

Werner syndrome

- Premature ageing and premature cell senescence
 - Werner fibroblasts undergo only about 20 population doublings in culture (normal = about 60)
 - Mutations in the Werner gene, RECQL2, a DNA helicase, lead to accelerated telomere shortening

Cell immortality (cells don't senesce)

- Naturally immortal cells
- Immortalisation

The germ line

- Normal germ cells express telomerase so they maintain full-length telomeres
 - Therefore germ line is naturally immortal - can divide forever



Any other normal cells immortal?

Embryonic stem cells (ES cells)

- ES cells also have telomerase activity – they are naturally immortal too
 - They can be considered germ-line cells, since they can form all cell types including gametes
- Mouse ES cells can form teratocarcinomas (malignant cancers containing a variety of tissue types), if transplanted under the adult kidney capsule
- ES cells are the only normal diploid cell type known to be able to form a growing tumour just by transplantation
 - This may be because – although normal and diploid – they are already immortal