

Radiation Protection at Low Doses – The Time for Change

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45th ARPS Conference

7-10 March 2022

Canberra ACT



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ICRP Review

- > “critical review of recent scientific results on the shape of dose–risk relationships and the influence of dose rate is being performed”
- > “this is needed to ensure that LNT is the most appropriate evidence-based assumption”
- > “the associated risk for stochastic health effects is uncertain, and becomes increasingly uncertain as the dose decreases.”

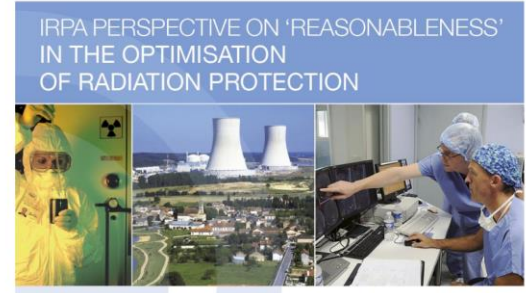
C Clement *et al* 2021 *J. Radiol. Prot.* **41** 1390

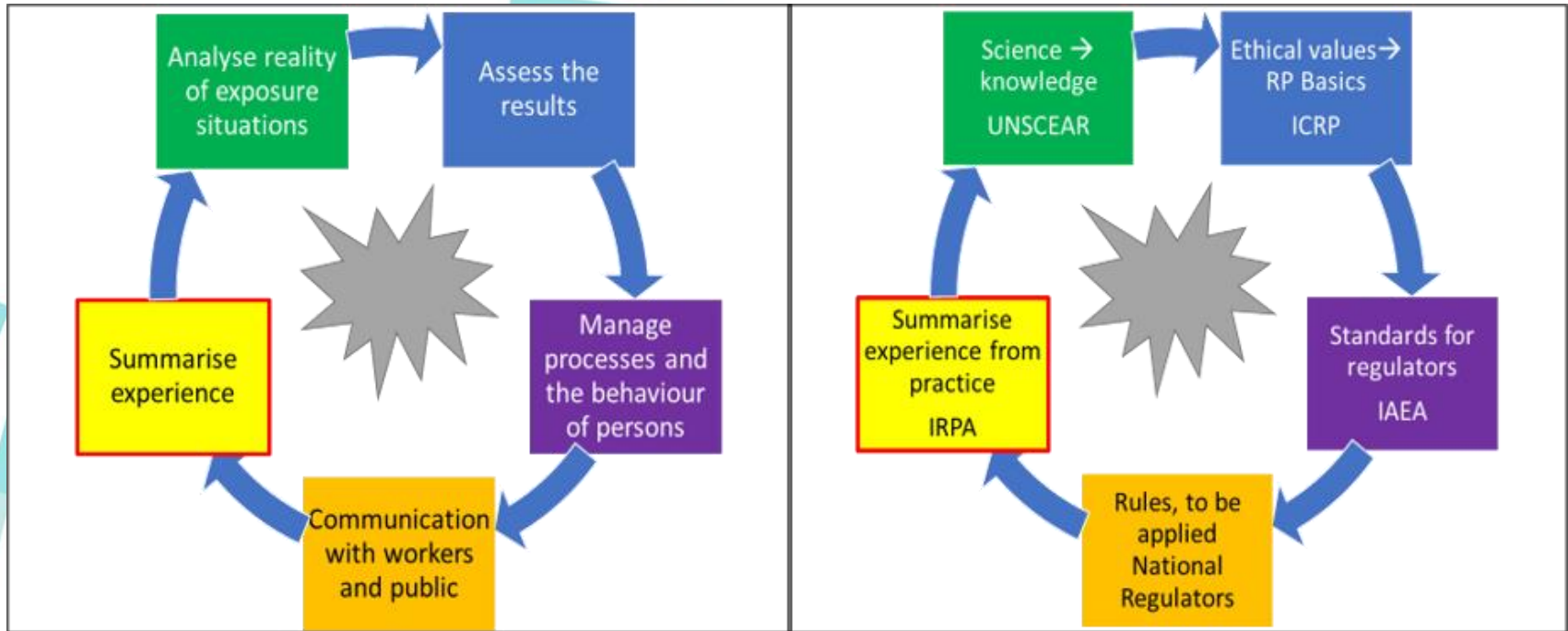
ARPS feedback on ICRP Review

- > Aim for simplification rather than increased complexity.
- > Be careful about a single framework
- > Practical regulation and management of radiation risk at low doses and ensuring that low risks are not over regulated.
- > The practical difficulties with LNT and consideration of adopting a threshold.
- > Radiation risk perceptions, ethics and communications.
- > The risks and ethical aspects of over conservatism when considering radiation impacts.

IRPA Position on Reasonableness

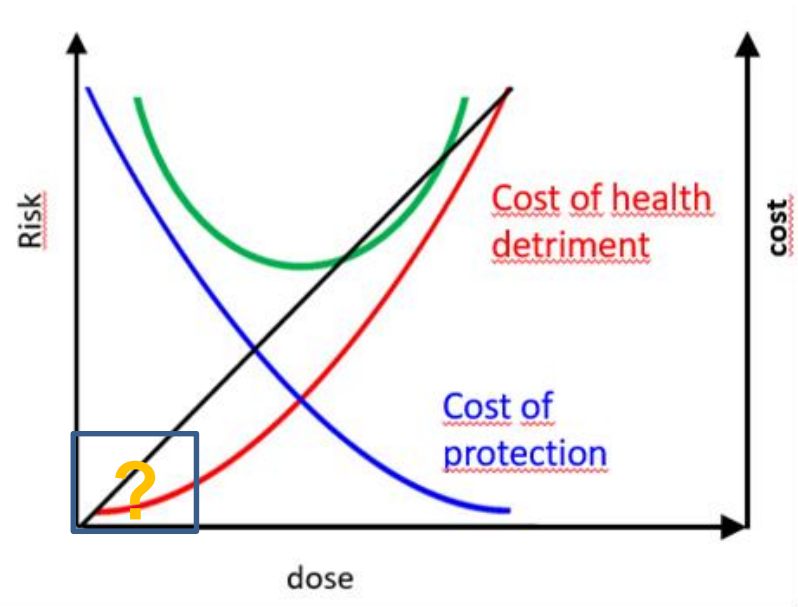
- > Principal Underpinning Factors for 'Reasonableness'
- > Judgement Call
- > Proportionality
- > Stakeholder Engagement
- > Holistic 'All Hazards' Approach
- > Avoidance of Over-Conservatism
- > Value for Society – Optimal Use of Societal Resources
- > De Minimis Approach
- > Alignment with Radiation Safety Culture
- > Audit Trail





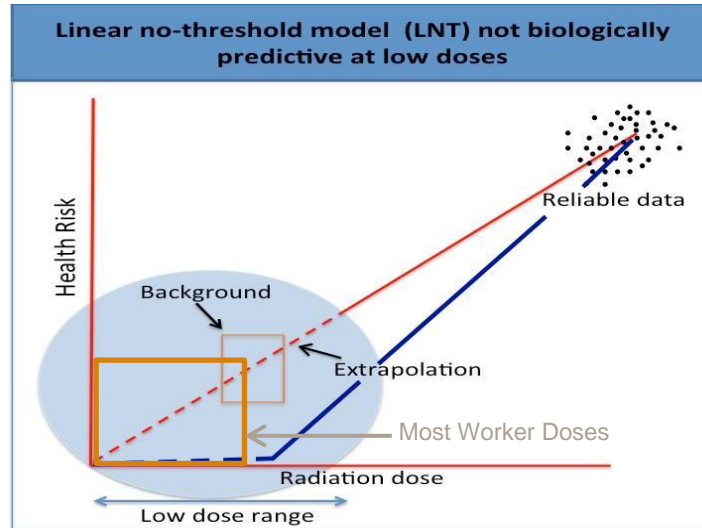
Challenging LNT

- > The risk model widely used by health agencies and regulators.
- > Considered to conservatively assume a direct relationship between tiny radiation exposures and cancer rates.
- > Creates tendencies that policy-makers will overrule cost benefit considerations forgetting the meaning of the "R" in ALARA and the social-economic aspects of this approach.



Challenging LNT

- > Mean doses for workers at the low end of the low dose range
- > Mean doses for the public and the environment almost zero
- > The smallest fraction of radiation exposure to general public is questioned most



The Low Dose Paradox

- > Failure to accurately portray current scientific knowledge about low-dose radiation exposure causes unnecessary confusion and fear.
- > Fear may cause people to not accept medical care that includes radiation use.
- > While the LNT concept is a convenient, pragmatic tool - its use must be explained correctly, so as not to cause greater fear among the public
- > Need an all hazards approach based on risk

NORM and Over-conservatism

- > The majority of doses from activities with NORM are comparable with the variations that exist in natural background doses.
- > Currently receives considerable attention
- > Significant societal resources have been directed to managing and, in many cases, eliminating the low doses from NORM
- > Could be more effective for broader safety and environmental improvements.
- > Decision making linked to LNT and over-conservatism
- > Simplified administrative controls (eg; 1Bq/g) become basis of decision making rather than risk
- > “Graded approach” advocated but rarely applied

Background Reading: Roger Coates 2022 *J. Radiol. Prot.* **42** 014001

Clearance Criteria

- > IAEA “Application of the Concepts of Exclusion, Exemption and Clearance SAFETY GUIDE No. RS-G-1.7”
 - A source or practice is exempt (and therefore not subject to regulatory control) is **10uSv/y**
 - Clearance criteria modelled on this criteria - considered to be a “trivial dose”
- > In practice, this is:
 - This equates to about 1nSv/h
 - 1% of natural background (we know that background can vary by orders of magnitude)
 - Impossible to measure!
- > Despite being unrealistically low, it becomes embedded as the basis of secondary “limits” such as contamination clearance levels.

Lead Aprons in Surgery

- > “Scrubbed” and “non-scrubbed” workforce
 - Surgeons, scrub nurse – high dose levels
- > Mandatory to wear lead aprons for all in the room
- > Mandatory to do personal monitoring
- > Nurse dose < 0.05 mSv/a (n~200)
- > Is the cost justified



Australian Drinking Water Guideline

- > Water screening for gross alpha/beta (0.35 mSv?)
- > Operational Dose – reduced from 0.5 to 0.3 mSv/a
 - Alignment to 1/3rd of the public dose limit
- > But water is going to be all or nothing
- > Groundwater is the only radiological concern
- > Other contaminants will dominate the health concerns
- > Reduced Operational dose level for...?

Conclusion

- > The use of LNT leads to zero dose approach
- > Any dose is unacceptable, “Every photon is sacred”
- > Blind adherence, to a working hypothesis
- > Consequences are not cost free
- > Low dose consumes resources without clear protection
- > Threshold not from a scientific, but practical POV
 - Where is the threshold?



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