

Hormesis, Knowledge and Belief in Science

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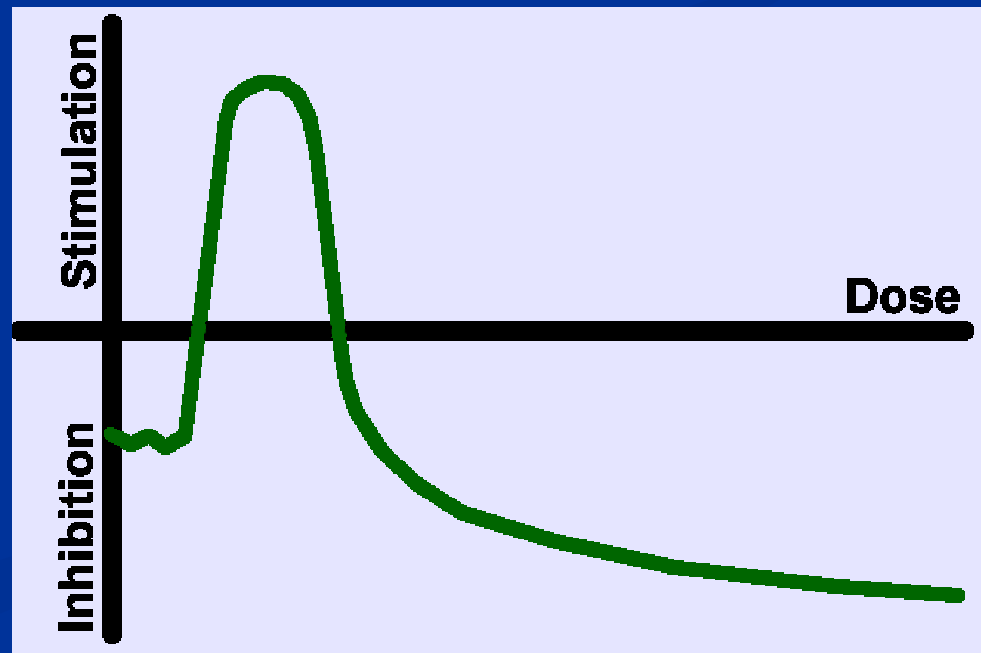


Don Quixote



Hormesis

- “In toxicology, hormesis is a dose response phenomenon characterized by a low dose stimulation, high dose inhibition, resulting in either a J-shaped or an inverted U-shaped dose response. A pollutant or toxin showing hormesis thus has the opposite effect in small doses than in large doses.”



Knowledge

- Knowledge is the awareness and understanding of facts, truths or information gained in the form of experience or learning (a posteriori) or through introspection (a priori).
- Knowledge is an appreciation of the possession of interconnected details, which, in isolation, are of lesser value.

Belief

- An unproven assertion based on one or more fundamental assumptions. The assertion may be unprovable.

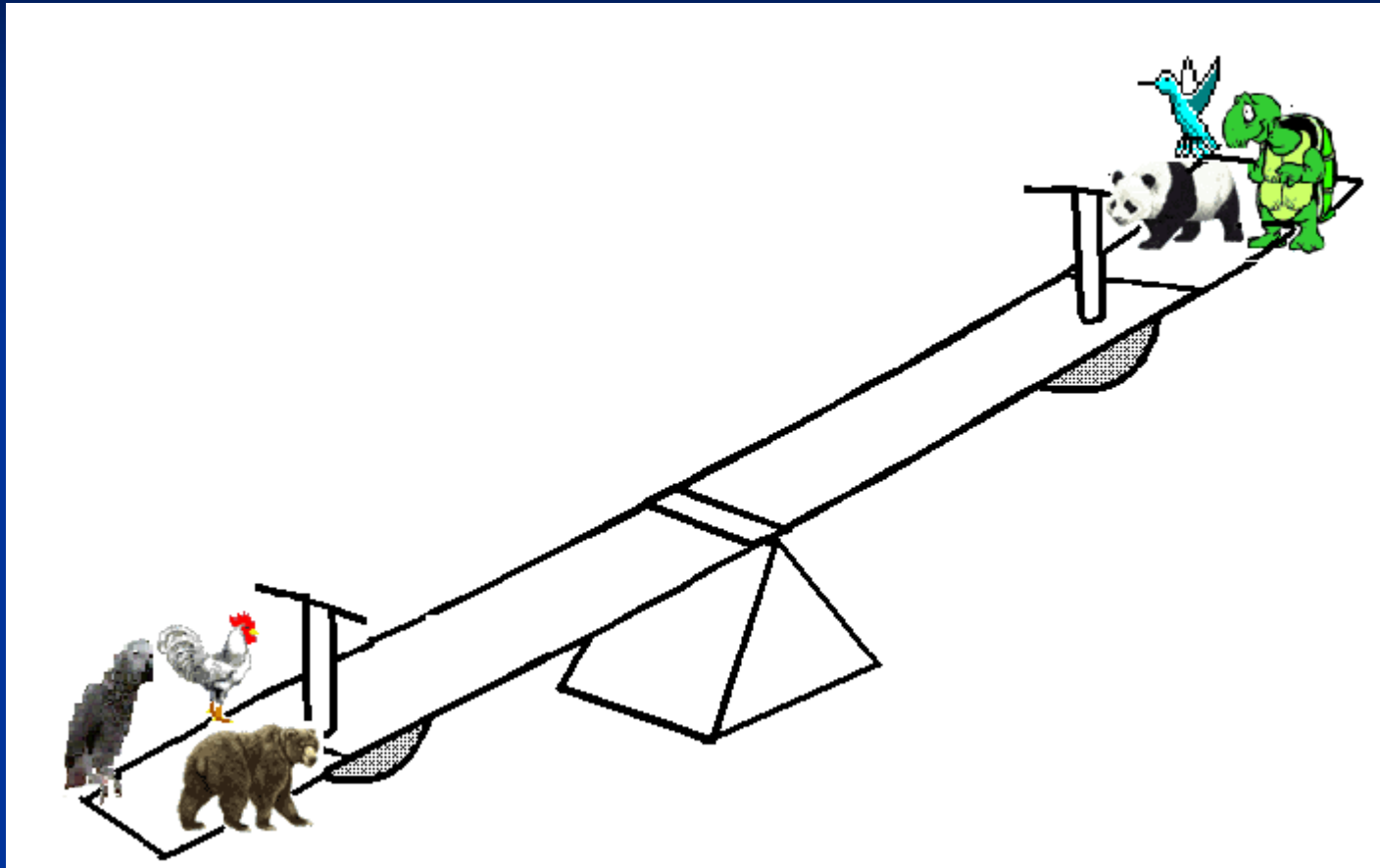
Belief (Kant)

- Is the form of judging something to be true, intermediate between mere opinion and certain knowledge.
- Belief is “a ground that is objectively insufficient but subjectively sufficient.”

Hormesis, as it is
counterintuitive, confuses
the boundary between
knowledge and belief.







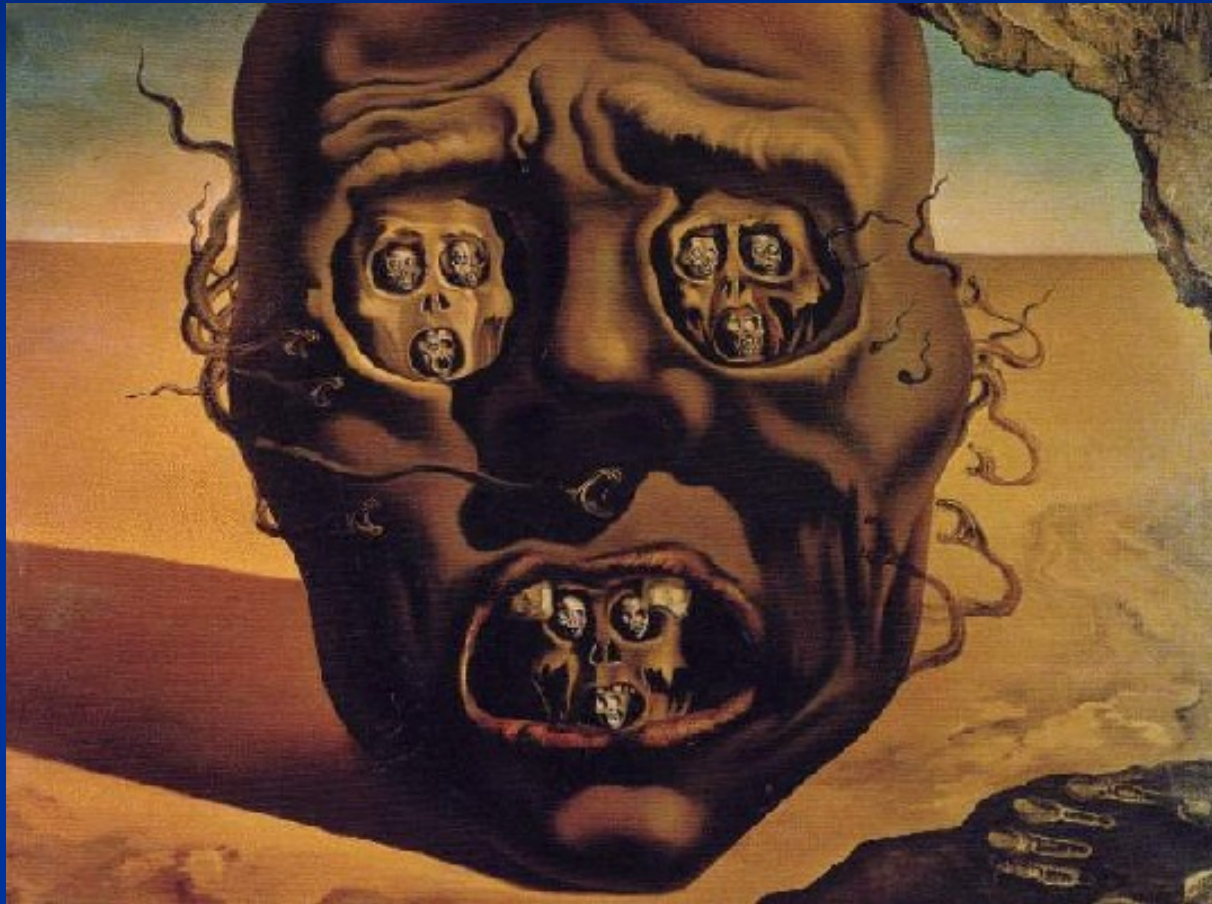
Policy or Politics?

- Non carcinogens- threshold model
- Carcinogens- linear no threshold model

Role of the Hyperstate



Salvador Dali



Role of Fear in Public Policy

- Use of fear to stifle debate
- Can a hidden policy be debated?
- How bad would a dirty bomb be?

Fear and Faith are closely
linked; the role of Faith is
to protect us from our
worst fears.

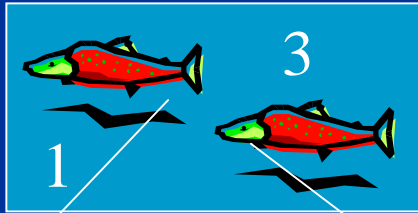
Hormesis reduces the fear of radiation. If radiation is no longer feared, government policy gets more closely questioned.

Fish data

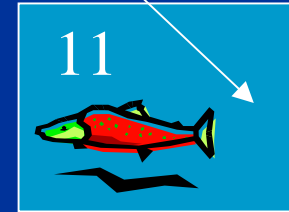
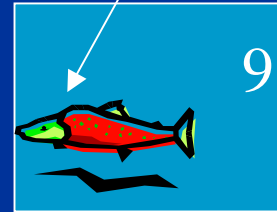
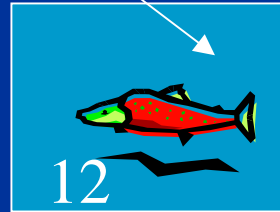
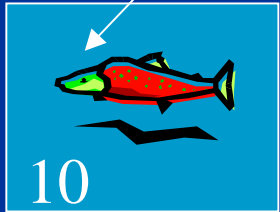
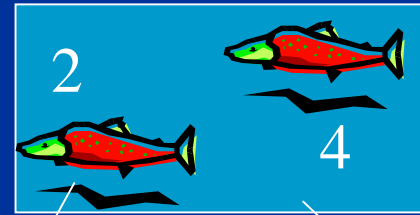
Truly truly in vivo bystander effects!!!!

Fish Water Experiment

Irradiated

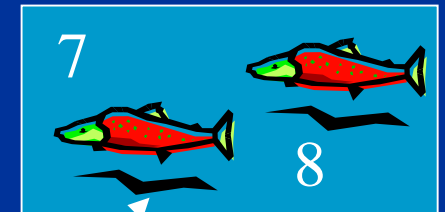
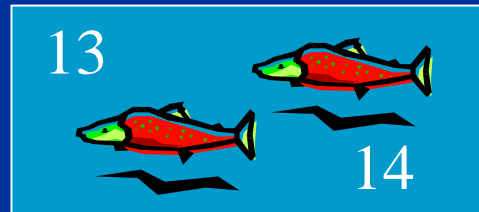
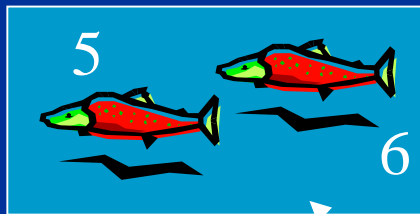


Sham



Buddy tanks

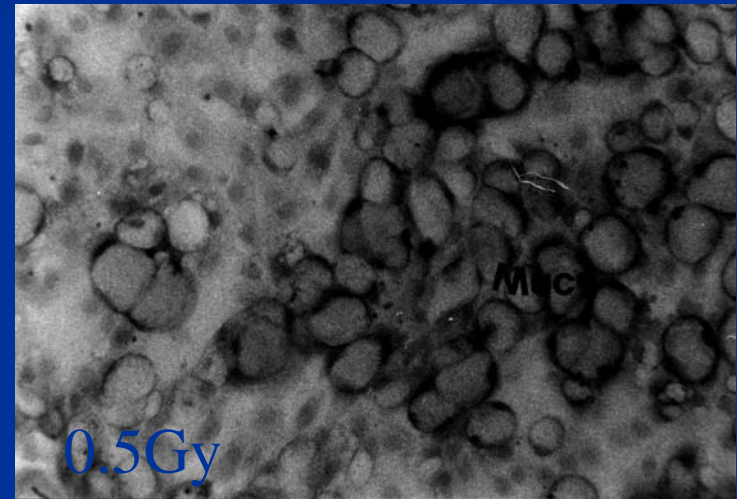
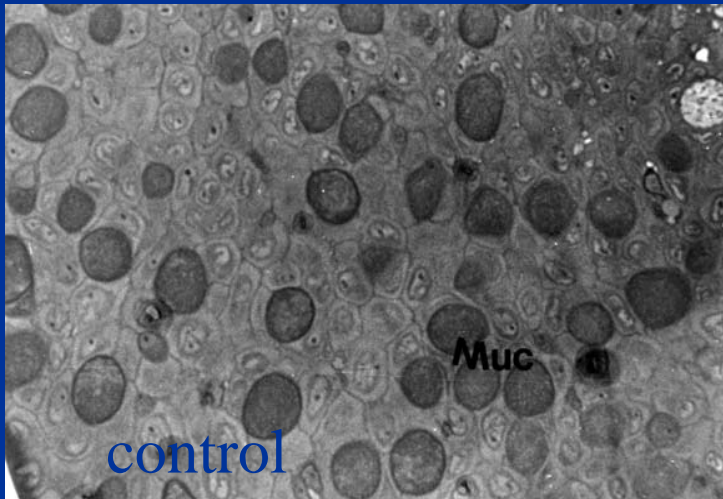
Buddy tanks



Control tank

Fish in water from buddy tanks

Rainbow trout in vivo irradiated skin
Response of “buddy” skin cells

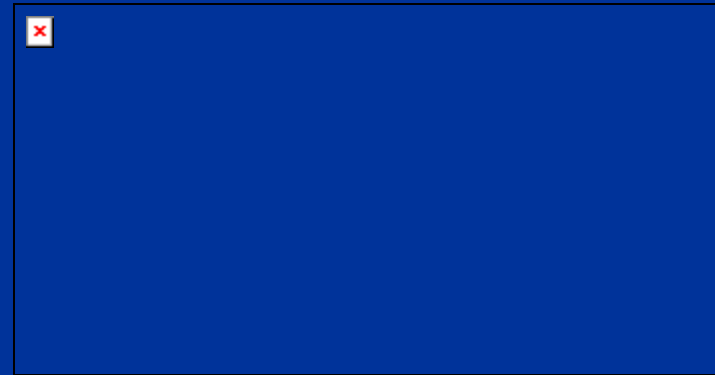


Fish Water Bystander Experiment using reporter technique

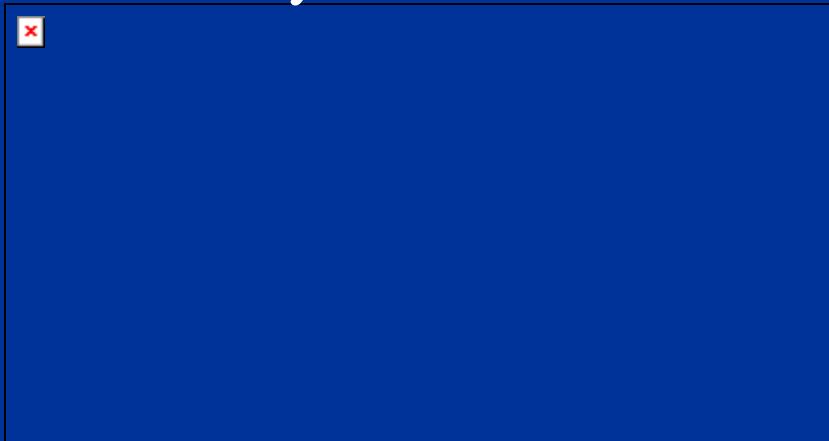
Fin



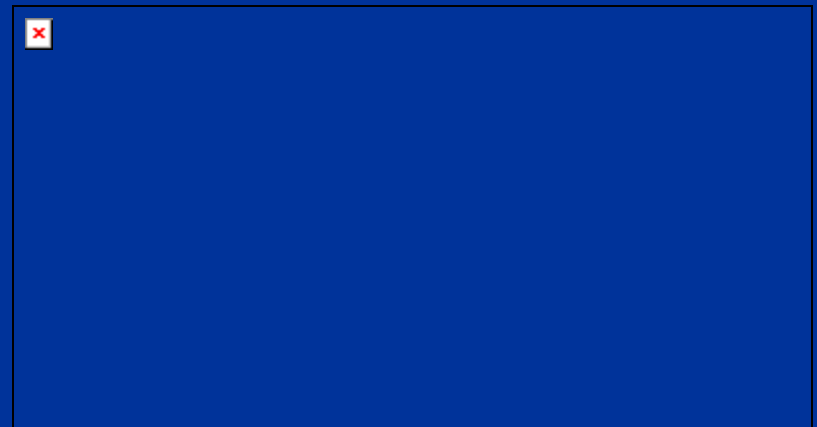
Gill



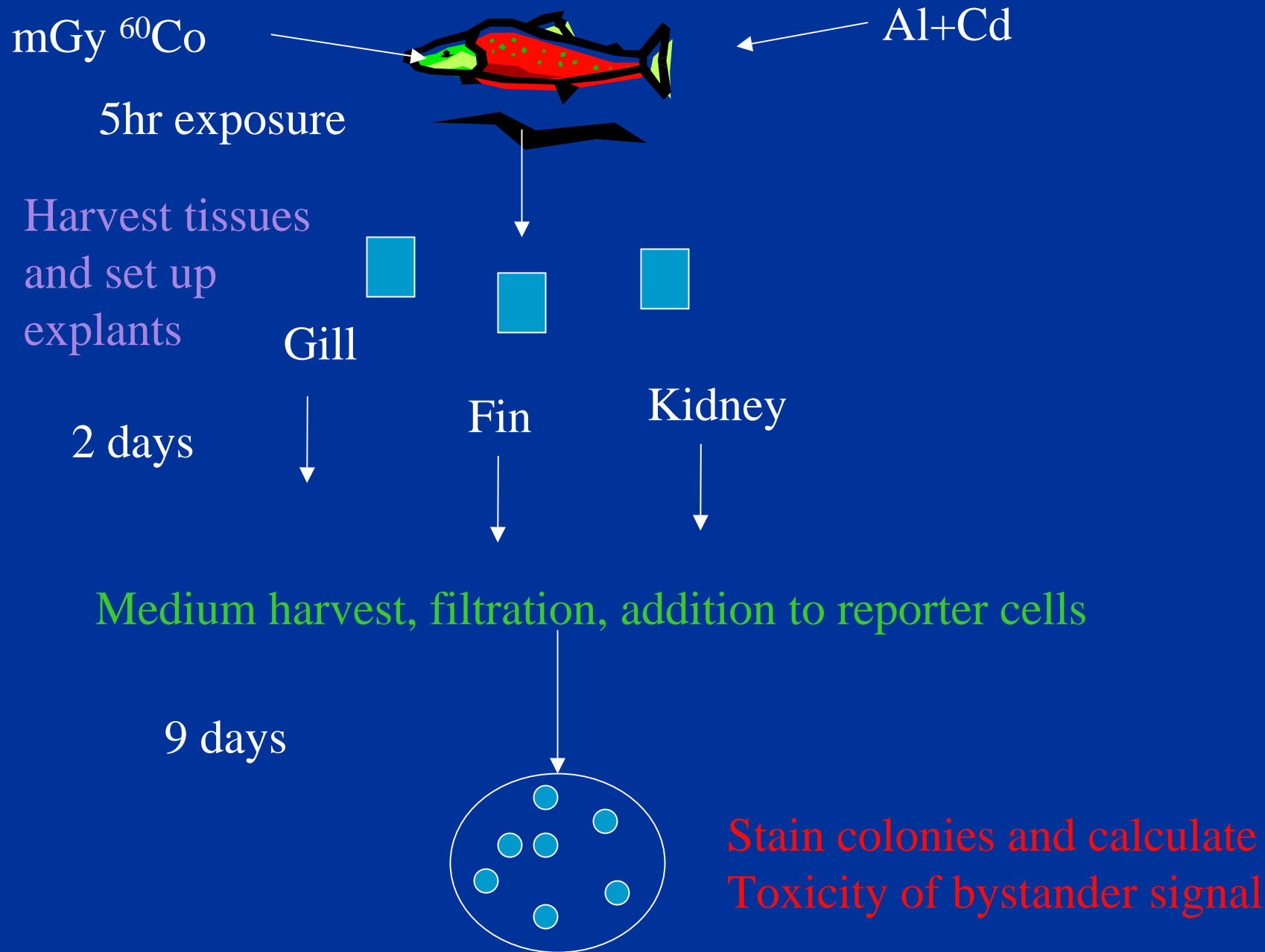
Kidney



Epidermis



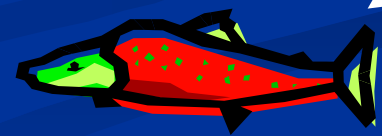
Design of multiple stressor in vivo experiments



Comparison of in vivo mGy
radiation exposure±metals
on production of bystander
signals

^{60}Co

Al+Cd



Summary thoughts on hormesis

- Government policy encourages fear of radiation
- Information is lost because of biases of reviewers
- There is an inertia within any system to maintain the status quo
- Rather than accepting new ideas de novo, there is always an attempt to link them to existing belief frameworks
- Hormesis and the precautionary principle are difficult to reconcile
- We only see what we expect to see