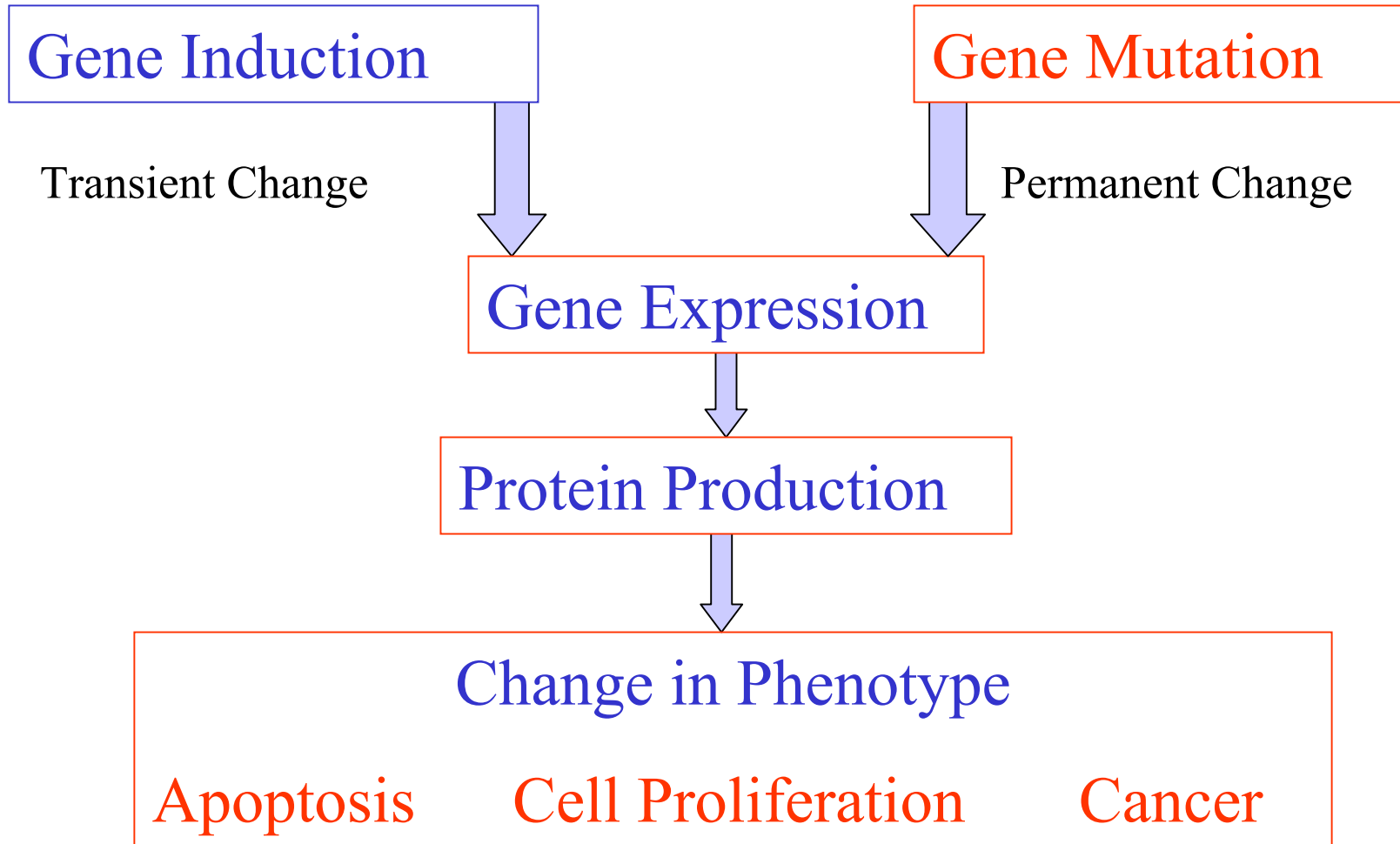
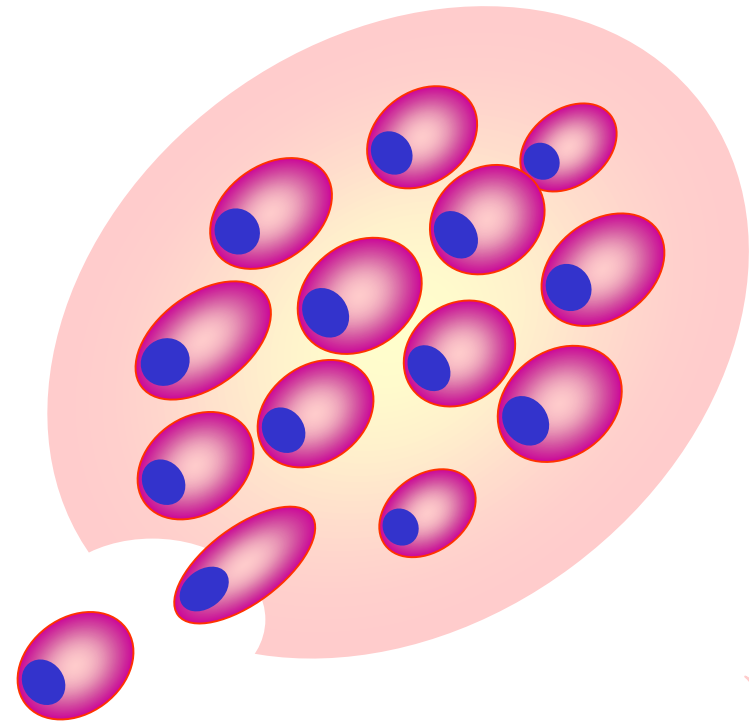


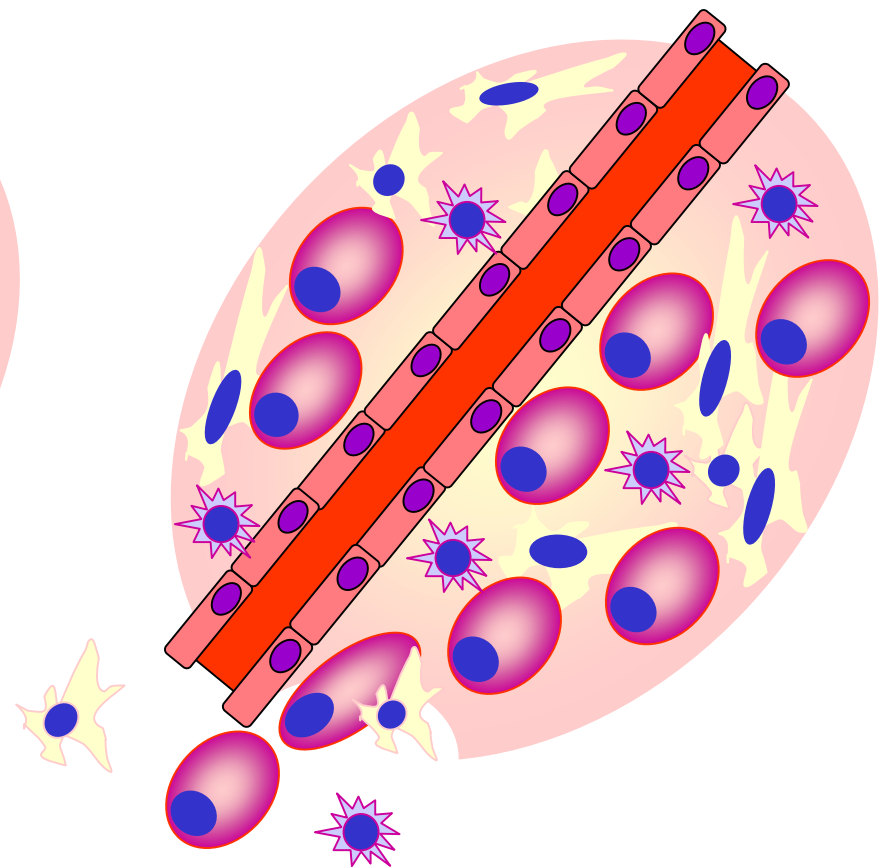
# Mutation vs. Gene Induction



## The Reductionist View



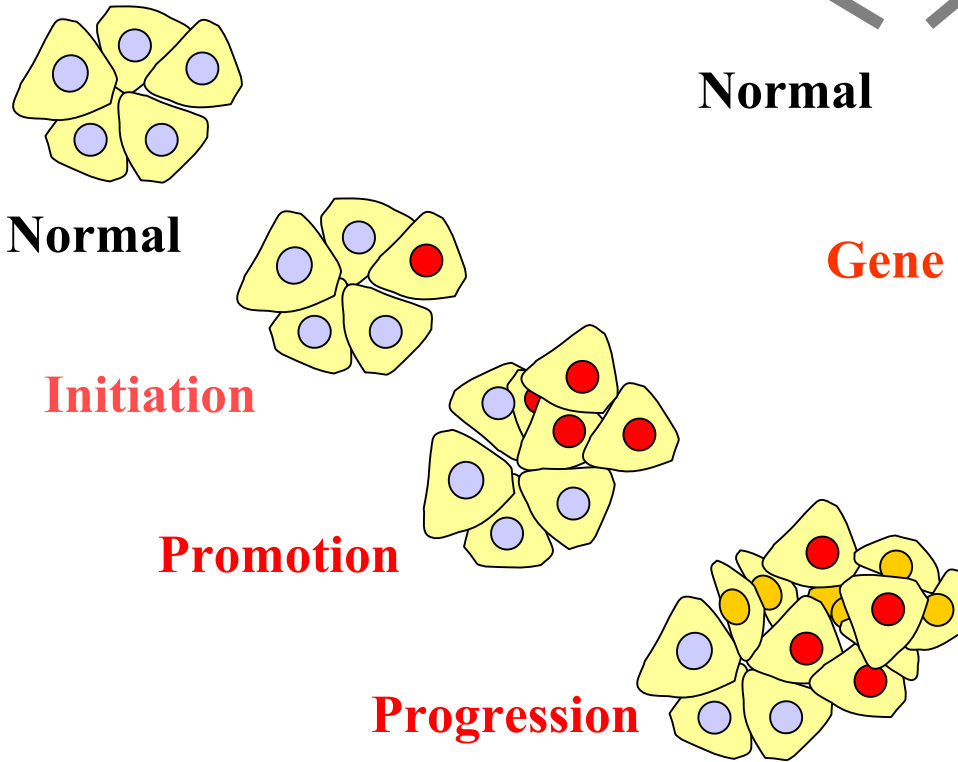
## A Heterotypic Cell Biology



# Gene Mutation and Expression in Cancer

## Mutation Theory

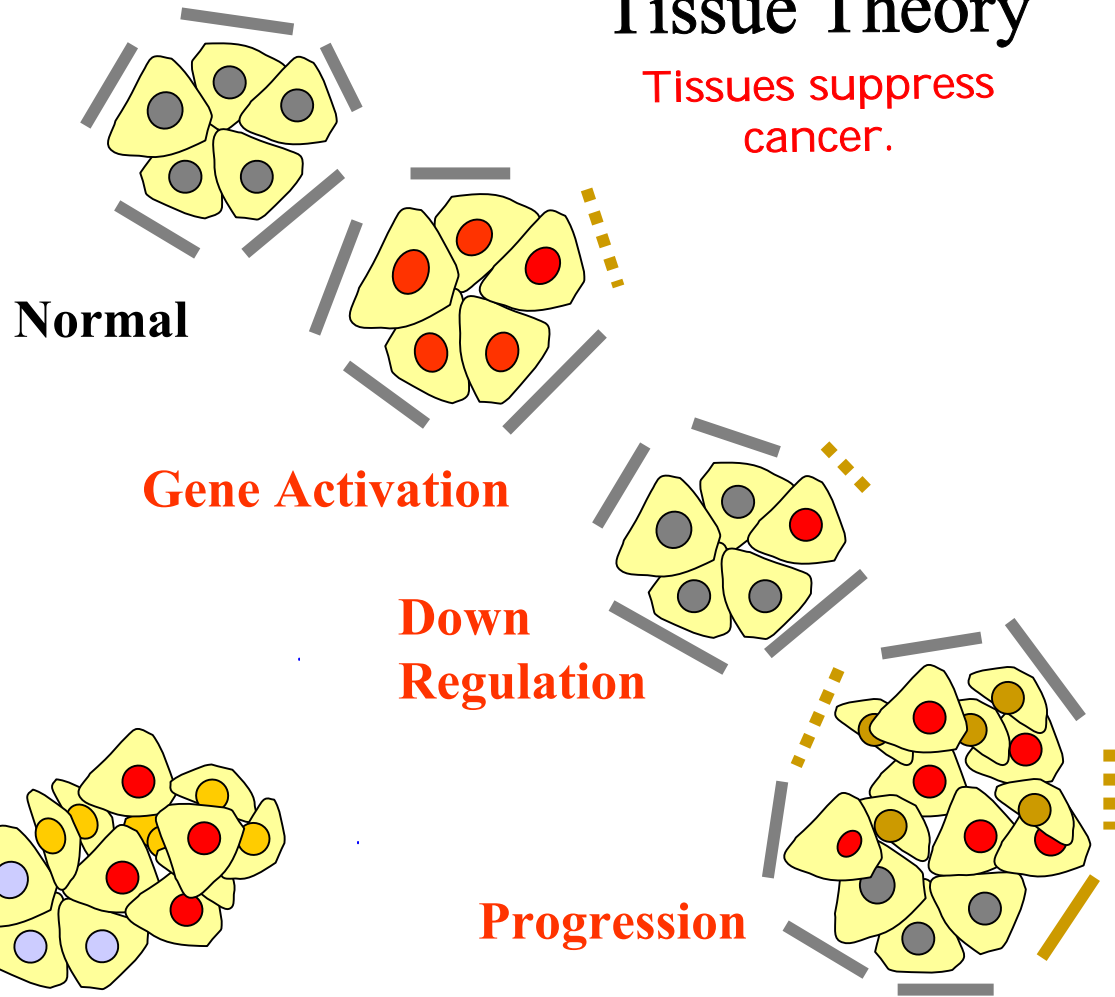
Single cell origin of cancer



Gene Mutation- a rare event

## Tissue Theory

Tissues suppress cancer.



Gene Expression- a common event

# Summary of New Paradigms



- Adaptive paradigm instead of a linear theory
- Bystander paradigm instead of hit theory
- Gene expression paradigm instead of mutation theory
- Tissue paradigm instead of single cell cancer induction theory

# Summary



- **Radiation risks from low levels of radiation exposure cannot be predicted with epidemiological studies.**
- **Combining advances in technology with those in cell and molecular biology make it possible to detect biological changes after low levels of radiation exposure.**
- **These low level changes have required changes in basic radiation paradigms.**
- **Understanding the role of these biological changes in cancer risk may or may not impact radiation protection standards, but will help ensure that the standards are both adequate and appropriate.**