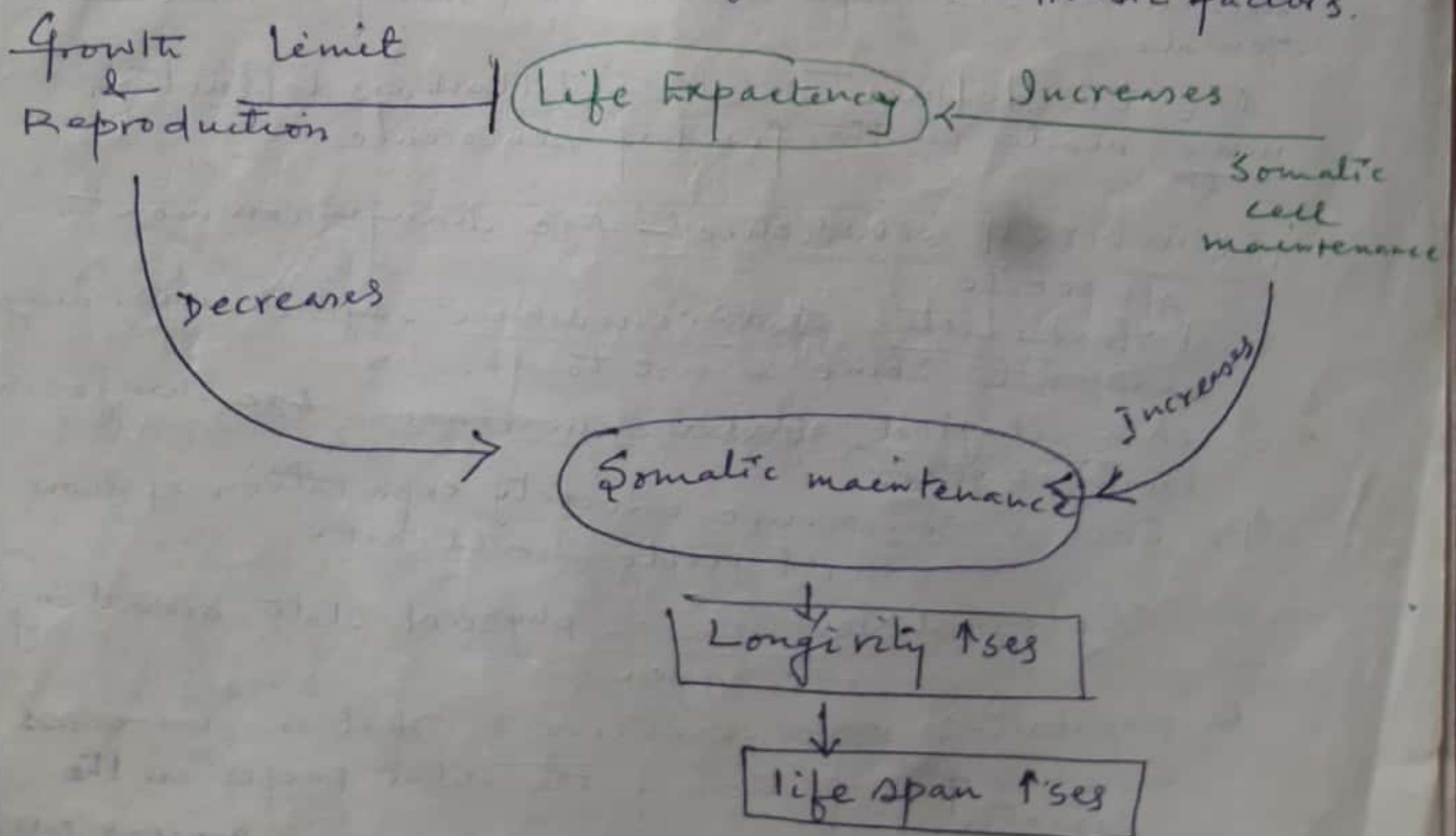


④ // Ageing changes :-

- ① Structural & physical impairment of skin.
- ② Increased susceptibility to infection & hypothermia.
- ③ Cancer of several types.
- ④ Delayed wound & fracture healing.
- ⑤ Increased adverse reaction to drugs.
- ⑥ Reduced absorption of nutrients.
- ⑦ Senile dementia & Alzheimer's type.
- ⑧ Parkinsonism.
- ⑨ Gout syndrome.
- ⑩ Disruption of pattern of sleep, wake cycle.
- ⑪ chronic renal failure & urinary incontinence.
- ⑫ Cardiovascular (cerebrovascular) disease.
- ⑬ ↓se in cognitive behaviour functions.
- ⑭ Decline in ability to learning the number.

Mechanism of Senescence (Ageing)

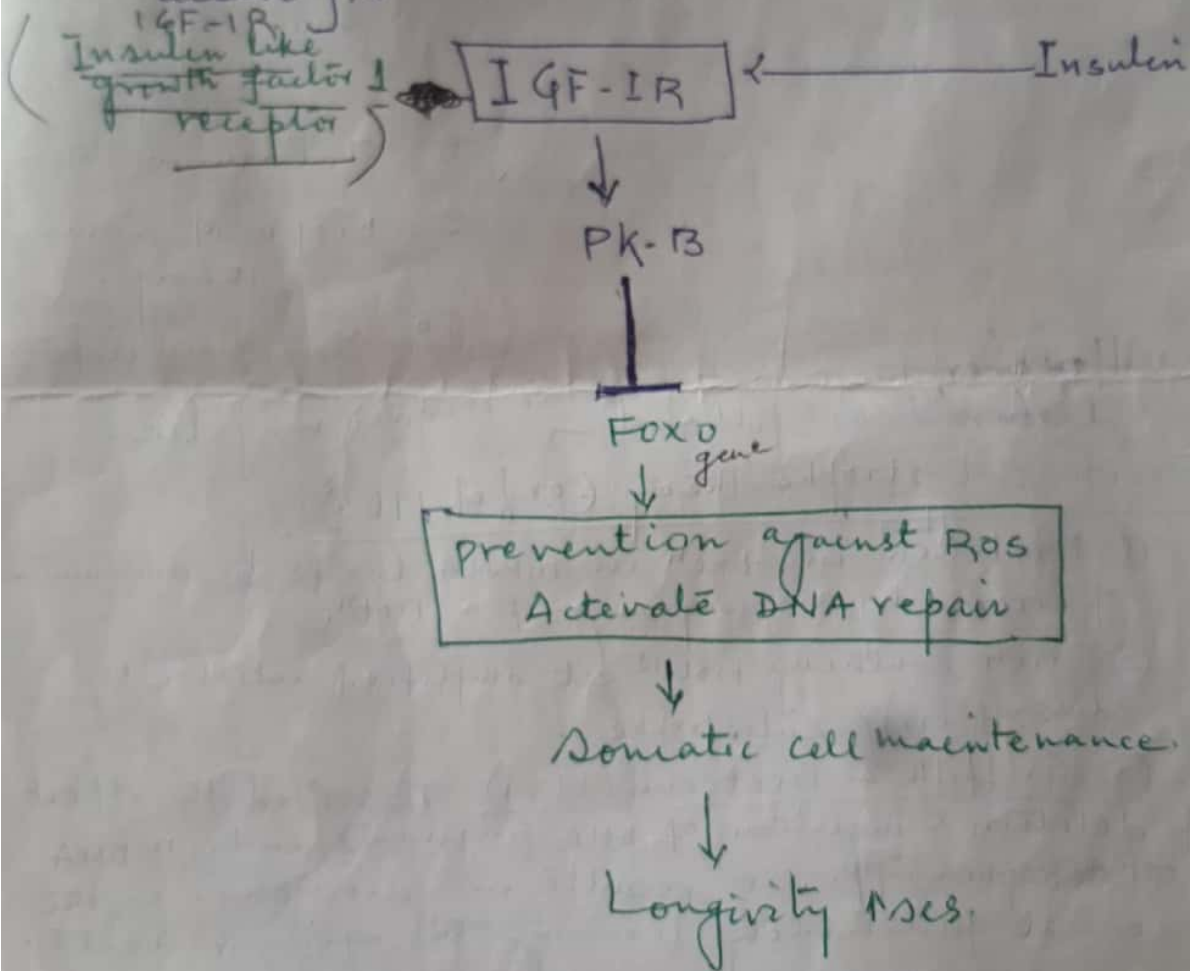
Ageing / Senescence is energy dependent developmental process controlled by environmental factor interaction with genes and intrinsic factors.



There is trade off of energy between maintenance and reproduction. If maintenance energy increased DNA damaged and somatic cell damage prevented, so which uses longevity.

Ex: - In progeria (accelerated pace of aging) DNA repairs genes are mutated. In Hutchinson Gilford progeria, dominant gene mutation occur in gene producing Lamin-A Protein.

→ ↑ caloric diet intake ↑ insulin signaling which repress maintenance gene activity.



Theories of Senescence (Ageing)

Many researchers have proposed hypothesis or theory to explain the mechanism of ageing. Most theory can be grouped into two categories: -

⑥

Theories of Senescence (Ageing)

[A] Programmed theories

1. Endocrine theory
2. Programmed Senescence theory.
3. Immunological theory.
4. Genetic clock theory.

[B] Damage or, errors theories

1. Living theory
2. cross linking theory
3. Wear & Tear theory
4. Somatic mutation theory
5. Error catastrophe theory.
6. Free radical theory.
7. Gene regulation theory.
- ✓ 8. Telomere theory
9. Disposal some theory.
10. Mitochondrial

However, the most popular theories may be discussed as follows: -

✓ Error catastrophe theory: (Orgel, 1963).

- ① Mistaken ^{this} in trans in mRNA leads to accumulation of errors in a.a sequence of a protⁿ.
- ② Error containing prot^{ns} get amplified until cell dies off error catastrophe.
- ③ Griffith & Bestrend (1984) - observed the effect of deletion & insertion of DNA fragments into mtDNA of *Xenospora* spp. It results in disruption in the normal functioning leading to ageing & death.

Free radical theory: - (Hoffman, 1983)

- ① ↑ in production of highly reactive free radicals in mitochondria/cell.
- ② Free radicals are most reacting compds or, atoms or, molecules bearing lone pair electrons.
- ③ They are constantly produced as a byproduct during mitochondrial oxidation-reduction reaction.
- ④ In normal healthy young cells, these free radicals are metabolised by protective enzyme such as super-oxide dismutase (SOD) & Catalase.

with advancing error there is ↓ the activity activating the protective enzyme, which results in interaction of free radicals with various macromolecules such as DNA, RNA & Protein.

Such causes irreparable damage of cellular structure & functions. The end result is cellular ageing & death.

Gene Regulation theory (M.S. Kanungo, 1970-1980)

Proposed by M.S. Kanungo during 1970-1980.

Developmental and reproductive phases are regulated by certain sets of gene which function in sequential manner & co-operatively continues reproduction in fact produces sudden factors which are essentially produces sudden results a total successive decline comes in:-

In summary, life may be divided into 3 phases namely:-
① Development ② Reproduction ③ Senescence

Every phase is under direct regulation of separate set of gene.

The overall product & effect of development phase leads to reproductive phase which finally results in ageing

Telomere theory (Shortening of telomere theory):-

Telomeres are repeats of hexanucleotide sequence at the tip of chromosomes.

They are not replicated with the rest of chromosomes.

In human, Herley's et al. (1990) found that fibroblast in culture suffer from telomere shortening with every cell division.

Blackburn, Greider & Szostak - who won the Nobel Prize in 2009 reported that —

"Every replication (duplication) of chromosome reduces the telomere"
↑sing loss of structural and functional integrity of chromosomes which ultimately leads to ageing of the cell or tissue.

