Seoul		Incheon		Daejeon	
	Number of days	Daily average mortality rate (per 1,000,000 person)	Change from baseline	Daily average mortality rate (per 1,000,000 person)	Change from baseline	Daily average mortality rate (per 1,000,000 person)	Change from baseline
All cause (A00-R99)							
2004-2005	731	11.76		13.83		12.98	
2006-2007	730	10.89	-0.87	12.68	-1.15	11.97	-1.01
2008-2009	731	9.8	-1.96	11.45	-2.38	10.98	-2.00
2010-2011	730	9.33	-2.43	11.04	-2.79	10.41	-2.57
2012-2013	731	8.96	-2.80	10.36	-3.47	9.79	-3.19
Cardiovascular disease (I10-I70)							
2004-2005	731	3.28		3.89		3.53	
2006-2007	730	2.9	-0.38	3.66	-0.23	3.12	-0.41
2008-2009	731	2.38	-0.90	3.07	-0.82	2.80	-0.73
2010-2011	730	1.99	-1.29	2.85	-1.04	2.52	-1.01
2012-2013	731	1.8	-1.48	2.59	-1.30	2.15	-1.38
Ischemic Heart disease (I20-I25)							
2004-2005	731	0.72		0.79		0.87	
2006-2007	730	0.8	0.08	0.83	0.04	0.78	-0.09
2008-2009	731	0.6	-0.12	0.75	-0.04	0.66	-0.21
2010-2011	730	0.49	-0.23	0.83	0.04	0.58	-0.29
2012-2013	731	0.46	-0.26	0.67	-0.12	0.47	-0.40
Cerebrovascular disease (I60-I69)							
2004-2005	731	1.95		2.45		2.07	
2006-2007	730	1.52	-0.43	2.21	-0.24	1.73	-0.34
2008-2009	731	1.18	-0.77	1.66	-0.79	1.38	-0.69
2010-2011	730	0.99	-0.96	1.35	-1.10	1.17	-0.90
2012-2013	731	0.87	-1.08	1.29	-1.16	1.07	-1.00

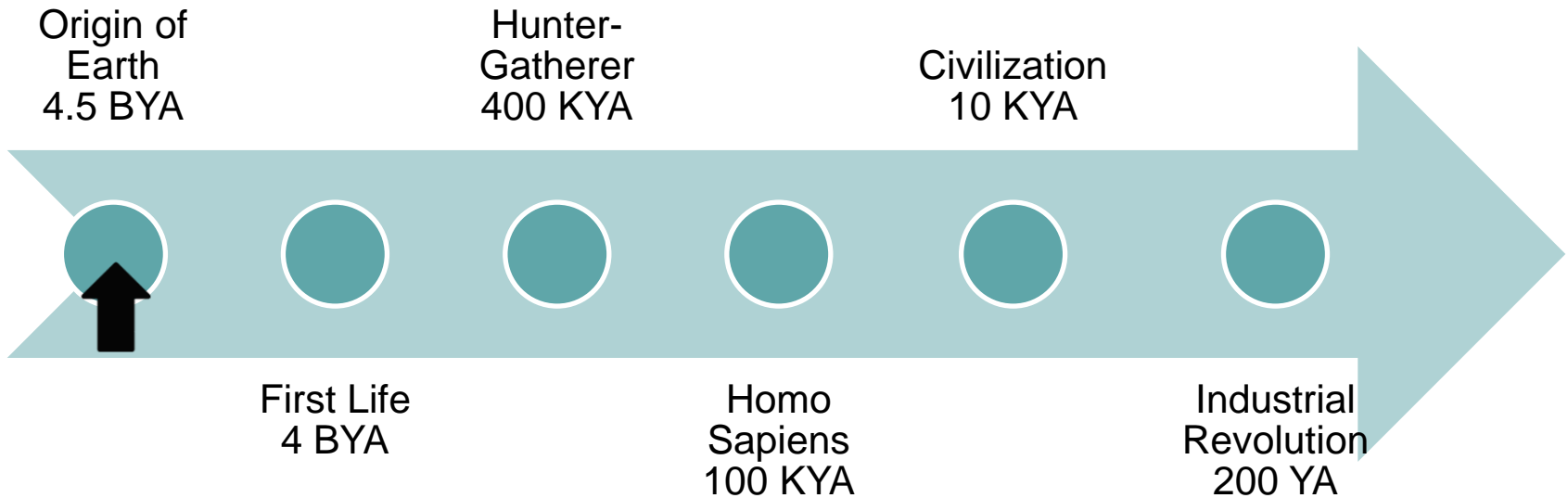
Year

*Per 100,000 population, standardized to the 1940 U.S. population.

e

1996

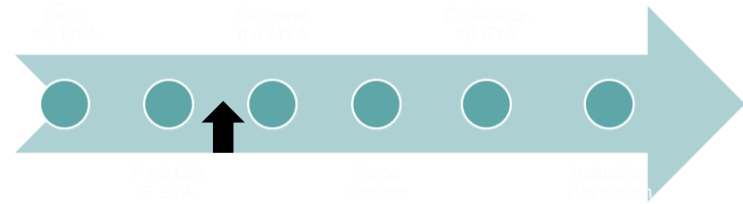
The Timeline



BYA=Billion Years Ago

KYA=1,000 Years Ago

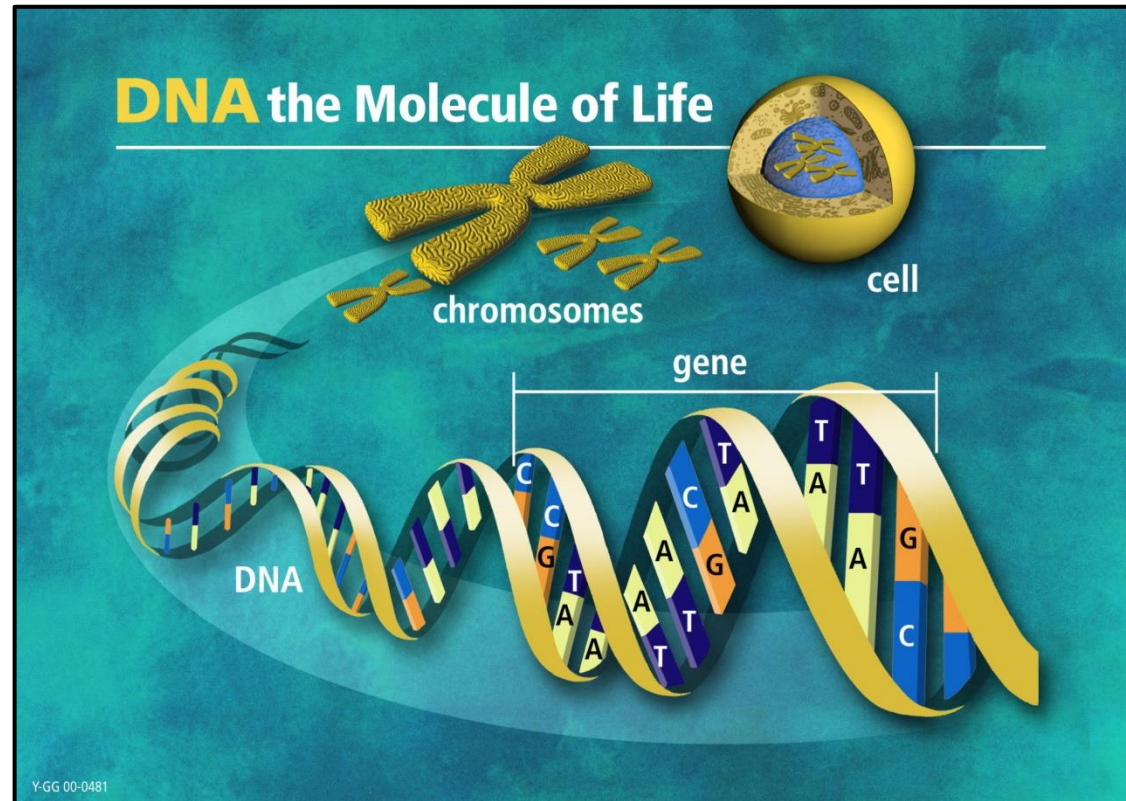
DNA



Trillions of Cells

Each Cell:

- 46 Chromosomes
- 2 meters of DNA
- 3 billion subunits (A, T, C, G)
- 30,000 gene codes for proteins



Survival Advantage

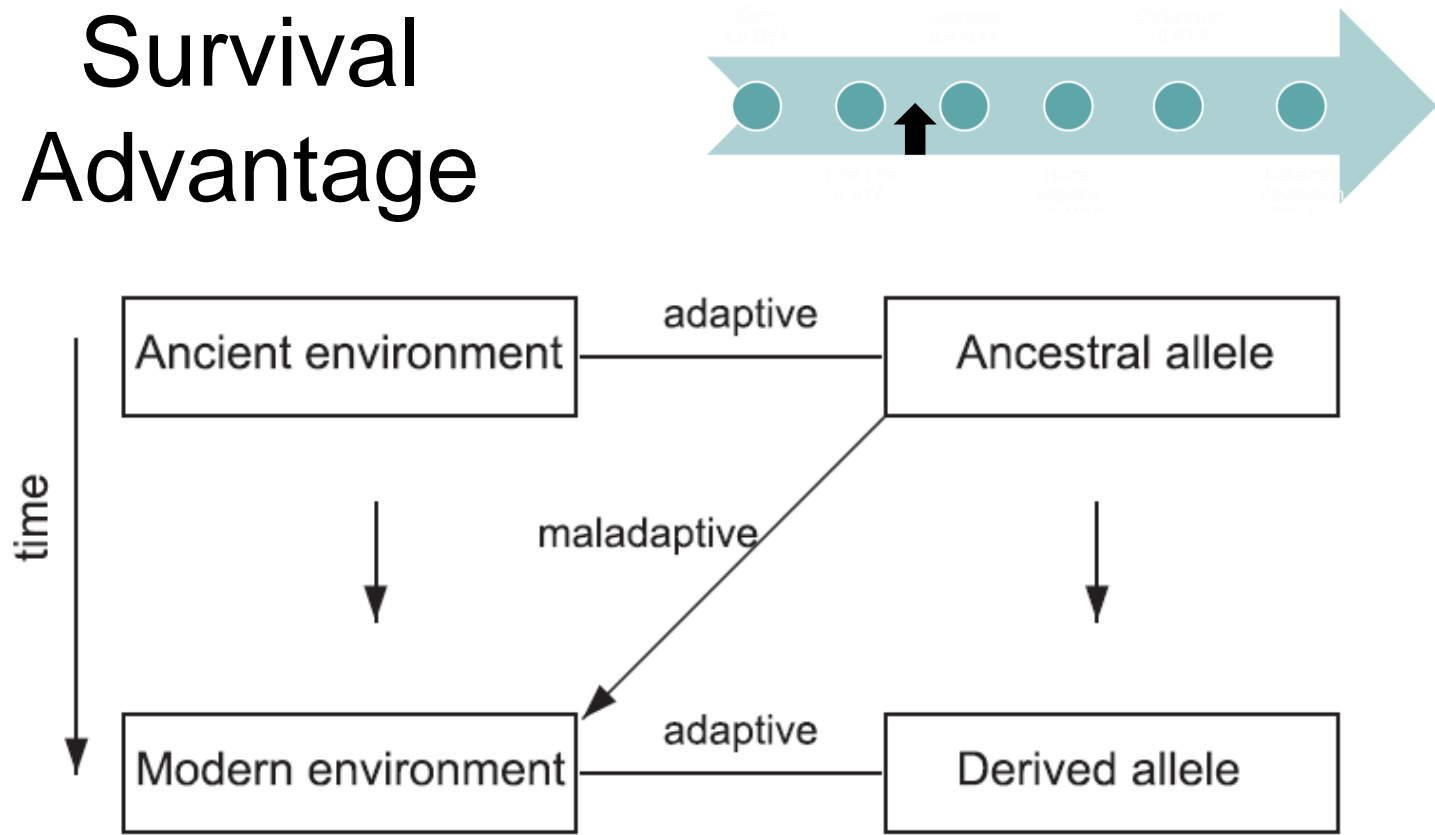


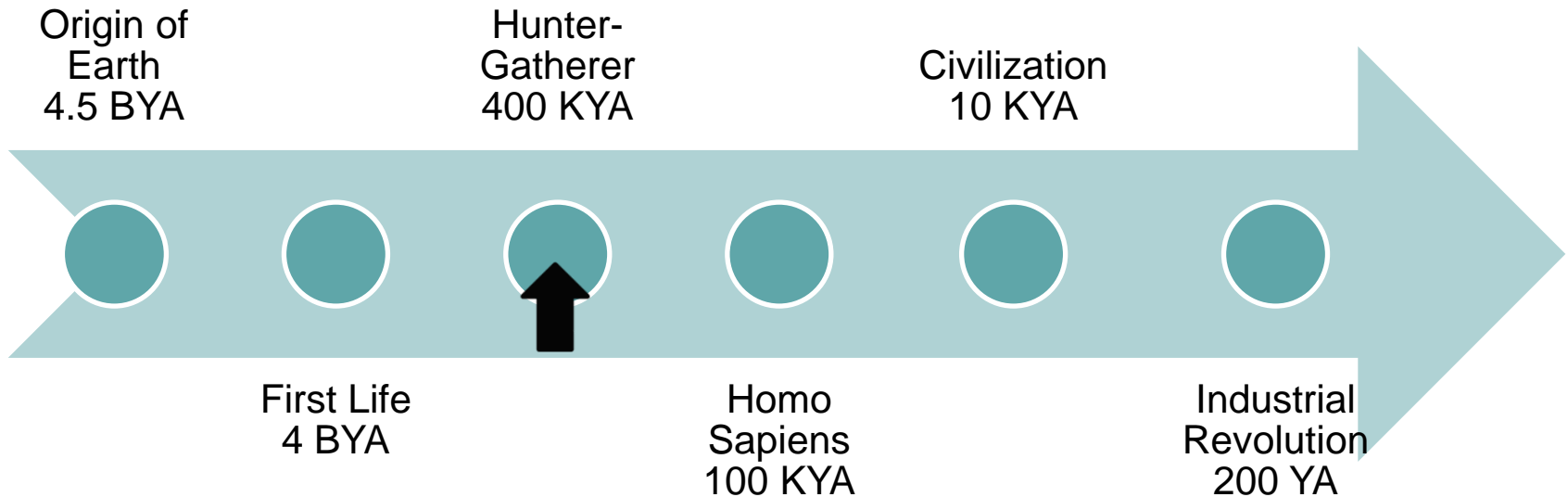
Figure 4. The ancestral-susceptibility model for common, complex diseases. The ancestral allele is maladaptive in the modern environment and associated with increased disease susceptibility, whereas the derived allele is adaptive in the current environment and may be protective.

Evolutionary Genetics of Coronary Heart Disease

Keyue Ding, PhD; Iftikhar J. Kullo, MD

Circulation. 2009;119:459-467

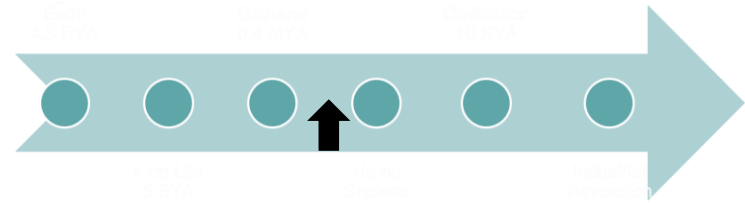
The Timeline



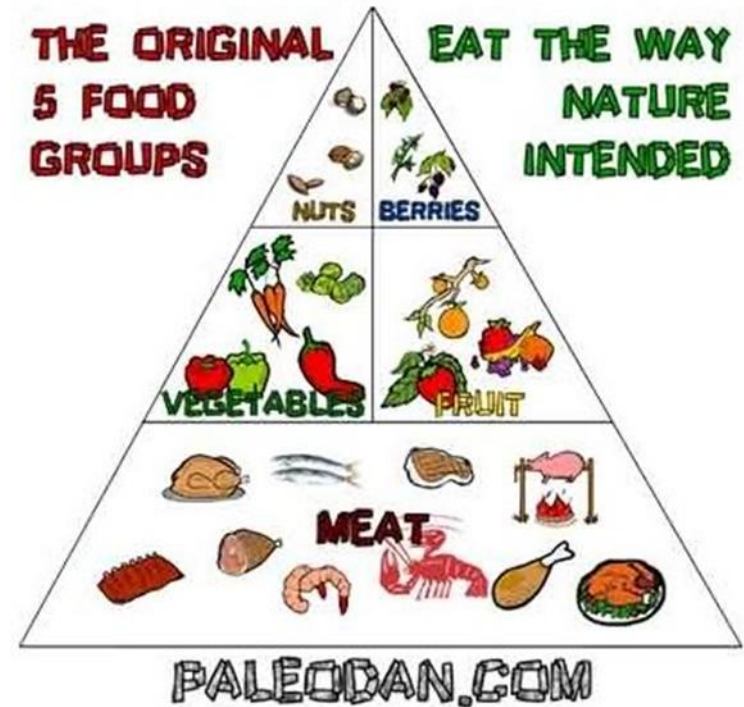
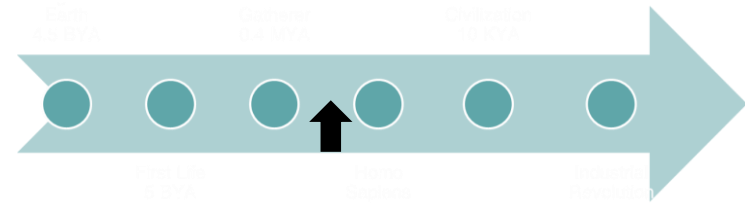
BYA=Billion Years Ago

KYA=1,000 Years Ago

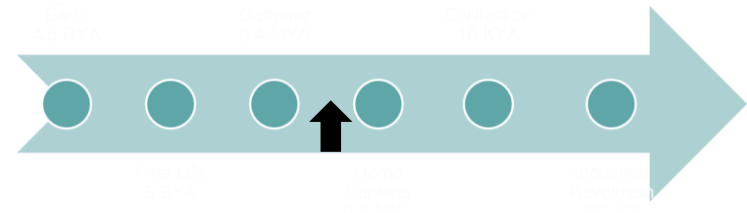
Shelter of Hunter-gatherers



Paleo Diet



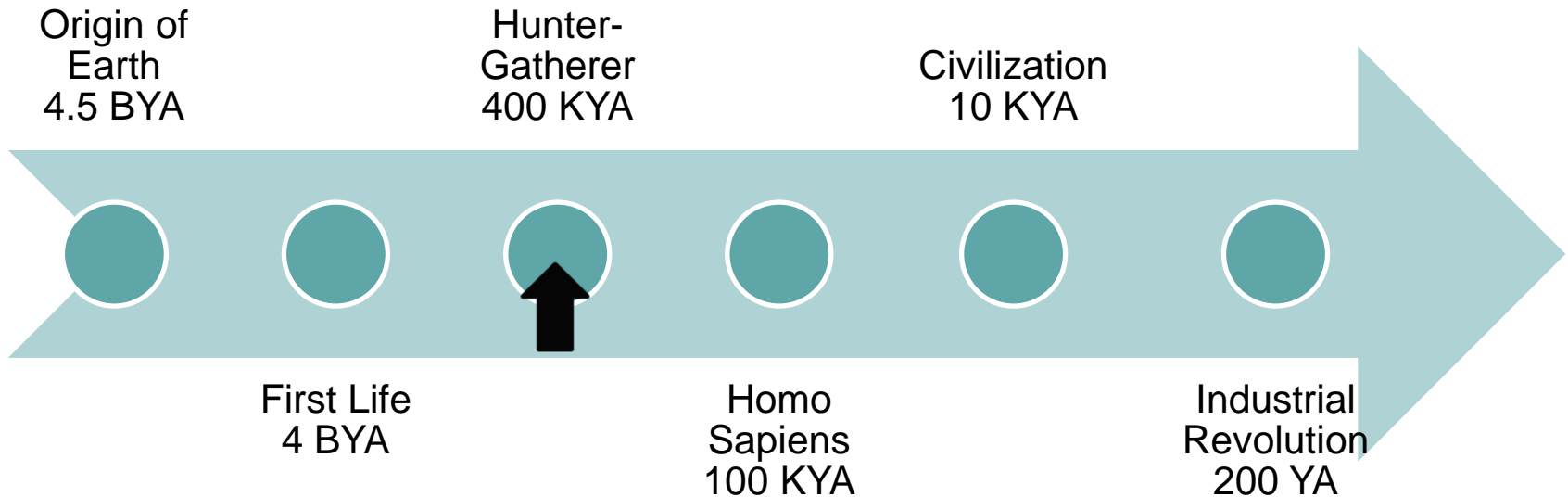
Endurance Running



No existence of communicable and non-communicable disease

- In the hunter-gatherer period, the life-threatening events were undernutrition, injury, and some parasite infections.
- Our ancestors did not have communicable and non-communicable diseases.

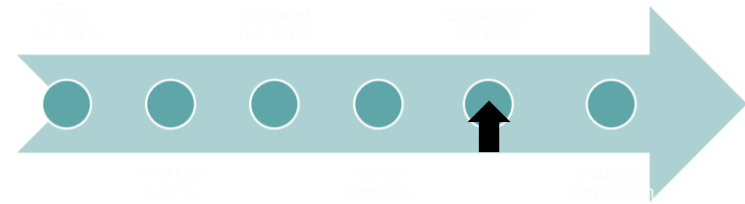
The Timeline



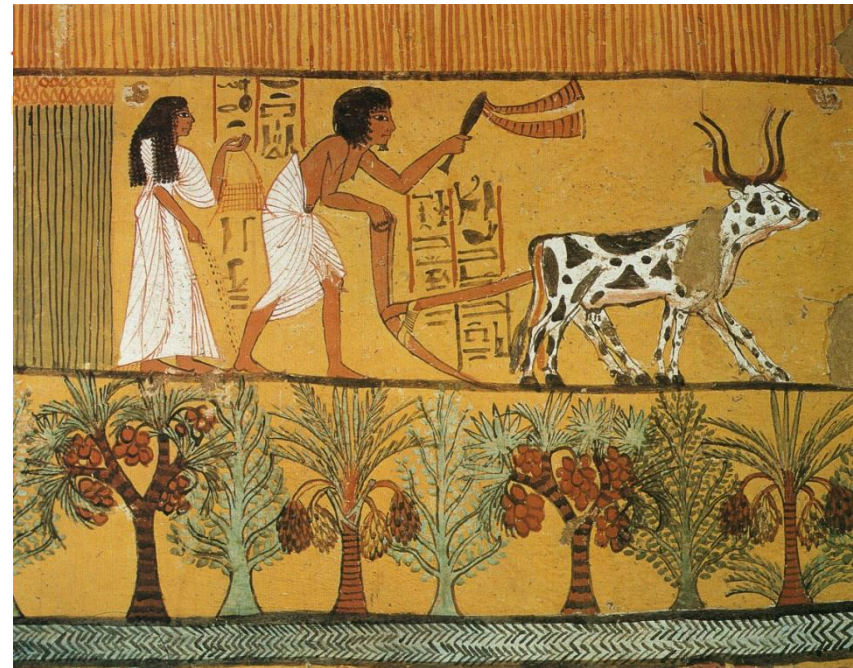
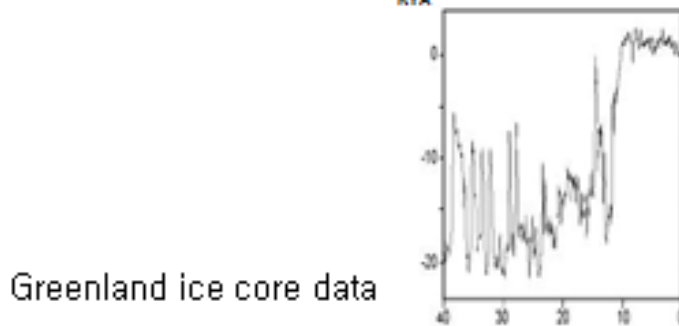
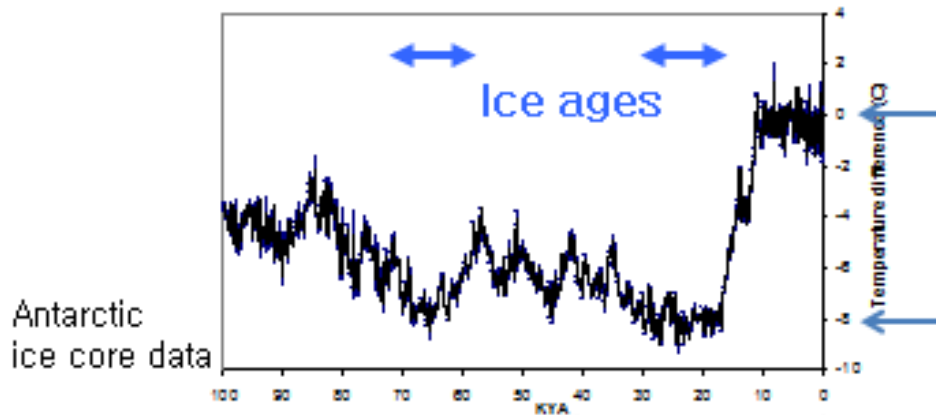
BYA=Billion Years Ago

KYA=1,000 Years Ago

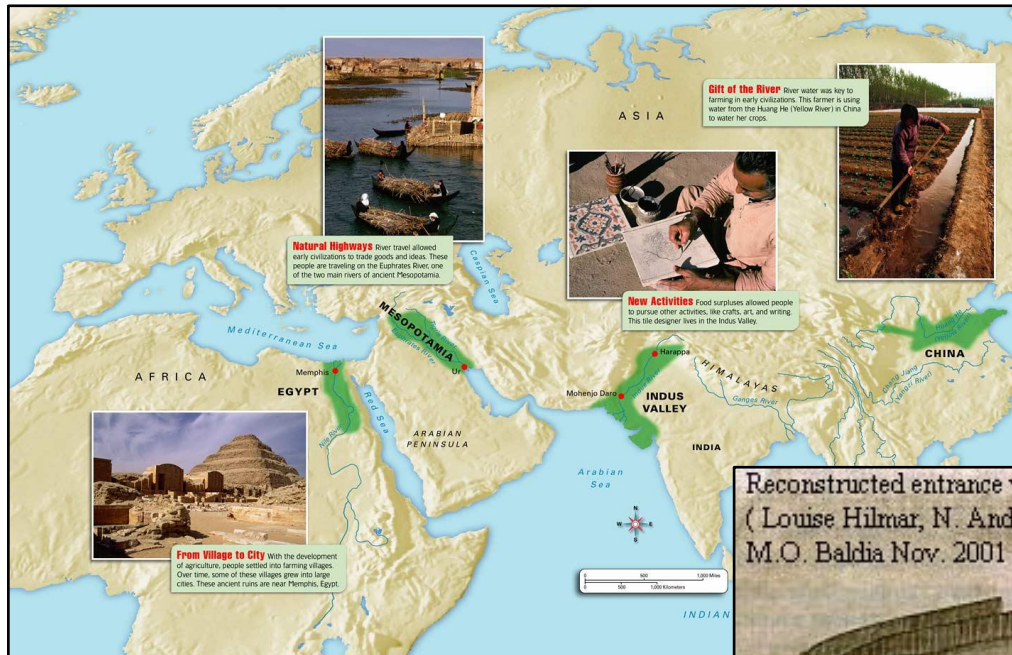
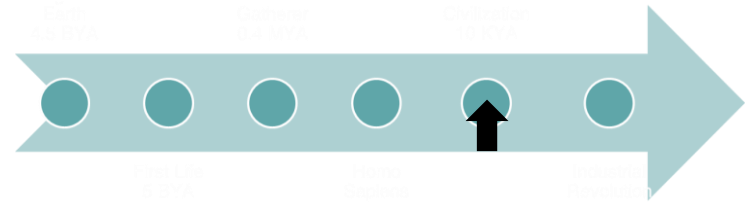
Agricultural Revolution



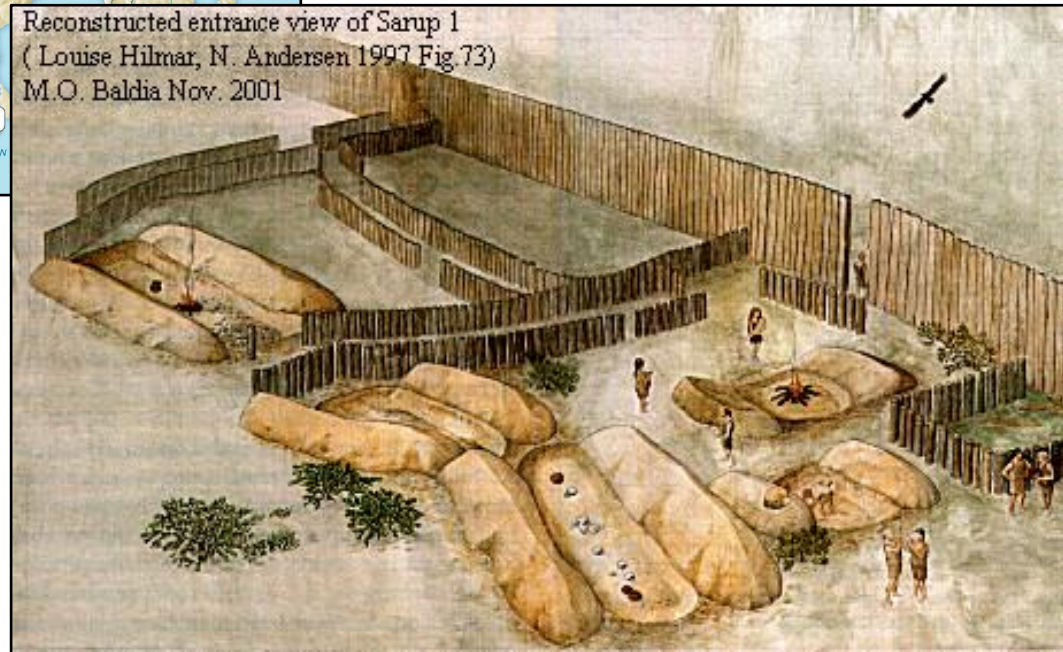
Fluctuations in climate



Civilizations & New Pathogens



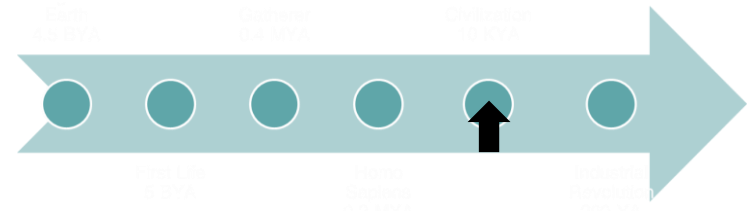
Reconstructed entrance view of Sarup 1
(Louise Hilmar, N. Andersen 1997 Fig 73)
M.O. Baldia Nov. 2001



Crowdedness

Close contact with animals

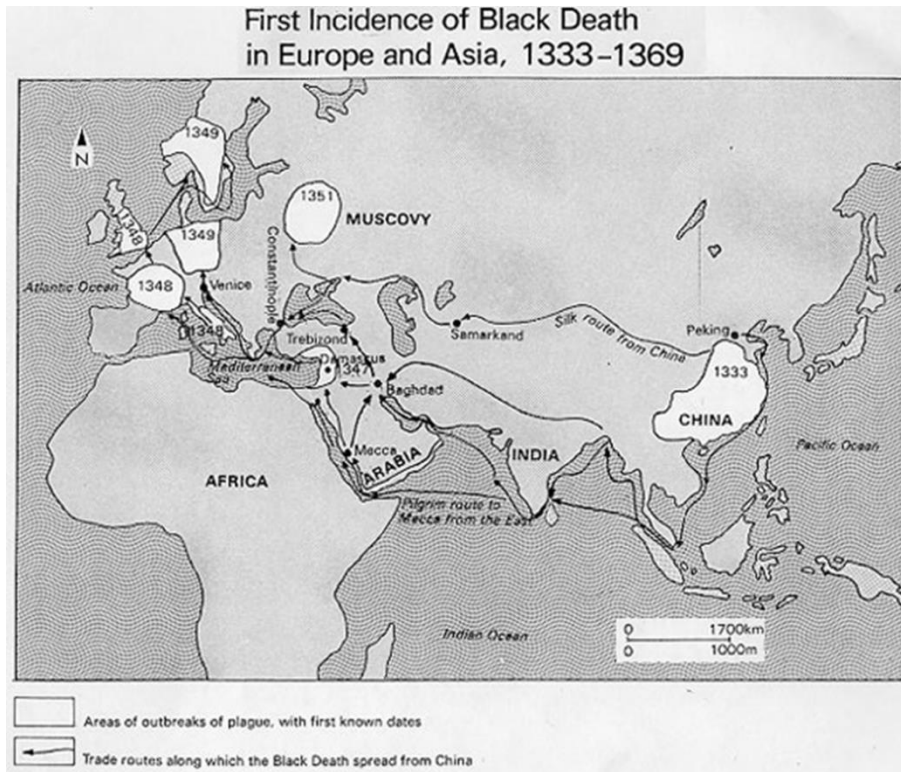
Diseases of Animal Origin



**>75% of communicable diseases
are animal origin.**

- Cow – anthrax, small pox, diphtheria
- Pig – influenza
- Goat – brucellosis
- Rat – plague (Black death)

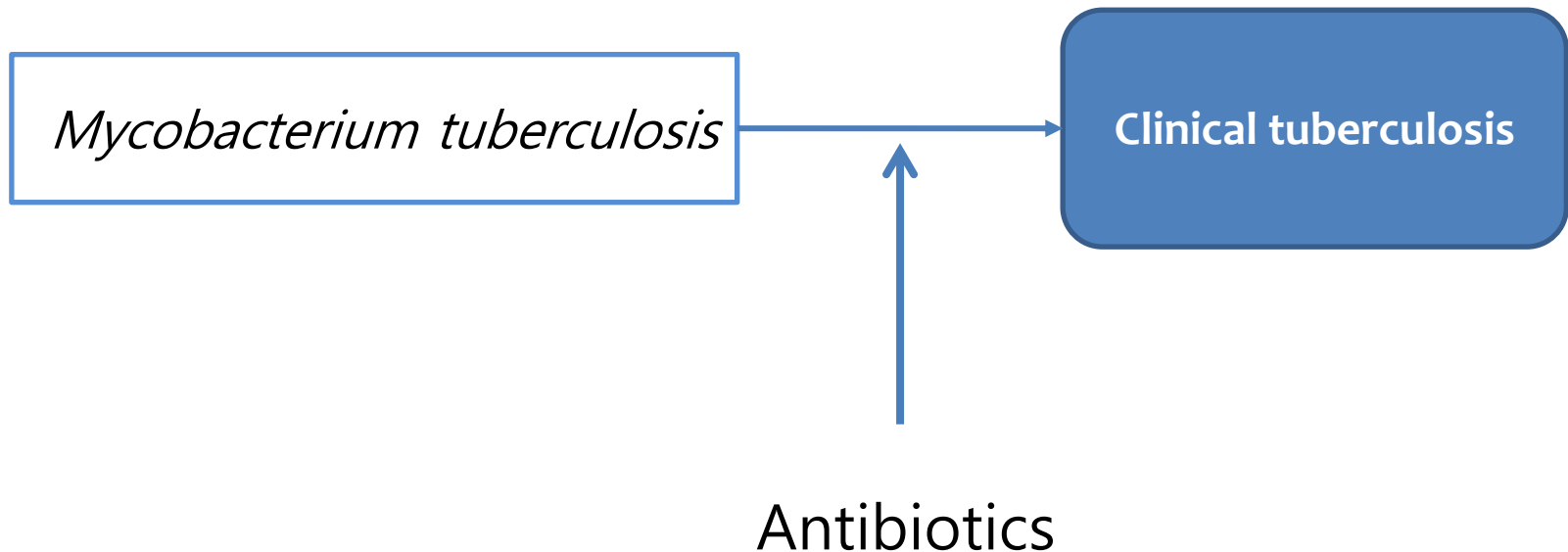
Age of Communicable Diseases



The Great Plague of London, in 1665, killed up to 100,000 people

Causality in health sciences

- Tuberculosis



Biomedical view
생의학적 질병관

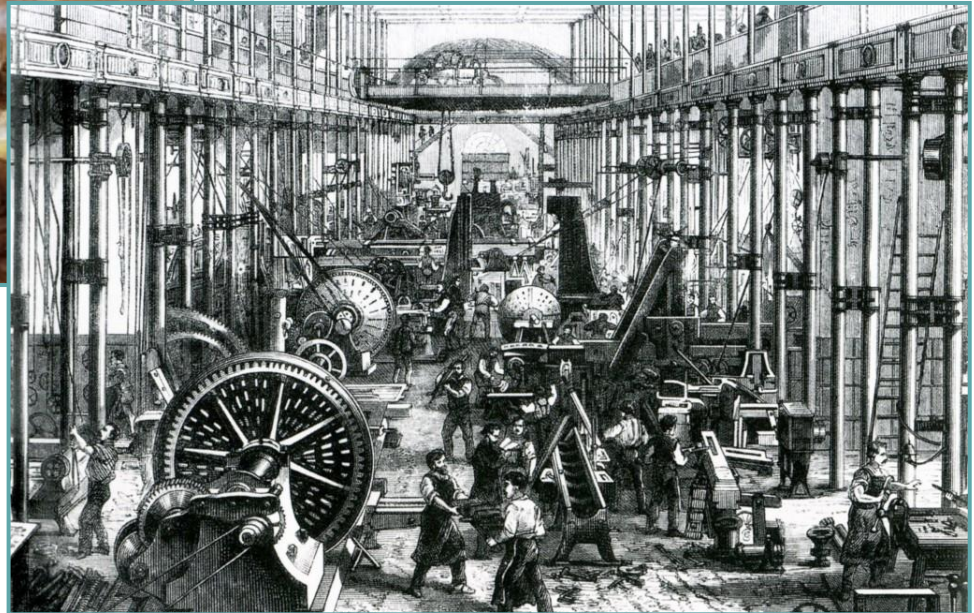
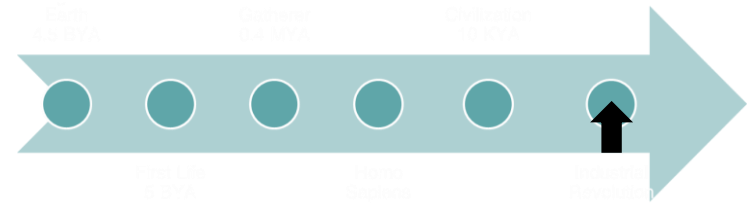
Communicable disease control

- Hygiene, nutrition, improved living conditions
- Antibiotics
- Immunization

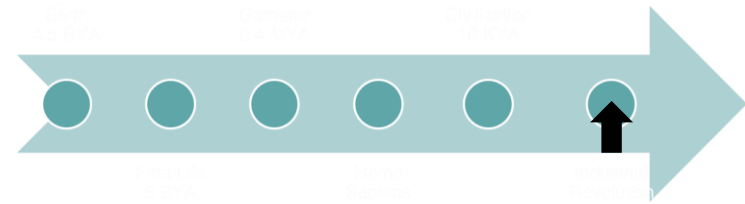
INFECTIOUS DISEASES CONTROL



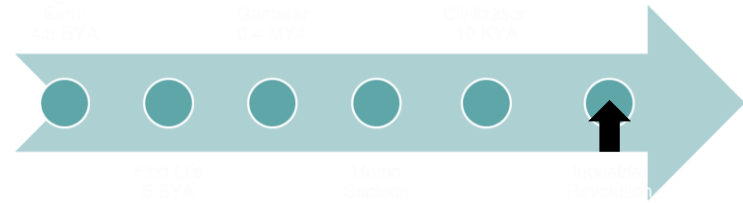
Industrial Revolution



Lifestyle and Work



Chemical Exposure



Bisphenol A

baby bottles, polycarbonate plastic bottles, microwave plastic containers, polycarbonate plastic tubing, Canned food lining



Perfluoroalkyl compound, PFCs
non-stick cookware, Teflon®, GORE-TEX®, waterproof clothing, fast food wrappers, pizza boxes, popcorn bags, stain-resistant carpet, paint, and windshield washer fluid.



We are surrounded by tons of environmental toxins!

Phthalates

	Clothing - raincoats, printed shirts, diaper covers, skirts
	Footwear - rain boots, sandals, sneakers
	Accessories - backpacks, handbags, packaging
	Building products - floor tiles, wall covering, wiring
	Household - shower curtains, tablecloths, toys
	Personal care - shampoo, deodorant, lotion, nail polish
	School supplies - lunch boxes, notebooks, binders
	Recreation - swimming pools, inflatables, garden hoses
	Automotive - car seats, upholstery, dashboards

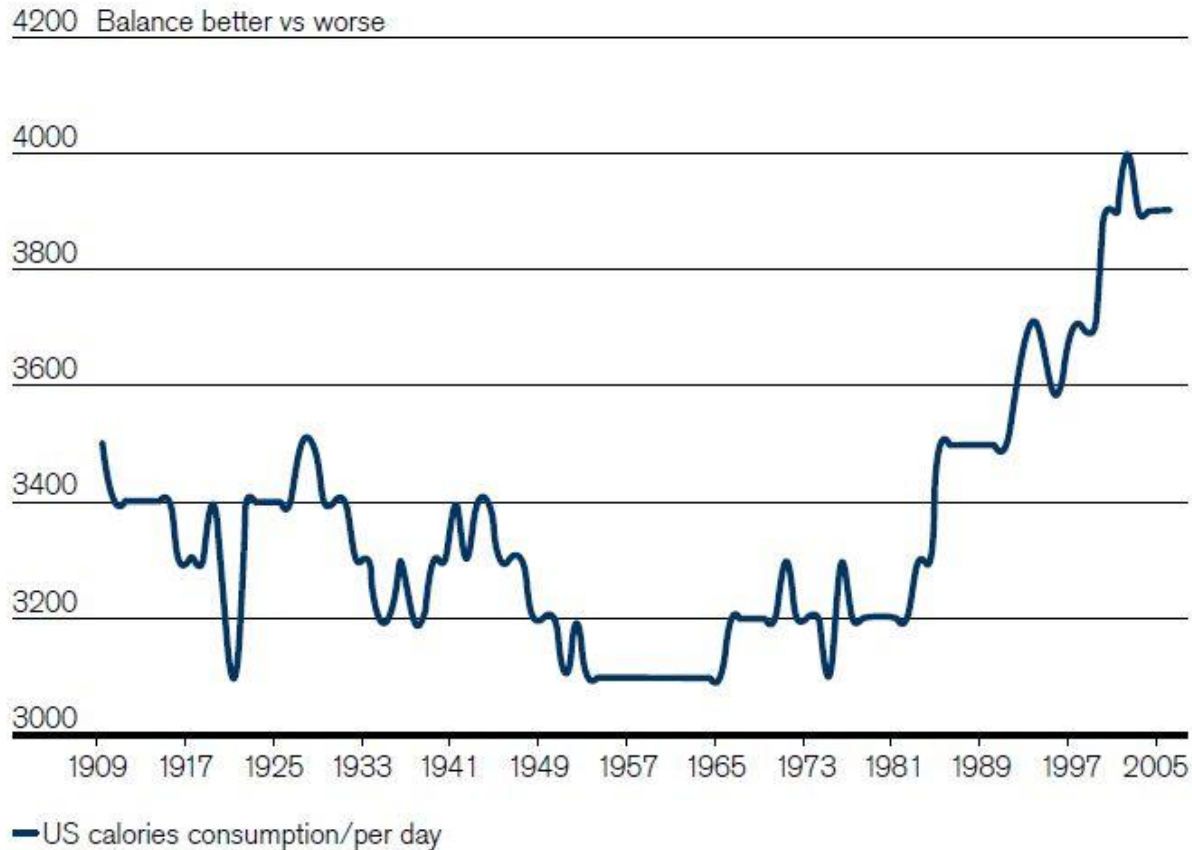


Calorie Consumption

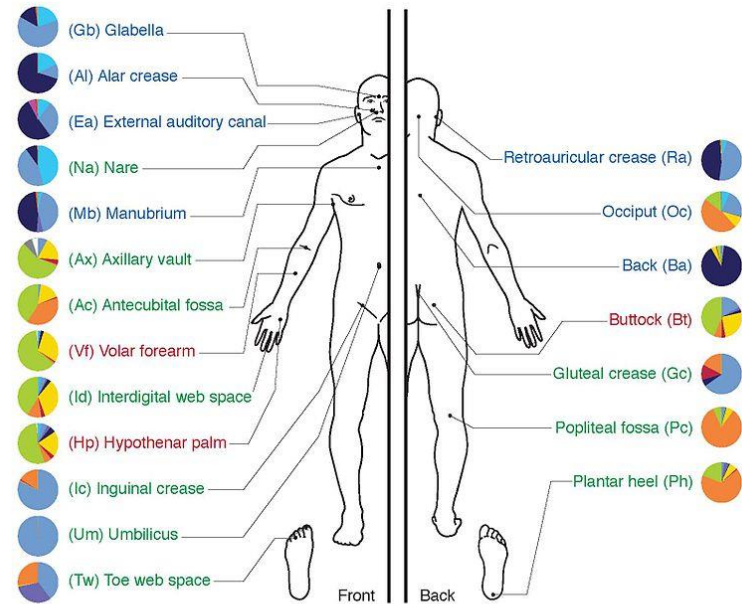
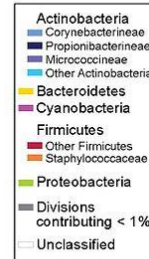
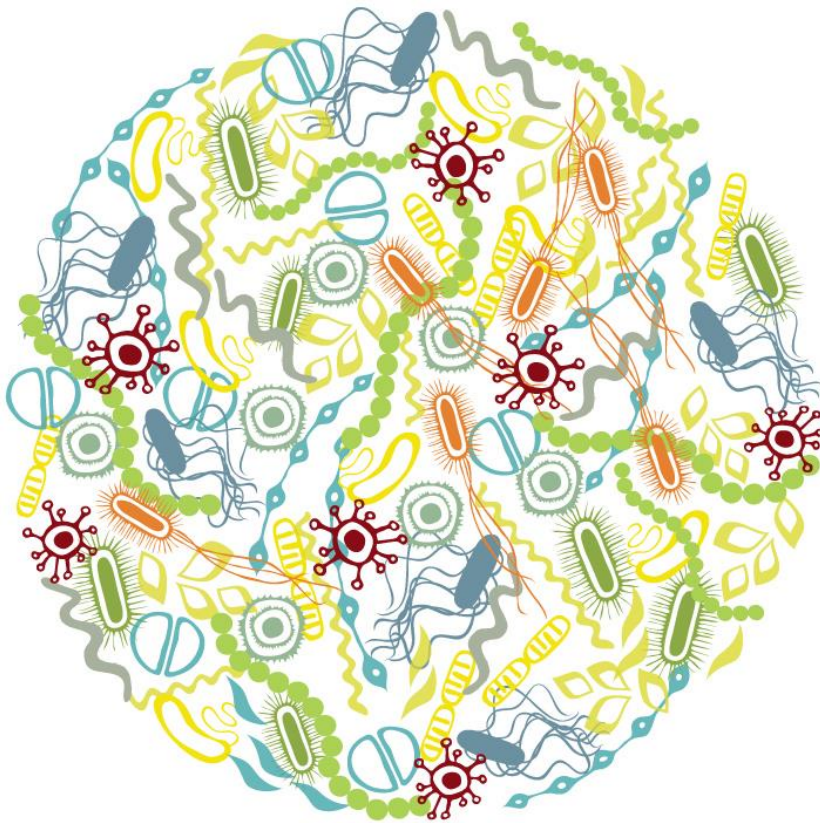
Figure 3

US calorie consumption growth over the 20th century

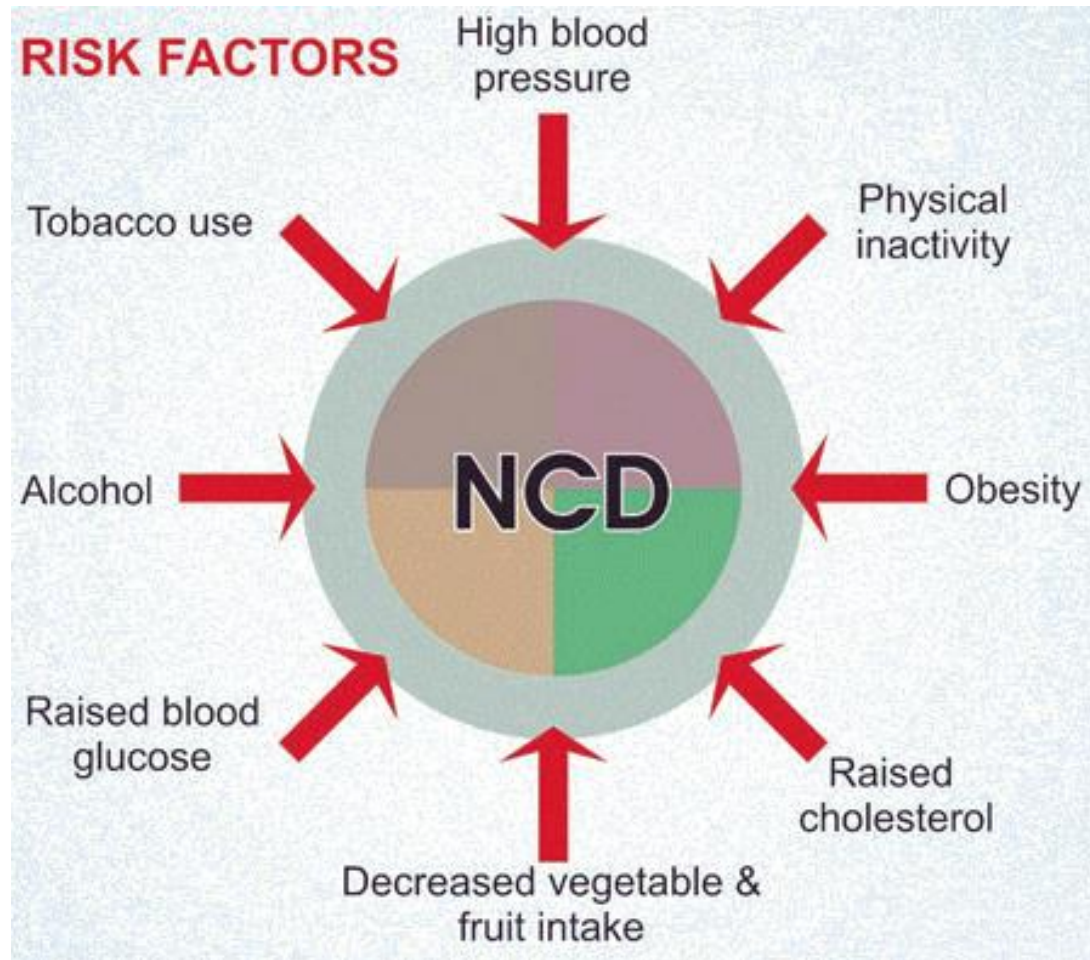
Source: USDA, Credit Suisse Research



Microbiome

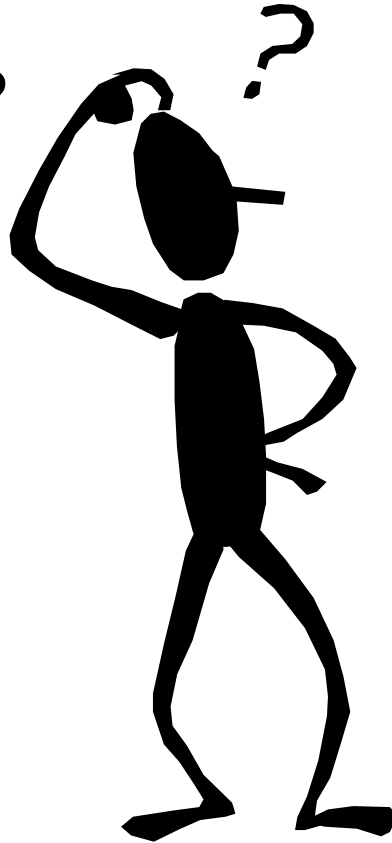


Causes of NCD

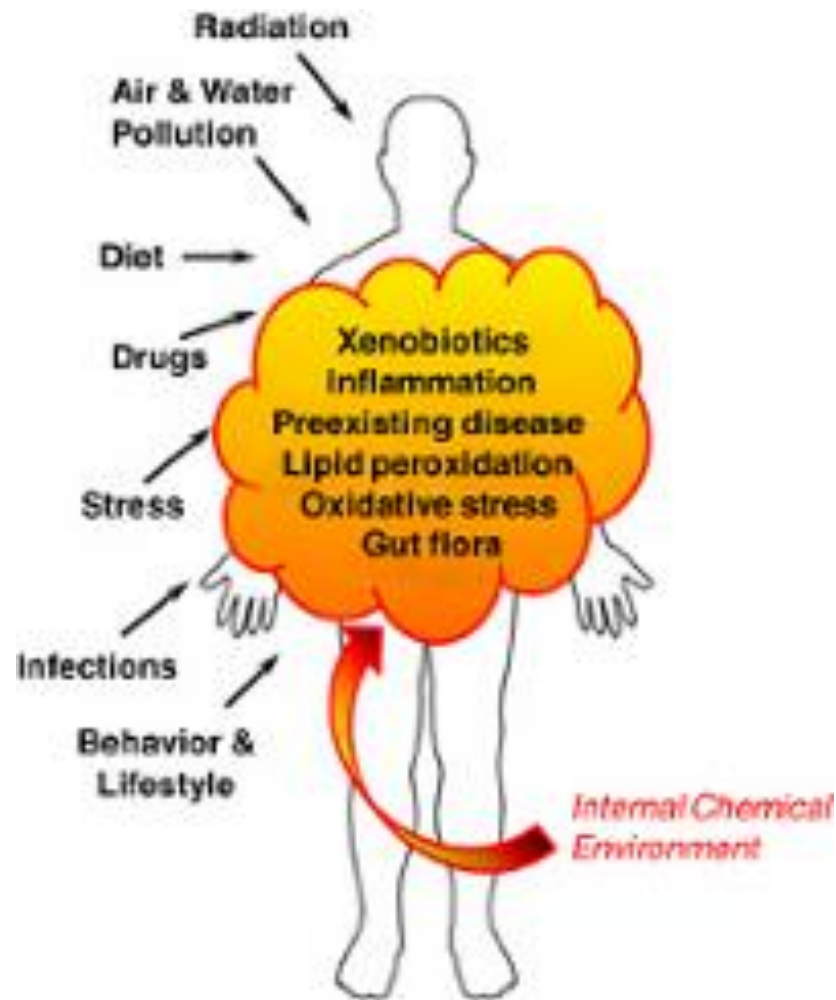


Causality

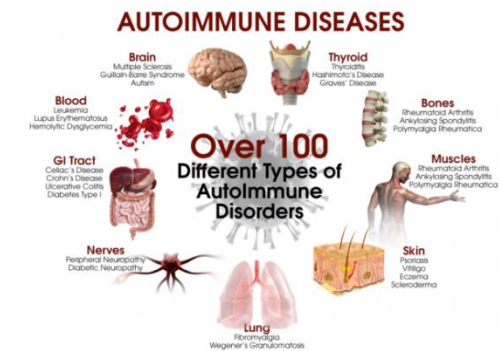
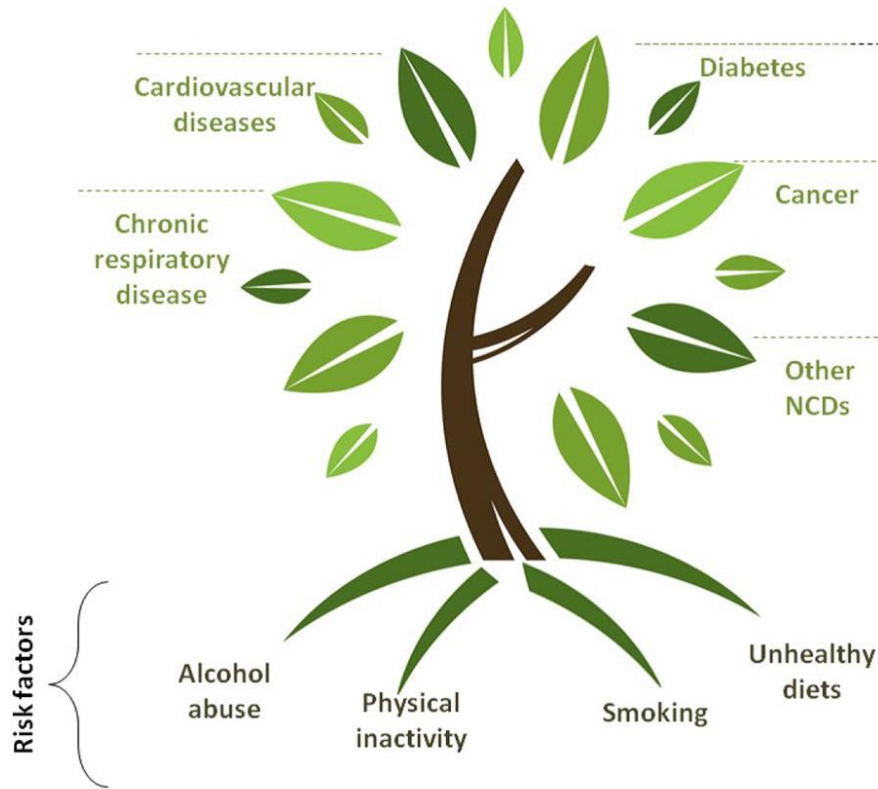
- What is cause?



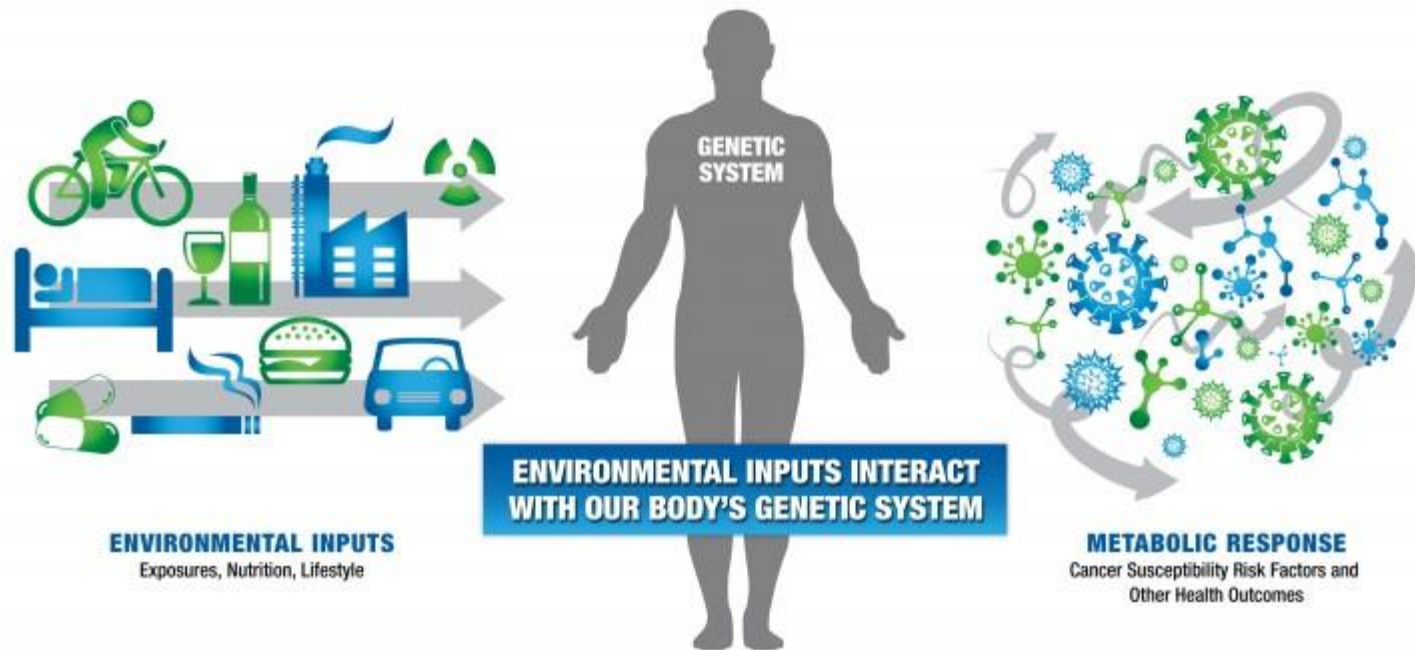
Exposure or Exposome?



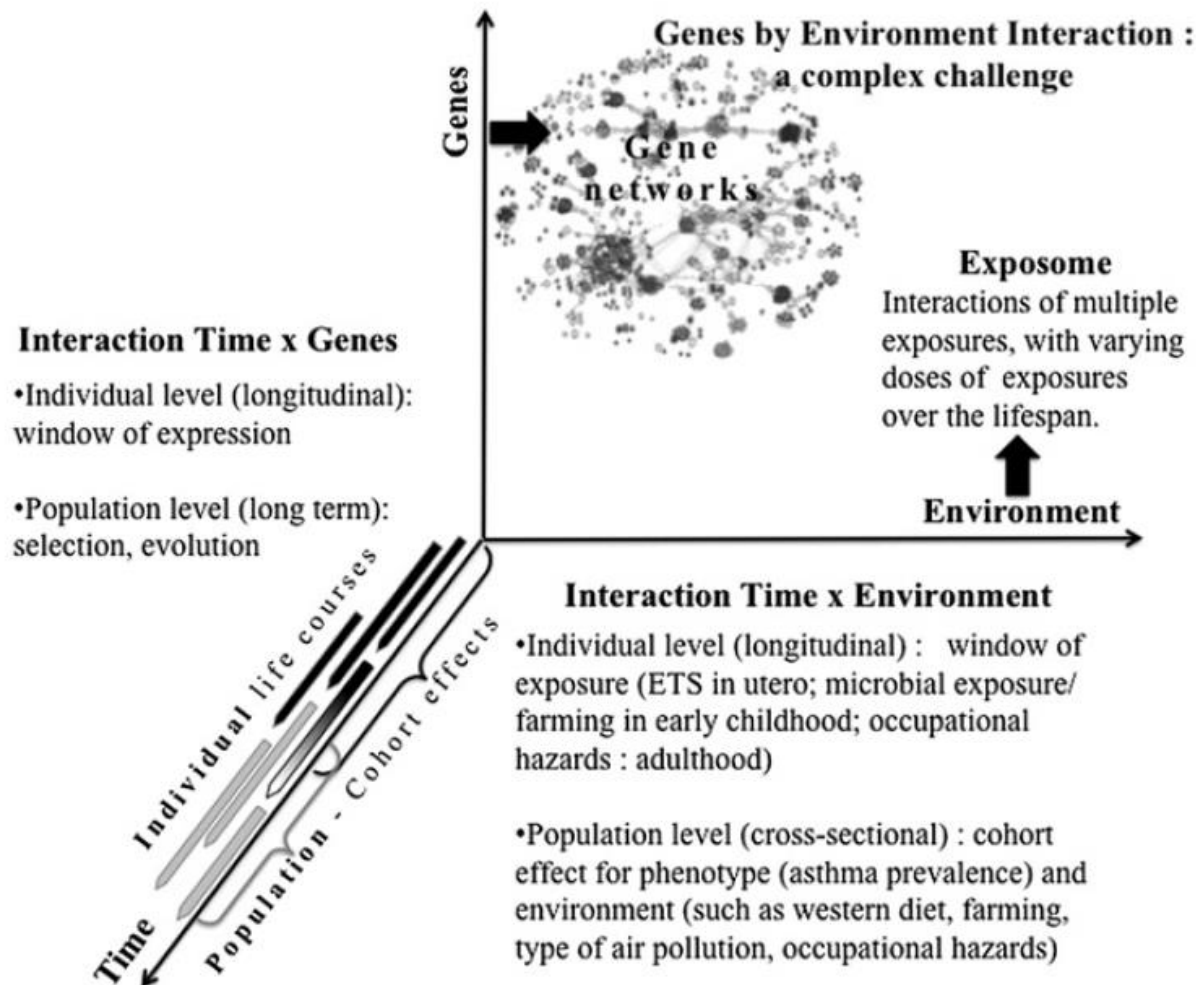
Changing era of diseases



Interaction of Environment and Gene



Gene x Environment x Time interactions



Dutch Famine Study

The Dutch Famine of 1944-45

- Also known as 'Dutch Hunger Winter'.
- Germany occupied parts of Netherlands and prohibited food transport in Nov. 1944 until May 1945.
- Adult food rations were as low as 400-800 calories/day.
- 4.5 million people affected.
- Estimated 22,000 deaths
- Unfortunate humanitarian disaster as a result of WWII.
- Unique opportunity to study the effects of brief period of malnutrition during gestation on F1 and F2 generation.

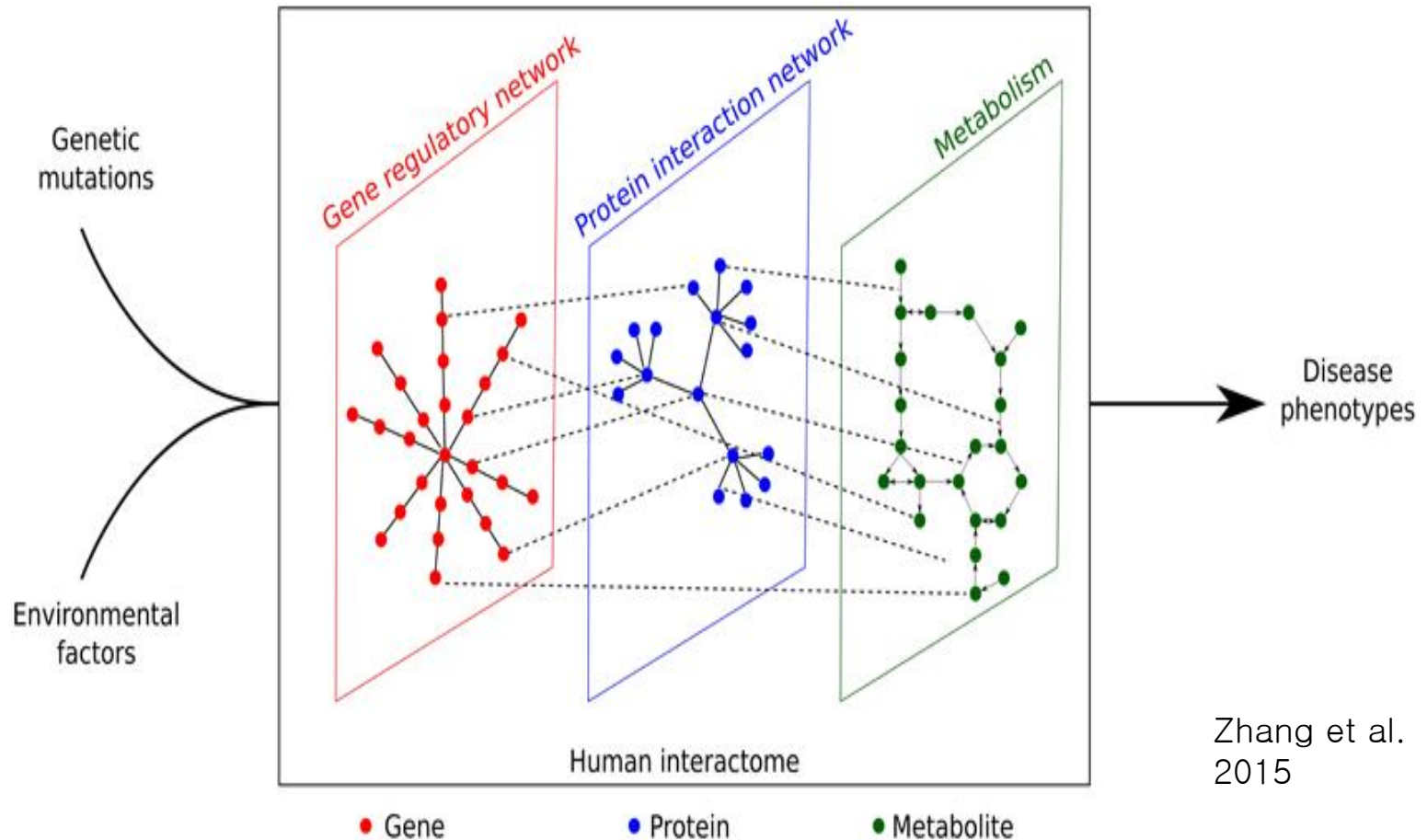


Figure 5.



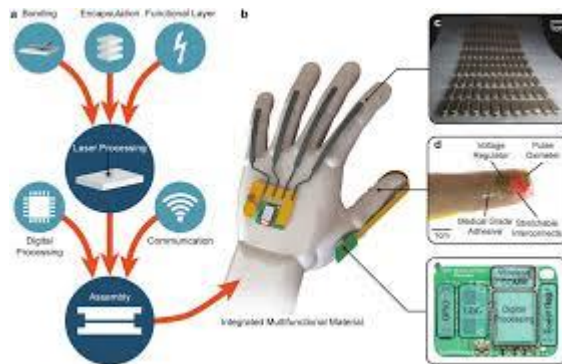
Systems Medicine Approach

시스템의학적 접근

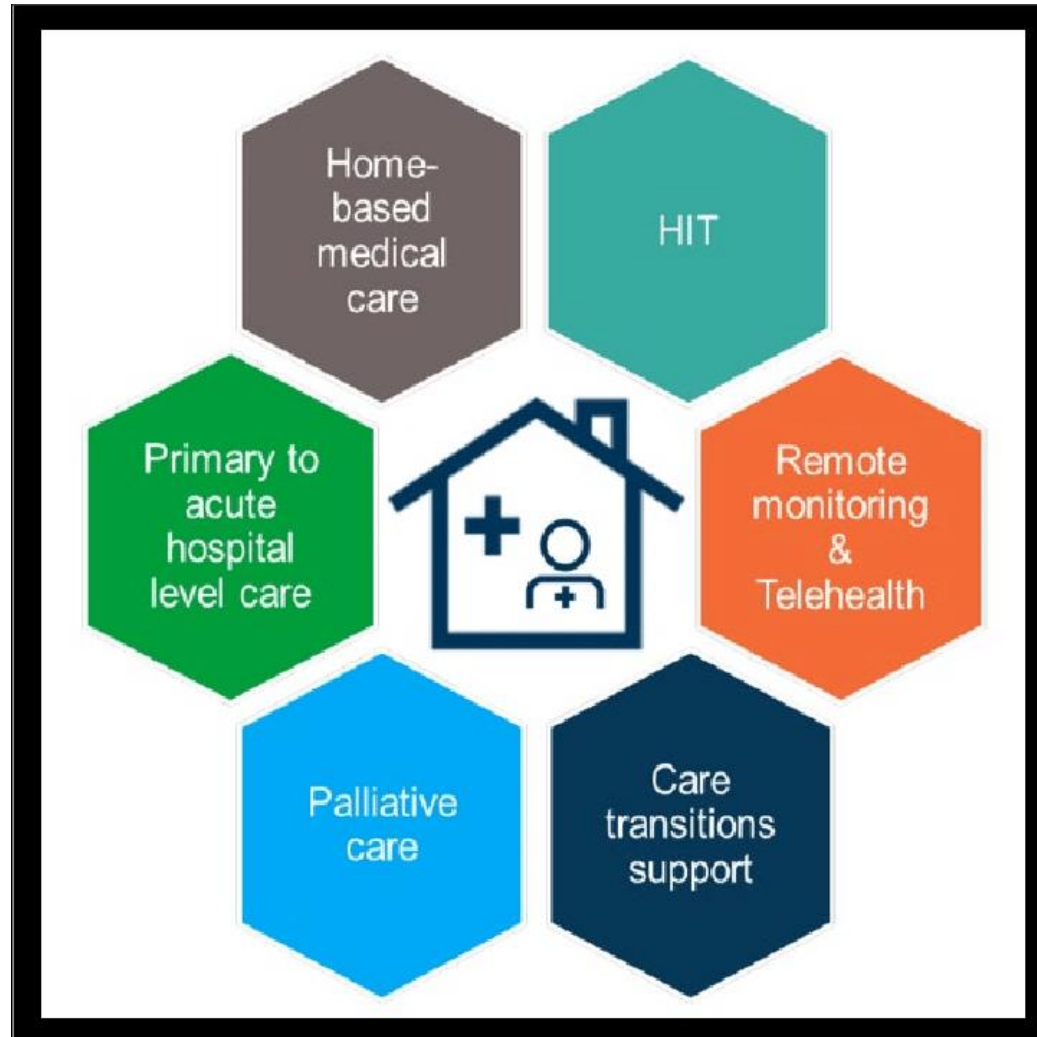


Zhang et al.
2015

BioMonitoring

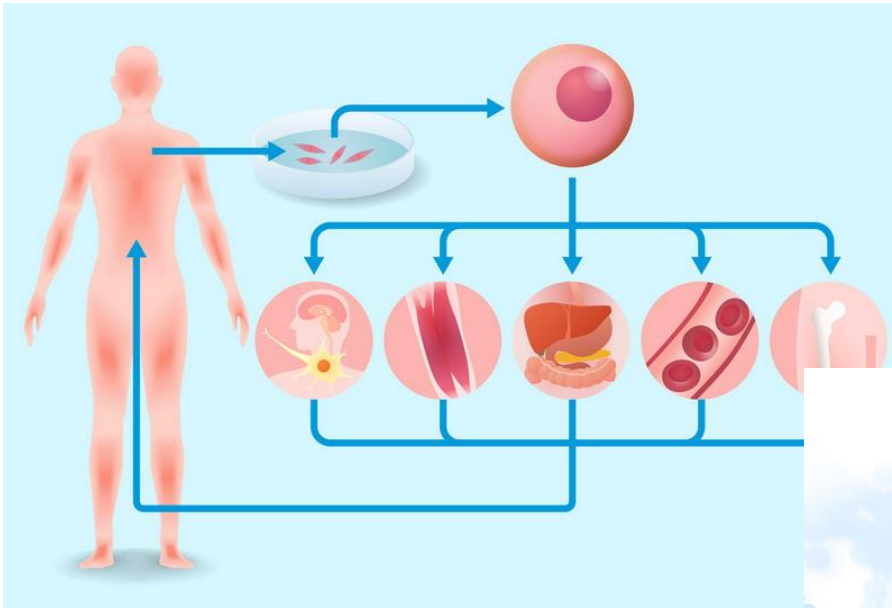


Home-based medical care

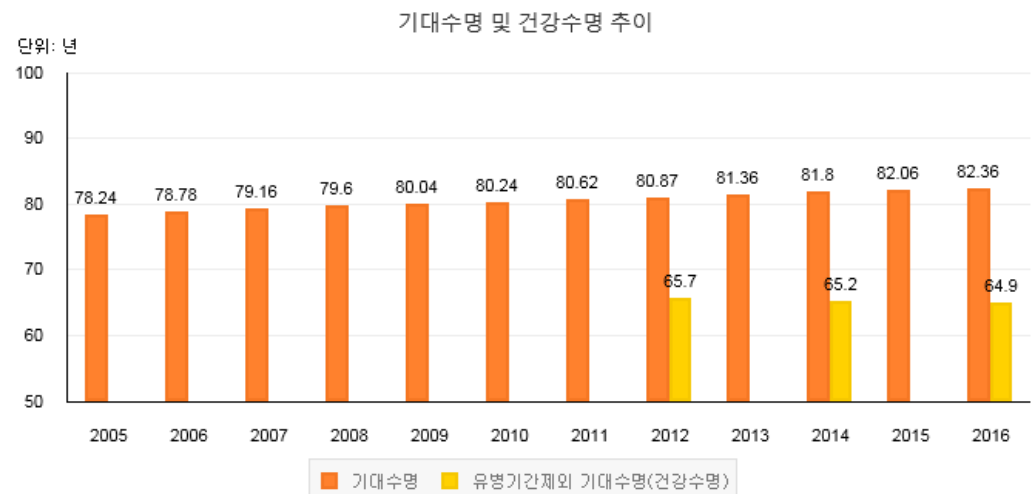
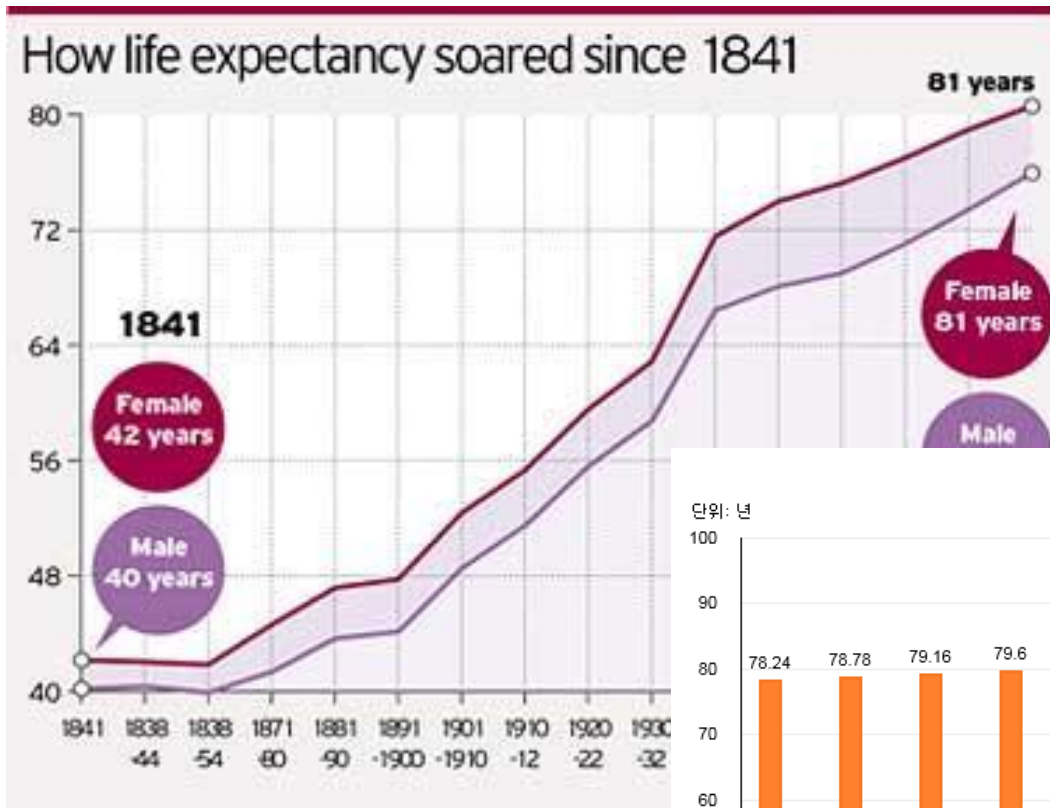




Regeneration or Biostrengthening

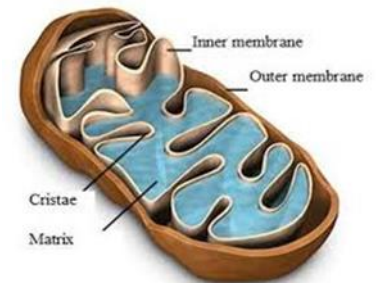
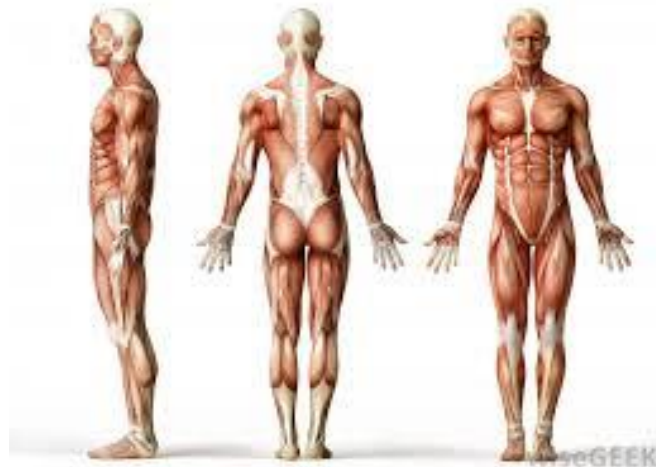
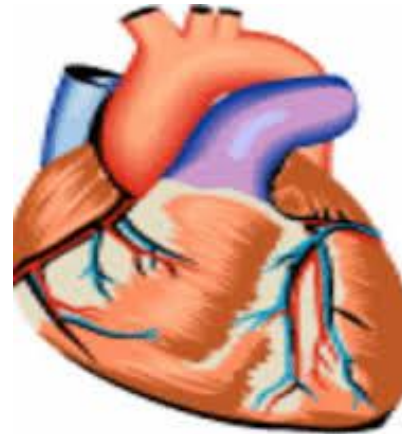


Life Expectancy



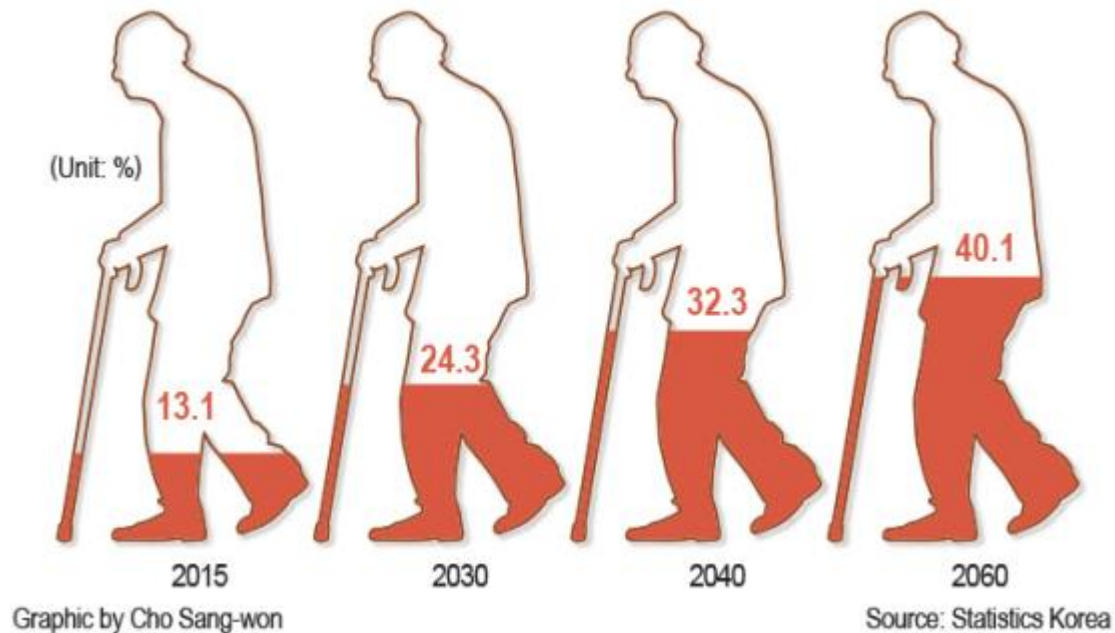
출처 : 통계청, 「생명표, 국가승인통계 제101035호」

Postmitotic cells

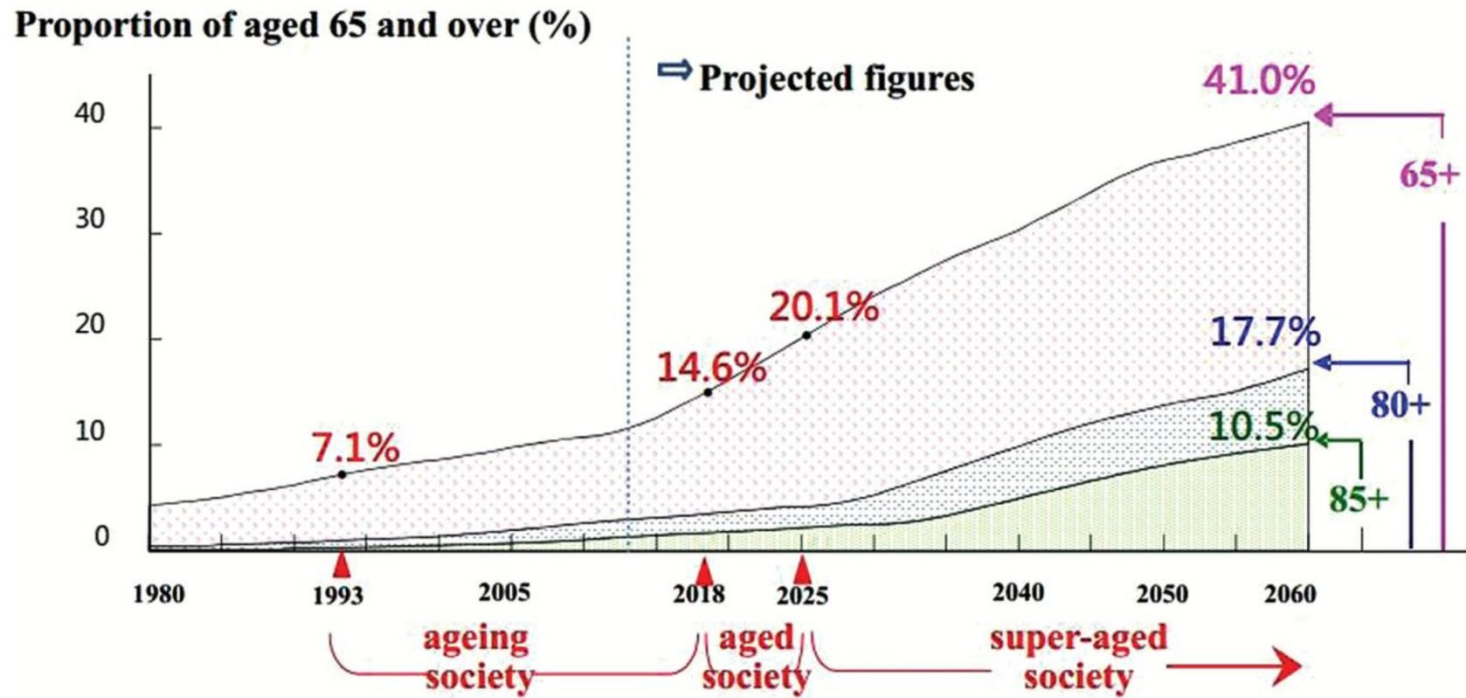


Population Over 65

Ratio of elderly over 65



Building a Society for Active Aging



Residence



Lifelong education



Home
medical care



Working at home



WIN-WIN MEASURES

These measures increase the resilience of elderly people while contributing to wider sustainability and resilience benefits for cities and people. Selected examples are provided below.

1 GREEN / BLUE INFRASTRUCTURE

Transform as many urban areas from 'grey' surfaces to green and blue areas which increase cities' resilience to floods and heatwaves.

- ▶ The Green Infrastructure Audit Best Practice Guide helps to map green areas, evaluate benefits and identify opportunities in London.

2 AWARENESS, INFORMATION AND EDUCATION

Effective communication and access to knowledge and tools reduce vulnerability to extreme weather events

- ▶ The Future Air – Knowledge Cards raise awareness on the challenges, efforts and solutions around air pollution in China.

3 DESIGN FOR FUTURE CLIMATE

Design, build and retrofit buildings and spaces for future climate conditions while contributing to wider sustainability benefits.

- ▶ The NYC Office of Housing Recovery Operations worked towards ensuring the resilience of buildings in New York City to future storm surges.

4 COMMUNITY CAPABILITIES AND ENGAGEMENT

Promote community resilience and community-led actions to enhance preparation and response to extreme weather events. These measures and actions should proactively engage older people's knowledge and skills.

- ▶ The State of New York established the New York Rising Community Reconstruction Program to help storm-impacted communities.

5 PLANNING FOR WEATHER

Enhance warning systems, emergency systems and city plans for extreme weather to ensure reliable and suitable communication channels to reach all people in cities including the most vulnerable.

- ▶ The UK Heat Health Watch Service acts as an early warning system for warning of periods of high temperatures.



The City of the Future



Utopia??

