LECTURE 1 : Theories of ageing

- Disease in the past => main causes => microbial pathogens (ex: tuberculosis / cholera), viruses (small pox), parasites (hookworm), malnutrition (rickets) & violence (warfare)
- Nowadays => major progress in identification of disease aetiology, immunisation, antibiotics, ↑ sanitation & hygiene, control of environmental toxins & ↓ violence
  - ↳ result => we live longer BUT experience diseases that didn't live long enough in the past to experience!
- Leading causes of death in UK:
  - ↳ respiratory disorders
  - ↳ ♡ & circulatory disorders
  - ↳ cancer => 'ageing is the greatest carcinogen'
  - => AGEING now main cause of disease worldwide!
    - ↳ infection due to immune senescence
    - ↑ accidents & lethal falls, ↑ suicide due to depression / chronic illness / terminal conditions
    - ↳ diseases of ageing => aetiology unknown + largely incurable => new challenge of browned research.
  - ↳ cardiovascular diseases (atherosclerosis)
  - ↳ cerebrovascular diseases (stroke)
  - ↳ late-life cancers (prostate, breast & colon)
  - ↳ dementia (AD)
  - ↳ chronic destructive pulmonary disease (COPD)
  - ↳ macular degeneration of the eyes.
- Key (?)
  - ↳ What are the aetiologies of diseases of ageing?
  - ↳ What is ageing?
  - ↳ How does ageing give rise to diseases of ageing?
  - ↳ Are they preventable?
  - ↳ Is ageing one or many disease?

AGEING as central cause:

"Intimate of healthy ageing, optimum..."

- Radical proposal: prevent diseases of ageing by treating ageing itself!

- ↳ Study diseases of ageing individually in separate disciplines
  - ↳ ... trend of ... treating indiv diseases becomes futile => one replaces the other!!
- ↳ current strategy!
- ↳ treat ageing itself & protect against all ... diseases ... ageing?!?!
- ↳ alternative strategy!

'BIG GERIATRICS'

- Dietary restriction!!
  - ↳ in rodents => postpones multiple diseases of ageing + confers 20-40% ↑ in lifespan & extension of 'youth-span'
    - ↳ autoimmune disorders, cancer, cataract, T2D, hypertension & kidney failure
  - ↳ McCay et al. 1943.
- Comparative biology of ageing:
  - ↳ ageing rates vary greatly btw even closely related species => evolve rapidly.
    - ↳ ex: human lifespan 2x longer than higher primates.
      - ↳ some species age very slowly / not at all => ex: Pinus longaeva (~5000yrs), Turritopsis dohrnii (not ageing)
- Single genes mutations => influence ageing rate!
  - ↳ can extend lifespan => ex. C. elegans age-1 PI-3 kinase mutants can live up to 10x longer than WT
  - ↳ Ayyadevara et al. 2009
- Geriatrics = late-life health
  - ↳ need to integrate fragmented study of diseases of ageing into unified discipline!
- Conclusion:
  - ↳ ageing is plastic
    - ↳ appears to be a central aetiologies of senescence
    - ↳ potential targets for anti-ageing therapies
  - ↳ seek unified understanding of drivers of ageing
  - ↳ bring together fields of geriatric medicine + biogerontology => BIG GERIATRICS!
- What does 'ageing' mean?
  - ↳ several meanings => chronological ageing (the passing of time) => senescence (deteriorative change)
    - => age changes (only time dependent changes)