Routine Internal Dosimetry Monitoring and Assessment:

The Practical Application of International Standards and Guidance

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Nuvia Ltd Approved Dosimetry Services

- **Providing dosimetry services since 1948**
- **Laboratories and offices based at**
  - Dounreay
  - Windscale
  - Harwell
  - Winfrith
- **Primary role to assess and record radiation doses to workers at various sites and projects**

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Objective of this presentation:-

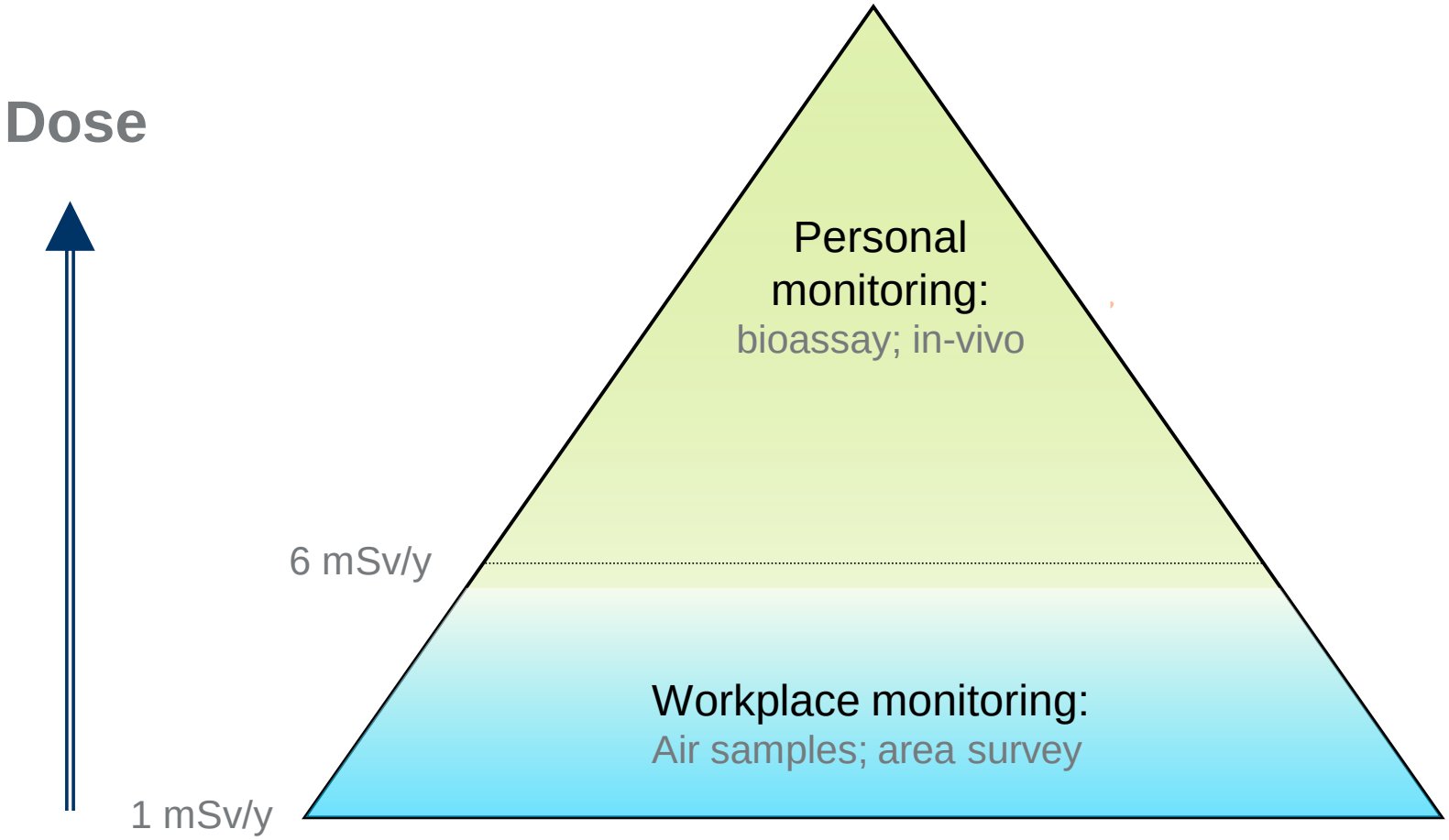
Published Standards and Guidance are useful tools, but need to be applied with care

Examples:

- ISO 20553: Radiation Protection - Monitoring of Workers Occupationally Exposed to a Risk of Internal Contamination with Radioactive Material

- "IDEAS": General Guidelines for the Estimation of Committed Effective Dose from Incorporation Monitoring Data

Monitoring Programmes (ISO:20553)



If expected dose is unknown where do you start?

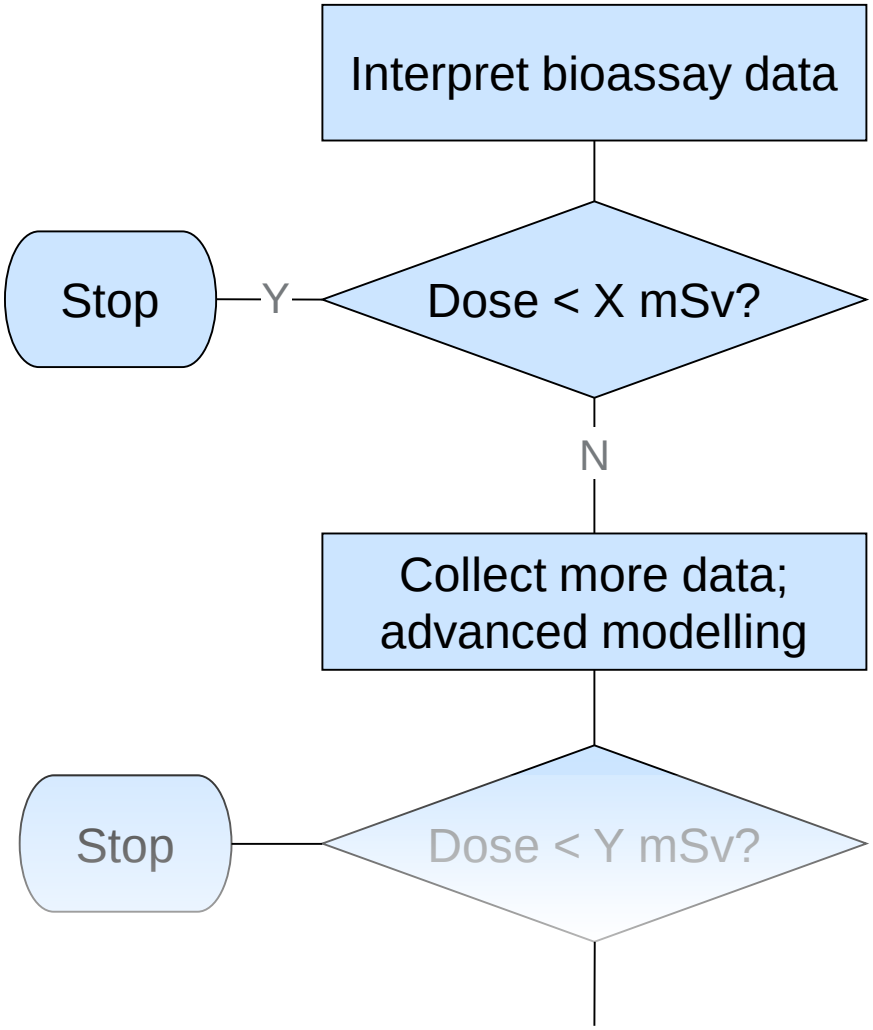
Is any routine monitoring needed at all?

e.g. prior risk assessment concludes expected dose < 1 mSv

Default Dosimetry Service advice:

- if work in controlled area then some monitoring required to validate the risk assessment
- however, this will be to ‘monitor’ the risk assessment, not the dose
- in which case the nature of the monitoring programme might be significantly different from a dosimetry monitoring programme

Dose assessment (IDEAS)



What is the effect of realistic measurement uncertainties?

Tested by theoretical study

What is the impact of measurement uncertainty?

Theoretical study

- assume acute intake equivalent to 1 mSv ^{239}Pu
- type M and type S intakes – all other modelling uncertainties fixed
- calculated urine excretion rates at 3 different times after intake: 45 days; 7 days; 1 day
- the excretion rates were ‘randomized’ by introducing realistic sampling and measurement uncertainty
- repeated ten times for each case
- results interpreted by use of IDEAS

Results: 1st Study
assumed that the correct lung type was used at start

1 mSv type M and type S ^{239}Pu at 45 days prior to urine sample

Case no	Estimated dose (mSv CED)	
	type M	type S
1	0.97	0
2	0.64	1.83
3	0.75	0
4	0.54	0
5	0.63	0.59
6	0.9	0.9
7	1.31	0.1
8	0.89	0.41
9	0.88	2.47
10	0.97	0

Results: 2nd Study
assumed that the *incorrect* lung type was used at start

1 mSv type M and type S ^{239}Pu at 45 days prior to urine sample

Case no	Estimated dose (mSv CED)	
	type M (initially type S)	type S (initially type M)
1	0.97	0
2	1.47	0.27
3	0.21	0
4	0.56	0
5	0.61	0.22
6	0.9	0.07
7	1.31	0
8	0.67	0.11
9	0.83	0.15
10	1.16	0

Conclusions form study

- IDEAS methodology works well for detecting ^{239}Pu acute exposures at 1 mSv if lung type is well known
- if lung type is uncertain then preferable to assume type S initially
- however; this might lead to the need for collecting more data and analysis to arrive at a reasonable solution:
- alternatively, consider other monitoring methods: e.g. faecal sampling

- Caveats:
- uncertainties in most model parameters not considered

SUMMARY

Published Standards and Guidance are useful tools, but need to be applied with care

Specific operational conditions will have significant impact on how such Standards and Guidance are 'best' applied in practice