IAEA Role in Response to Radiation Emergencies: IAEA Response Assistance Network (RANET)

Incident and Emergency Centre

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International Atomic Energy Agency

Background

- Parties to Assistance Convention have undertaken to cooperate among themselves and with IAEA to facilitate prompt provision of assistance in case of a nuclear accident or radiological emergency, in order to mitigate its consequences

Background

- Assistance Convention
  - Places specific legal obligation on Parties
  - Defines legal responsibilities and functions of IAEA
- IAEA must respond, in accordance with its Statute and this Convention, to request for emergency assistance by
  - Making available appropriate resources/information/advice through different mechanisms

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Past Experience: Use of Biodosimetry

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Biodosimetry Network

- Importance of regional and international network
  - International assistance
  - Enhancing regional capabilities within network
- Biodosimetry analysis provides credible results of dose assessment
  - Cases of high doses exposure
  - Reassurance

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Background

- Secretariat, as part of IAEA's strategy for supporting practical implementation of Assistance Convention, established in 2000 a global Response Assistance Network (RANET)* of teams suitably qualified to respond rapidly and, in principal, on a regional basis, to nuclear or radiological emergencies

* Previously called Emergency Response Network (ERNET)

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What is RANET

- Response Assistance Network is a system of Competent Authorities capable and willing to provide, upon request, specialized assistance by appropriately trained, equipped and qualified personnel with ability to respond timely and effectively to
  - nuclear accidents or radiological emergencies
  - other nuclear or radiological events
- Areas of assistance
  - Advisory
  - Assessment and evaluation
  - Monitoring
  - Recovery

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Concept of RANET

- Compatible and integrated system for provision of international assistance to minimise actual or potential radiological consequences of incident or emergency for health, environment and property
- Does not affect co-operation arrangements defined in any bilateral and/or multilateral agreements between States

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Purpose of RANET

- To facilitate:
  - Provision of requested international assistance
  - Harmonisation of emergency assistance capabilities
  - Relevant exchange of information and feedback of experience
- To complement:
  - IAEA initiatives to promote emergency preparedness and response among its Member States

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Responsibilities within RANET

- Requesting State
  - Overall direction, support and supervision of any assistance within its territory (Article 3 of Assistance Convention)
- Member States' Resources
  - MS are expected, within limits of their capabilities, to identify qualified experts, equipment, and materials that could be made available to assist another State
  - These experts, equipment, and materials are MS's National Assistance Capabilities (NAC) that can be activated by NCA to provide assistance
  - To designate NAC Coordinator

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Responsibilities within RANET - IAEA

- Provides managerial, organizational, logistics and financial support, as appropriate
- Declares official termination of assistance
- Establishes follow-up mechanisms if deemed appropriate
- Serves as focal point for following RANET preparedness activities
  - Performs official registration of MS's NAC
  - Maintains RANET Registry
  - Biennially requests MS's CA certification of continued NAC resource availability
  - Periodically provides information on RANET's status and activities

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Concept of Operations

- Whether an event originates on State's territory or under its jurisdiction or control, State may, in accordance with provisions of Assistance Convention, request assistance from IAEA

Concept of Operations

- State sends request for assistance to IAEA Incident and Emergency Centre (IEC)
- IEC may deploy IAEA Field Response Team (FRT) to assess situation and needs
- If activation of RANET assets is deemed necessary IEC alerts NWPs, which notify NCA(A)s
- NCA(A)s then coordinate provision of assistance with IEC
- IEC proposes Assistance Action Plan in consultation with participating NCA(A)s and international organisations
- Required assistance capabilities are utilized or deployed according to accepted Assistance Action Plan

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National Assistance Capabilities

- Aerial survey
- Radiation monitoring
- Environmental measurements
- Source search/recovery
- Assessment and advice
- Medical support
- Public health protection
- **Biodosimetry**
- Internal dose assessment
- Bioassay
- Histopathology
- Dose reconstruction

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Training, drills and exercises

- NAC members must be trained on and be aware of international guidelines and other aspects of international assistance and be prepared to respond
- Effective drills and exercises focusing on international aspects of assistance should be developed and conducted as appropriate by participating organizations of NAC
- When possible and appropriate, participating organizations of NAC should participate in international exercises such as ConvEx or intercomparison exercises

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Registration - How to Apply

- Prerequisites
  - State should be a Party to Assistance Convention
  - State's NCA(A) must endorse application for registration
- Information needed for registration
  - Statement of endorsement by State NCA(A)
  - Information on resources and areas of expertise of NAC
    - May include nominal list of generalized experience and equipment lists, statement of ability, quality and timeline for deployment of FAT and activation of External Based Support
- Details of RANET Registry and instructions how to register

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Conclusions

- RANET can facilitate enhancement of regional and international capabilities in biodosimetry
- RANET concept is built on practical experience of MS
- Conventions and Statute provide firm legal basis
- Expectation: RANET should enhance radiation emergency response capabilities worldwide

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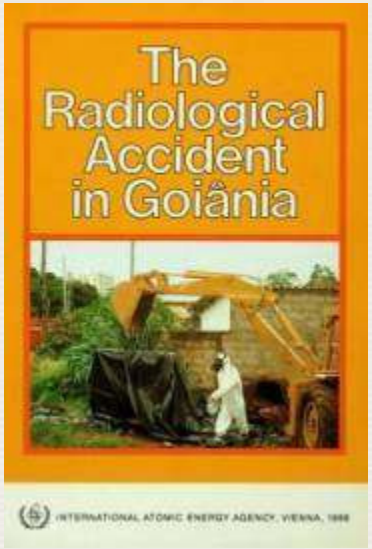
Examples of recent responses: lessons learned from application of biodosimetry

Goiania, Brazil



- **September 1987:** Two people dismantle the radiation head of an abandoned teletherapy unit, containing a 50 TBq Cs-137 source…

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Dose assessment by cytogenetic dosimetry

Re-estimated dose through cytogenetics (Gy)	Number of individuals
< 0.1 - 0.49	105
0.50 - 0.99	8
1.00 - 1.99	8
2.00 - 2.99	3
3.00 - 3.99	2
4.00 - 4.99	2
5.00 - 5.99	1
Total	129

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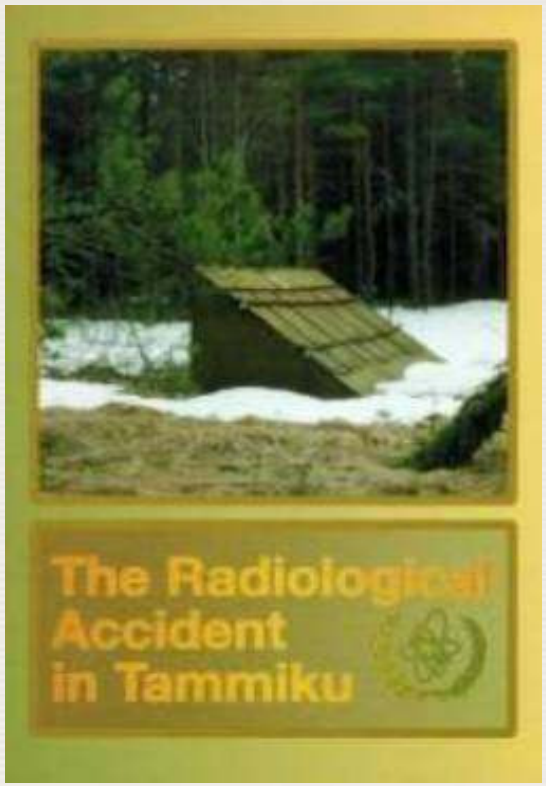
Tammiku, Estonia

- 21 October 1994: Three brothers, all young adults) broke into radioactive waste disposal facility……..
- …….Doses of about 1-3 Gy
- FISH, dicentric analysis



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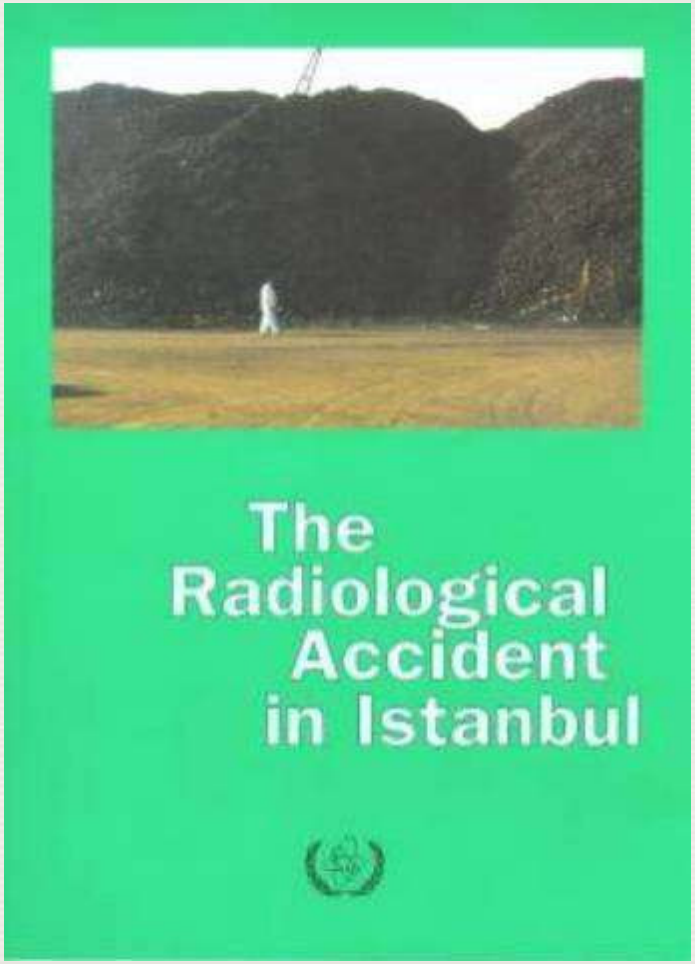
Istanbul, Turkey

- Former radiotherapy Co-60 source was broken open in a scrap metal yard
- 10 persons were irradiated
- One month elapsed between the accident and recognition by the authorities that exposure has occurred



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Istanbul, Turkey

- Biological dosimetry was carried out in 4 laboratories at:
  - Cekmece Nuclear Research and Training Centre, (CNAEM), Istanbul, Turkey
  - Institute for Protection and Nuclear Safety, (IPSN), Clamart, France
  - National Radiological Protection Board, (NRPB), Chilton, UK
  - Department of Radiation Genetics and Chemical Mutagenesis, LUMC, Leiden, The Netherlands.
- Methods used: dicentric analysis, FISH, MN

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1 month after exposure

Patient	Dicentric dose,Gy	FISH dose,Gy
1	2.2	2.8
2	2.3	3.2
3	3.1	3.9
4	2.5	3.0
5	2.5	2.7

Conclusion: FISH values ~20 - 30% higher

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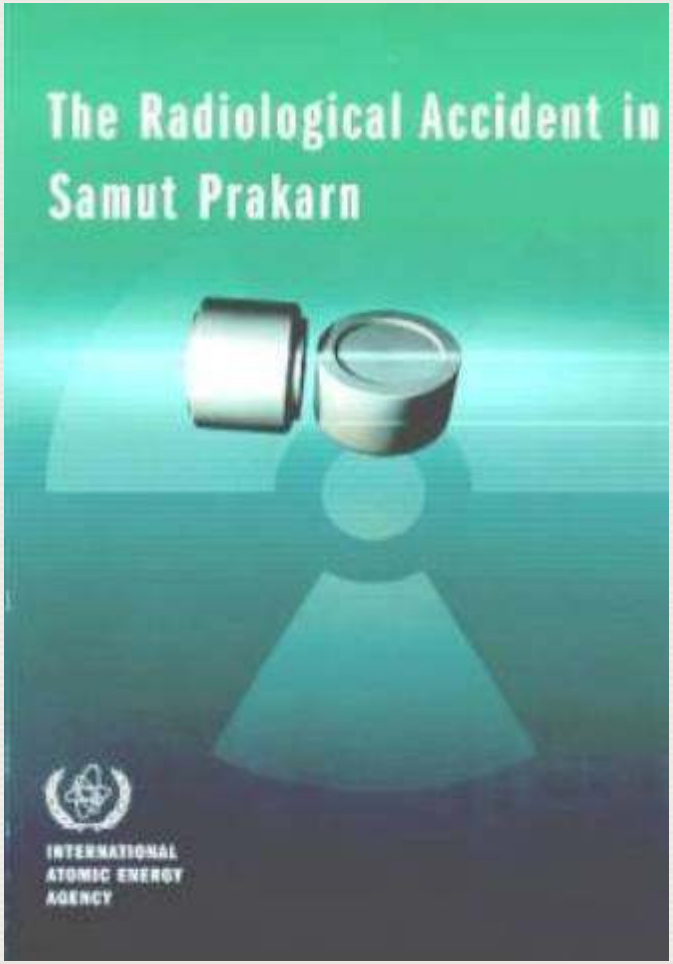
Samut Prakarn



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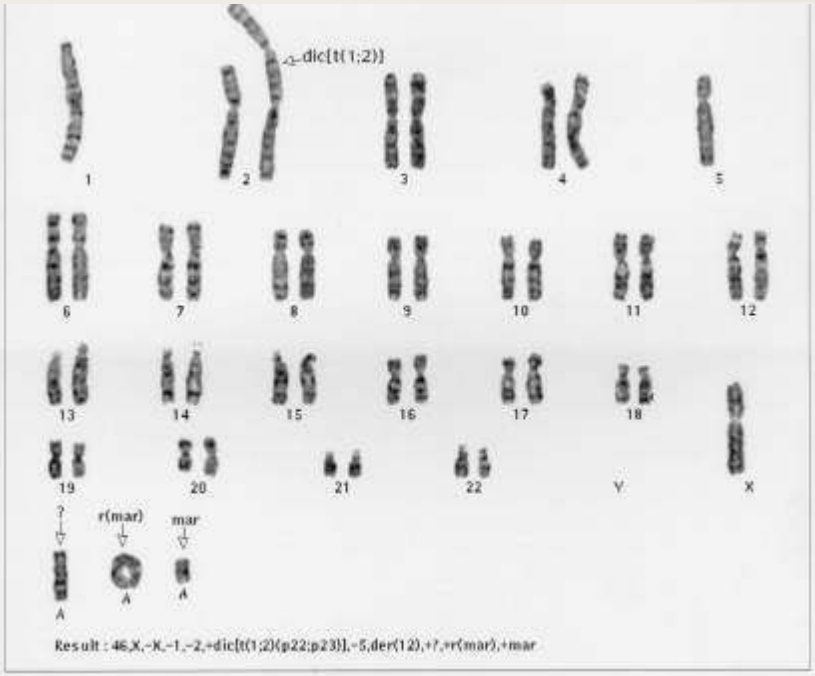
Chromosome study for biological dosimetry

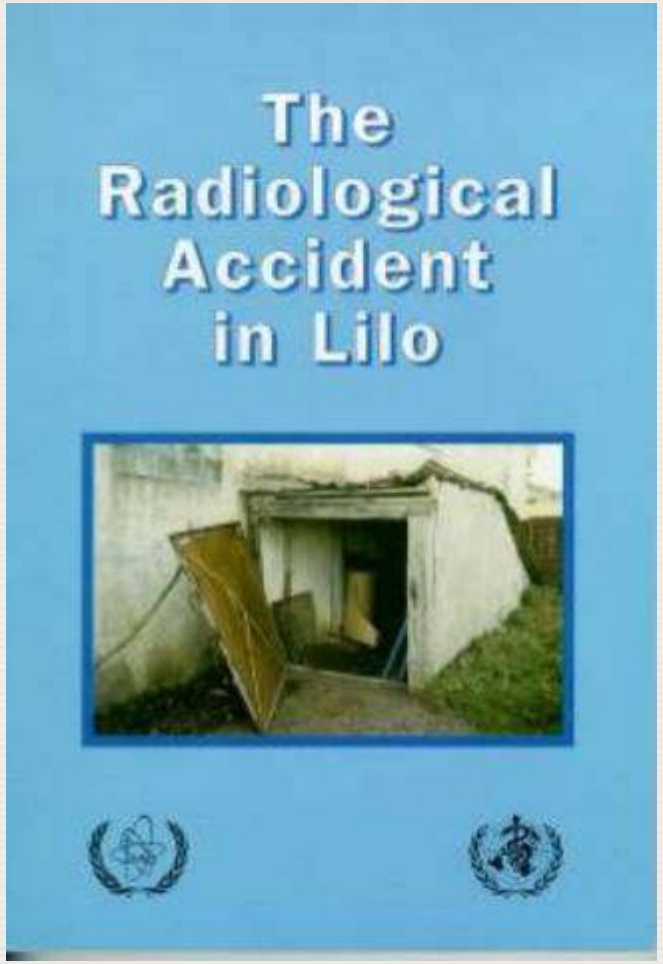
Dicentric analysis:

The varieties of the abnormalities shown in the peripheral blood, along with the normal karyotypes, suggests a variation attributable to severe but localized radiation exposure.



Lilo, Georgia

- **9 October 1997** – referring to Convention on Assistance in radiological emergency - Minister of Health of Georgia requested IAEA and WHO to assist in examining radiological situation at Lilo Training Site and to organize specialized treatment for 11 soldiers with severe radiation induced skin injuries
- IAEA survey - 200 units of ^{226}Ra night shooting guides, ten ^{137}Cs sources and one ^{60}Co source found in 5 days



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Individual (total body) doses in Gy

Patient	Cytogenetic	EPR
1 AN	4.2	no data
2 EP	5.9	4.5
3 CG	1.5	1.4
4 TK	1.1	1.5
5 GL	0.2	no data
6 BZ	0.6	0.7
7 GG	1.1	1.3
8 SO	0.7	0.1
9 ID	4.1	0.4
10 VZ	0.2	no data
11 SN	0.6	0.1

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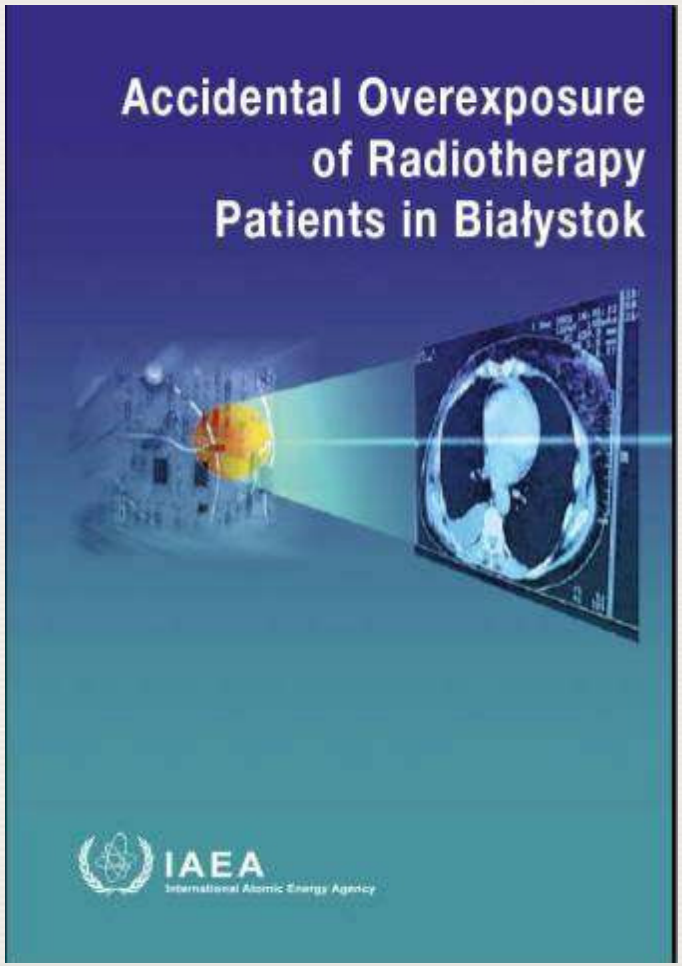
Bialystok, Poland

2001

- Overexposure of 5 patients
- Dicentric analysis 3 weeks after the emergency exposure
- EPR dosimetry alter



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Dose estimation by EPR, Gy

Accident doses received by Patients 3, 4 and 5 estimated at a tissue depth of 1.9 cm (d_{max} of 8 MeV electrons). The bottom line values were derived from the physical measurement perfomed by the local medical phisics team immediatelly after the accident.

	Patient 3	Patient 4	Patient 5
frontal position	59 ± 7	64 ± 11	71 ± 3
distal position	67 ± 8	84 ± 19	78 ± 5
calculation based on physical measurement	103 ± 9	83 ± 9	103 ± 9

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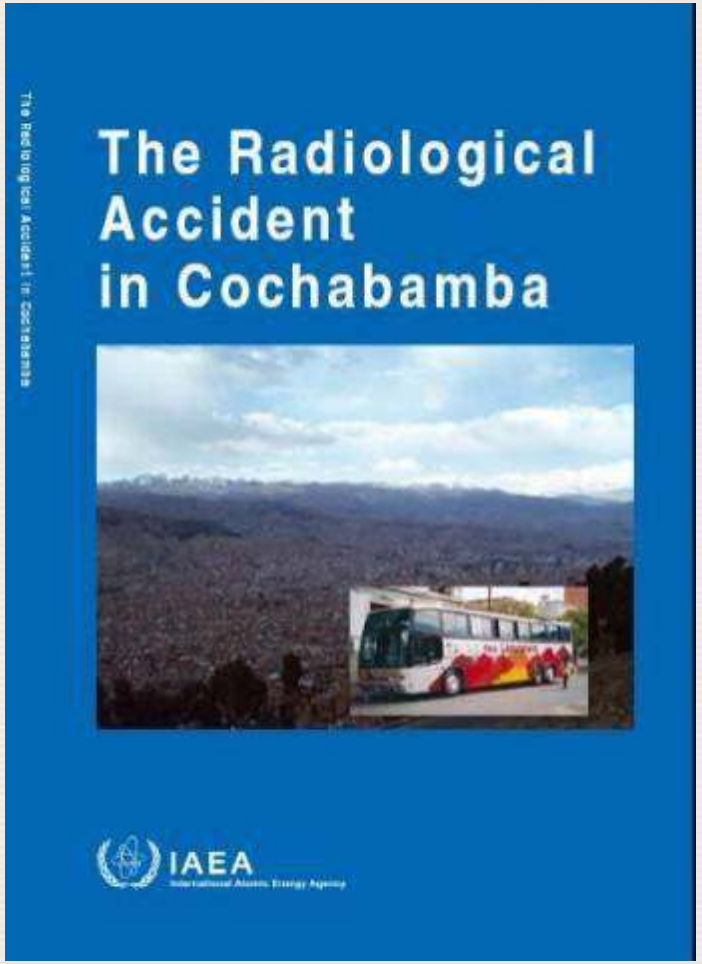
Cochabamba, Bolivia,

2002

- Radiography source
- Exposure of workers and public
- 2 laboratories involved
- Public reassurance



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