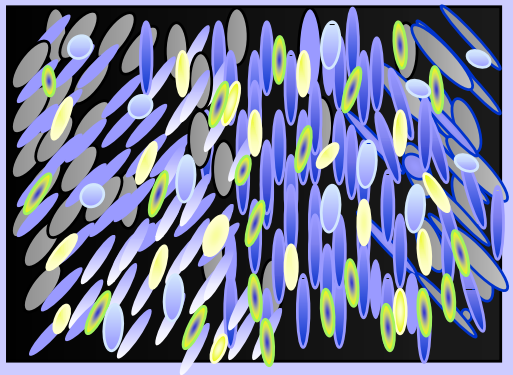
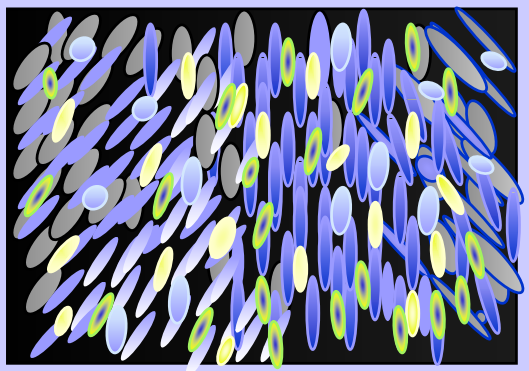
Cell/Cell Communication (Bystander Effect)

High Dose (10 cGy)

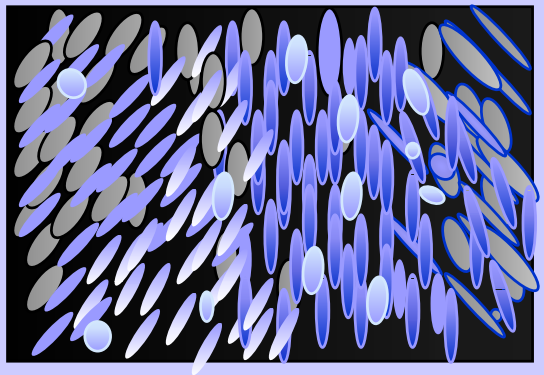


Field 1- Up-regulation

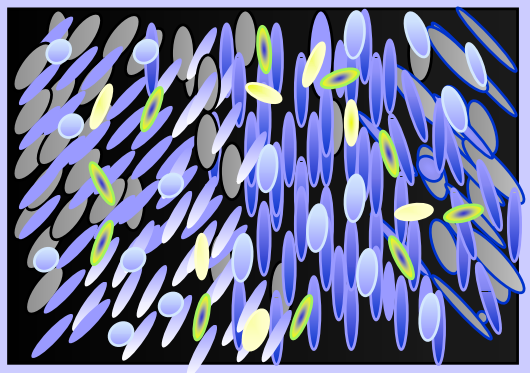


Field 2- Up-regulation

Low Dose (0.3 cGy)



Field 1 - No effect



Field 2 - Bystander Up-regulation

Azzam et al. 1998

How Does Radiation Interact with Cells?

Past

Hit theory

- Direct ionization
- Free radical formation

Present

Bystander effects

- Cell-cell communication
- Cell-matrix communication

Characteristics of Gene Mutation by Radiation

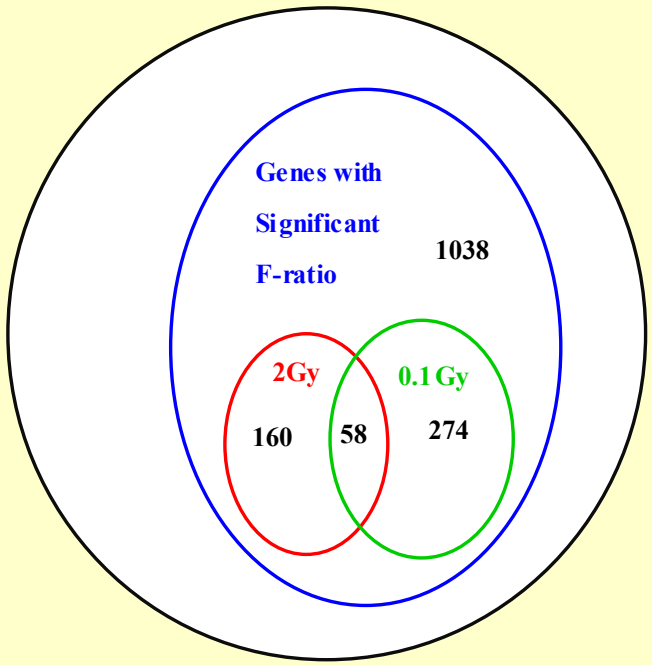
- Spectrum of rare events
- Random genes mutate
- Permanent change
- Produced in single cells Bystander effects?
- Independent of microenvironment
- Demonstrated in cancers

Characteristics of Gene Induction by Radiation

- Frequent event
- Targeted genes change expression
- In most cases it is a transient change
- Produced at the tissue and organ level
- Influenced by microenvironment
- Role in cancer induction and cell transformation?

DIFFERENCES IN TRANSCRIPTION PROFILES BETWEEN LOW AND HIGH DSE IRRADIATION IN HUMAN LYMPHOBLASTOID CELLS

HLB Cell Line



Total g ene set contains over 12,000 genes

Numbers of Genes Differentially Regulated in HLB Cells after IR

Up-regulated at 2Gy	71
Down-regulated at 2Gy	147
Up-regulated at 0.1Gy	191
Down-regulated at 0.1Gy	141