Optimization and Robustness of Intervention Strategies

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Emergency exposure situation strategy (ICRP)

- Setting a reference level
  - generic (or specific to the scenario) in the preparation
  - effective dose between 20 and 100 mSv
- Division of the intervention into phases and zones (to facilitate the application of protective measures)
- Selection of intervention measures
  - Justified measures (do more good than harm)
  - “Optimized” measures
- Setting triggers for interventions
  - Intervention level (IL) on the effective dose
  - Operational intervention level (OIL) on an easy appreciable parameter
Acute phase of intervention (before the release)

- Base of decision: provisional
  - Will the release take place? What will be the source term? What will be the weather conditions?
- Simultaneity of external / internal exposures
- Same protection measures
  - Sheltering/evacuation, with iodine tablet intake
- IL on the effective dose and equivalent dose to thyroid
- OIL = UAL (urgent action level)
  - fixed on a parameter describing the probability of the release
  - e.g. core temperature, activity in the confinement
**Optimization principles in the acute phase of the intervention**

- Situation dominated by the uncertainty
- Extremely critical situation
- Extremely rare situation

No time for procrastination
Implement “generous” protective measures

**Optimization under stress of robustness**
Intermediate phase (just after release)

• Basis of decision: field measurements (on the spot)
  – Maps of the dose rate and deposited activity

• Link between measurements and exposure pathways
  – External exposure: limitation of stay outside, evacuation
  – Internal exposure: ban on harvesting and grazing, measures concerning foodstuffs

• Setting of independent OIL’s for each exposure pathway
  – Dose rate for measures related to external exposure
  – Deposited activity (contamination) for the measures targeting internal exposure
Optimization principles during the intermediate phase of the intervention

- Relatively defined situation
- Possibly difficult situation
- Waiting for quick decisions

Act in calm (sang-froid)
“Calibrate” the response to the situation

Optimization under constraint of efficiency and speed
Transition phase (stabilized situation)

• Basis of decision: analysis of the doses in the practical situations encountered
  – Detailed knowledge of exposures in the context of daily life
• Conditions of stay linked to the external exposure
  – Stay on site without constraint
  – Stay on site with constraint
  – Temporary evacuation or relocation
• Conditions for internal exposure
  – Control of food contamination
  – Strategy specific to agriculture
• Decisions made on the basis of specific analyzes
  – No more IL and OIL
Transition phase (stabilized situation)

- First protection measures applied
- Adaptation of measures to local conditions and developments
- Time for reflection and medium-term planning

Public participation in decisions

Optimization under constraint of societal acceptance
Optimization in emergency exposure situation

• Evolution of optimization modalities
  – Robustness $\rightarrow$ efficiency-rapidity $\rightarrow$ societal acceptance

• Simplification of models and transparency of decisions
  – Decision-makers will not be the developers of the concepts

• No economy in the acute phase (even doing too much in case of uncertainty)

• As soon as the situation is known, renounce adopting a too conservative attitude

• Protecting the decision-maker against criticism is not a parameter of optimization
THANKS FOR YOUR ATTENTION