



SNS COLLEGE OF ALLIED HEALTH SCIENCES
SNS Kalvi Nagar, Coimbatore-35
Affiliated to The Dr.M.G.R Medical University, Chennai



**DEPARTMENT OF RADIOGRAPHY AND IMAGING
TECHNOLOGY I YEAR**

COURSE NAME : GENERAL PHYSICS

**TOPIC : PRINCIPLES OF RADIATION PROTECTION AND
REGULATIONS**



Radiation Risk



- **Risk** is the probability of an individual experiencing harmful effects due to radiation exposure.
- The **Linear No-Threshold (LNT)** Model is used to estimate radiation risk, assuming even small doses have potential effects.

Somatic Risk (Cancer Induction) - Affects the exposed individual during their lifetime.

- Most sensitive organs: Bone marrow, colon, lung, stomach.
- Moderately sensitive: Bladder, breast, liver, esophagus, thyroid.
- Higher risk in children & women (e.g., radiation-induced thyroid cancer).
- Latent period: 5–10 years.
- ICRP cancer risk estimate:
- General population: 5% per Sv.
- Radiation workers: 4% per Sv.



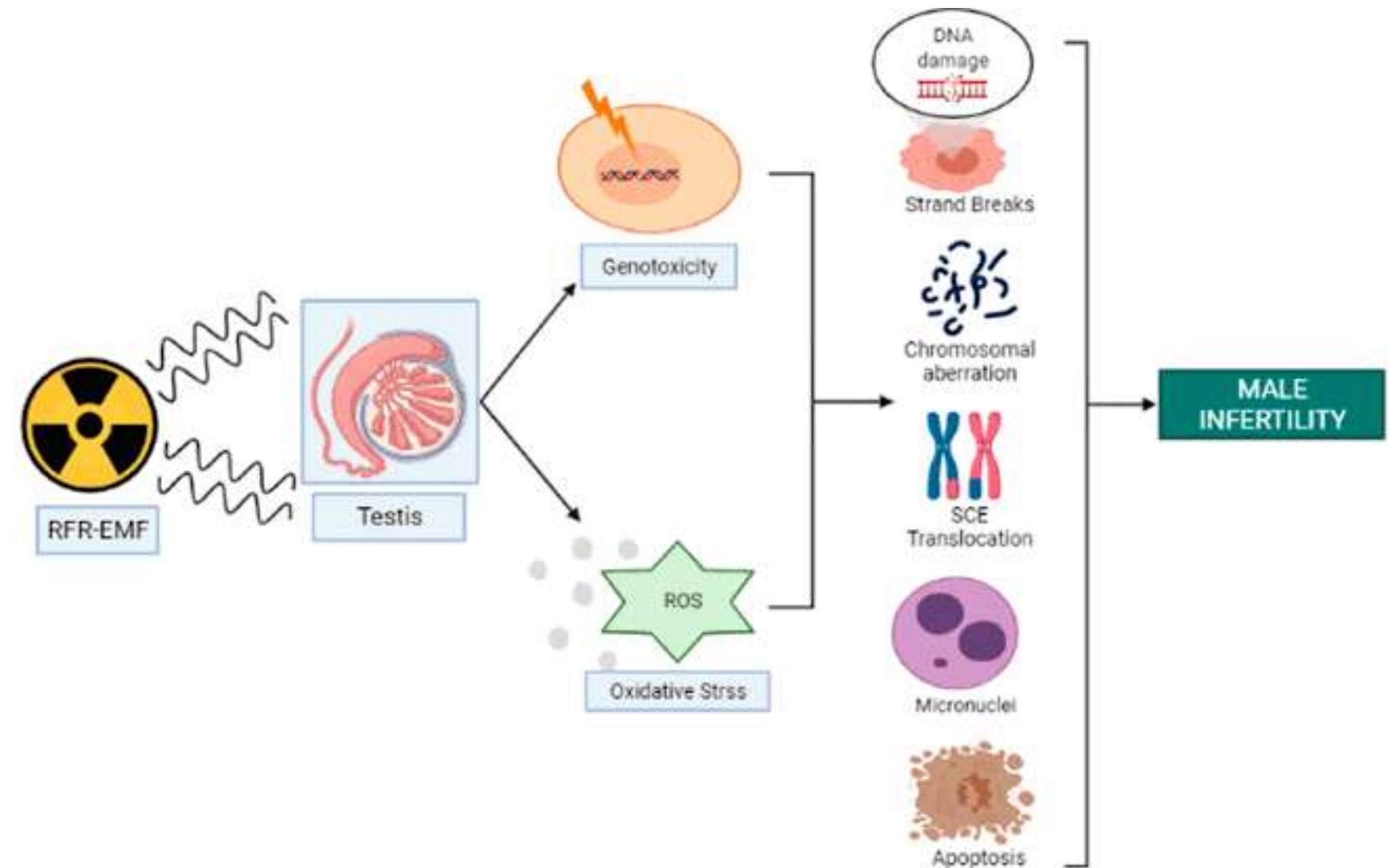
Radiation Risk

Genetic Risk - Affects future generations through gonadal exposure.

- Caused by chromosome mutations

(though no direct human evidence, based on animal studies).

- Risk decreases with age.
- ICRP hereditary risk estimate:
- General population: 0.1% per Sv.
- Radiation workers: 0.8% per Sv.





Radiation Risk

Fetal Risk (Pregnancy & Radiation Exposure)

Depends on **gestation** stage:

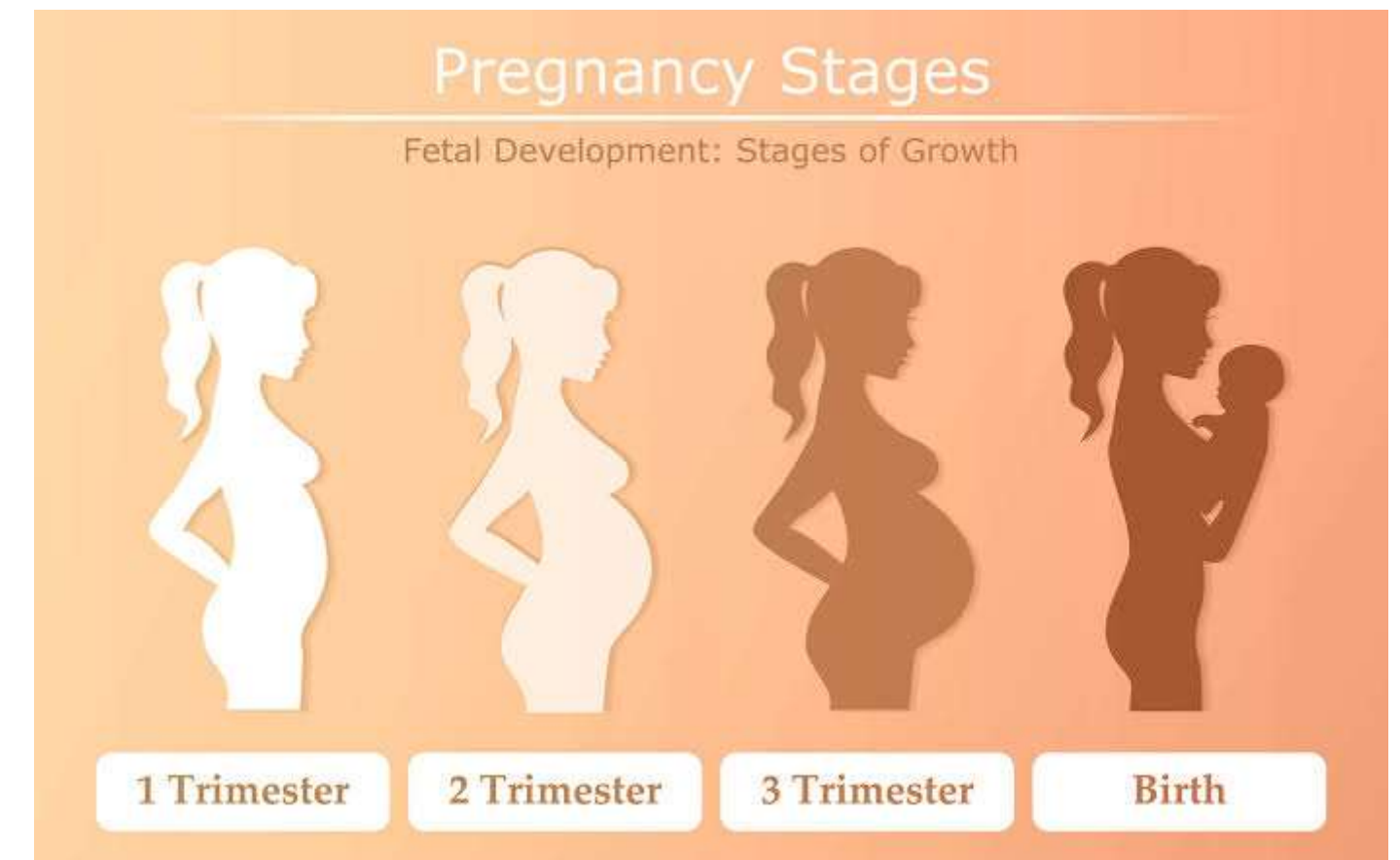
1. **Preimplantation (0-10 days)** → High-dose exposure may cause early death.
2. **Organogenesis (20-40 days)** → Congenital abnormalities risk.
3. **Fetal period (50-150 days)** → Microcephaly, growth & mental retardation.
4. **After 150 days** → Higher risk of childhood malignancies (e.g., leukemia).

Dose effects:

<10 mGy → Negligible risk.

>100 mGy → Increased risk of malformations; abortion may be considered.

Third trimester X-ray exposure → 40% increase in childhood cancer risk at 10 mGy..





Radiation Risk

Comparison with Other Industries

Radiation industry fatal accident rate: $<0.3 \times 10^4$, making it as safe as trade & manufacturing.

Higher-risk industries: Mining, agriculture, and transport.

