



REGIONE AUTONOMA  
FRIULI VENEZIA GIULIA

# Gli aspetti sanitari dell'emergenza radiologica

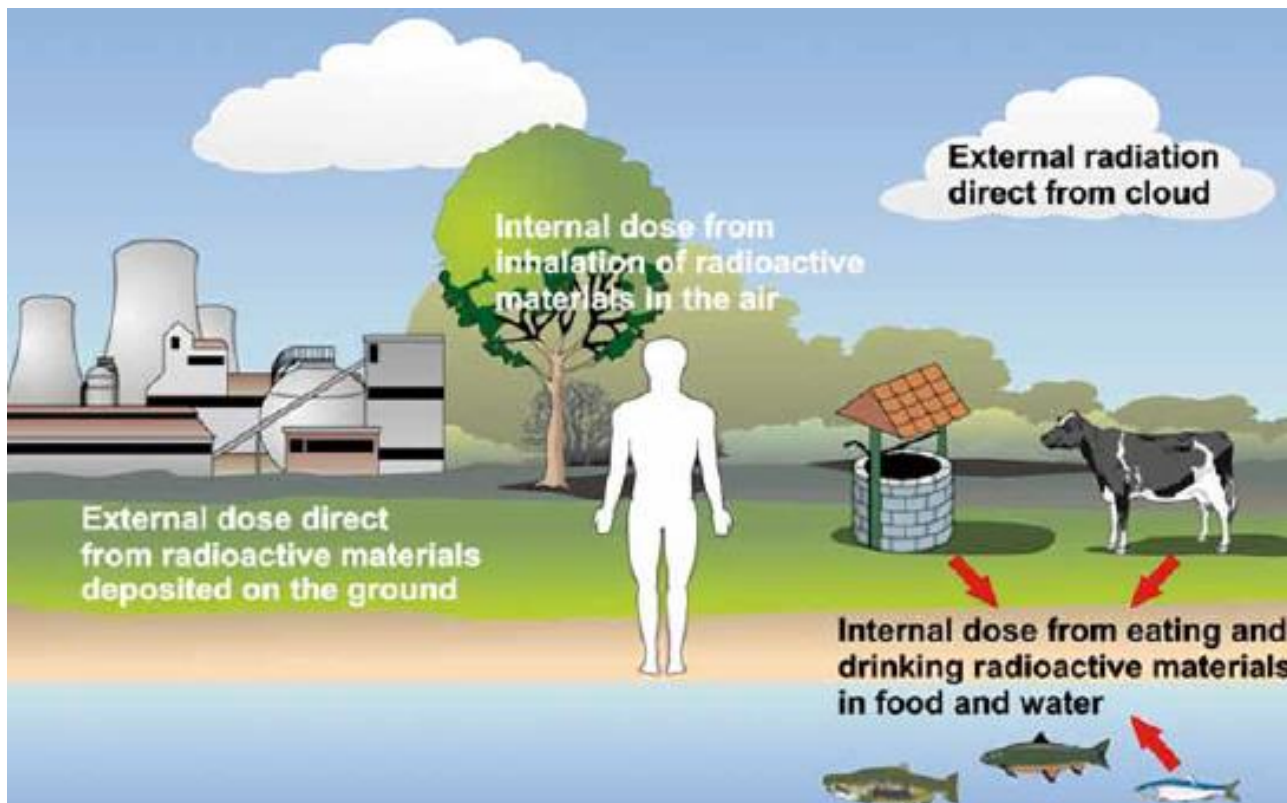
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# Esposizione per l'uomo in caso di rilascio ambientale di materiale radioattivo





# Rischi per la salute delle radiazioni

- Dosi elevate possono essere letali
- Possono causare cancro
- Possono causare danni fetali nei diversi stadi della gestazione
- Possono causare effetti ereditari in animali da laboratorio



INDIRECT

PHOTON

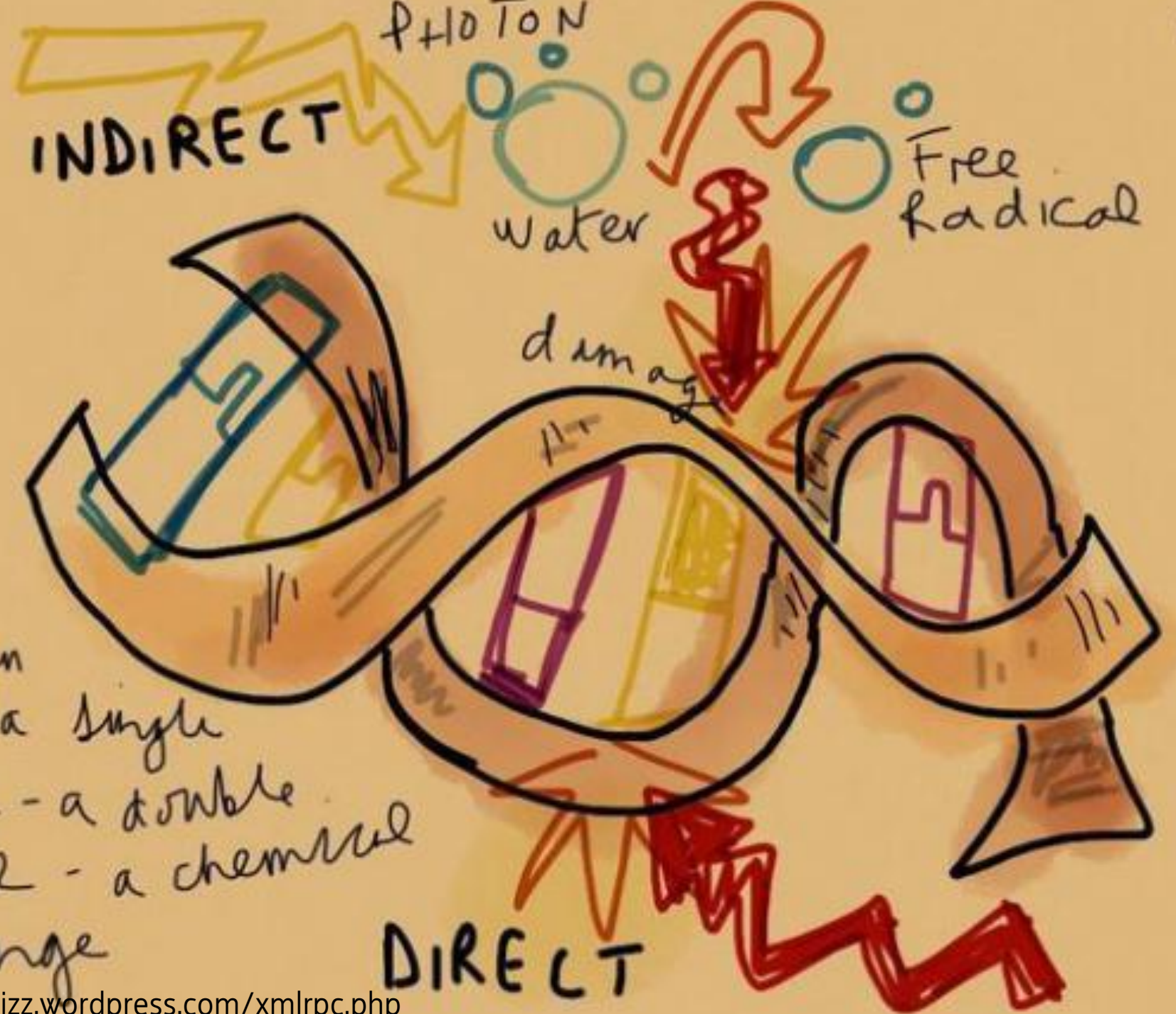
water

Free radical

damage

DIRECT

you can have a single break - a double break - a chemical change



## Box 3. Study cohorts of the atomic bomb survivors of Hiroshima and Nagasaki

Scientists from the Atomic Bomb Casualty Commission (ABCC) set up in 1947 and its successor, the Radiation Effects Research Foundation (RERF), have assessed the long-term health effects of radiation exposure in the survivors of the atomic bombings of Hiroshima and Nagasaki, as well as in their offspring. The Life Span Study (LSS) is an epidemiological study of cancer mortality and incidence in a cohort of about 120 000 individuals, including a defined subset that underwent additional health surveillance (Adult Health Study, AHS). Other study cohorts were added later, including individuals exposed *in utero* and children conceived after the bombings. In total, approximately 200 000 individuals, 40% of whom are still alive today, were identified and followed up in these different study cohorts (16).

The systematic follow-up of the LSS cohort began in 1950, including survivors who were within 2.5 km of the hypocenters at the time of the bombings and a similar-sized sample of survivors who were between 3 and 10 km from the hypocenters whose radiation doses were negligible. In the context of radiation epidemiology, the cohort of the atomic bomb survivors from Hiroshima and Nagasaki is unique, owing to:

- the large number of members not exposed for any medical reason;
- the long follow-up period of more than 50 years;
- a composition that includes males and females, children and adults;
- whole-body exposures (which are more typical for radiation protection situations than the partial-body exposures associated with many medically exposed cohorts);
- substantial effort expended on reconstructing tissue-specific doses (DS02);
- a large dose range, from levels comparable to the natural background to lethal levels;
- an internal control group with negligible doses, i.e. those who survived at considerable distance (>3 km) from the hypocenter;
- mortality data that are virtually complete up to now<sup>1</sup>, high-quality tumour registries, and less potential bias from confounding than other exposed cohorts.

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1. LSS cancer burden from early childhood exposure will continue to be expressed for another decade or two.



World Health  
Organization

**Health Effects  
of the Chernobyl Accident  
and  
Special Health Care Programmes**

Report of the UN Chernobyl Forum  
Expert Group "Health"

25 April 2016



**World Health  
Organization**

**1986-2016: CHERNOBYL at 30**

An update

How fast is that dose delivered to the body?(dose rate):

- if the same dose is delivered over an extended period of time, the effect would not be as severe as if the same dose were delivered all at once.

What part of the body is irradiated?

- If a dose is delivered only to a portion of the body, the health effect is not as severe as if the entire body is exposed.

Individual sensitivity.

- Children and young adults are more sensitive to late effects of radiation. Growing tissue, dividing cells, many years' lifespan ahead of them to allow for any potential cancer to develop later in life.
- Among individuals of the same age there's variation in individual sensitivity to radiation.



# The dose makes the poison

dose of radiation is high, delivered to the whole body, and given in a short amount of time

- the potential likely outcome is death. The individual will die (within a few days, a few hours or it could take weeks after a period of severe illness with internal bleeding and infections).

dose is moderate

- radiation sickness (symptoms)
- chance to survive
- better chance if prompt medical care is provided
- For those who survive, there will be a higher than expected risk of cancer later in life.

dose of radiation is low

- no radiation sickness.
- no immediate health effects
- no symptoms
- Likely no observable health effect later in life either.
- statistically there will be a higher than average risk of developing cancer later in life

If the dose is really, really low:

- small increase in risk of cancer is so low that we can't measure it nor estimate it.



## all solid cancers

- around 4% in females exposed as infants;

## breast cancer

- around 6% in females exposed as infants;

## leukaemia

- around 7% in males exposed as infants;

## thyroid cancer

- up to 70% in females exposed as infants (the normally expected risk of thyroid cancer in females over lifetime is 0.75% and the additional lifetime risk assessed for females exposed as infants in the most affected location is 0.50%).

# Health risk assessment

from the nuclear accident  
after the 2011 Great East Japan  
Earthquake and Tsunami

*based on a preliminary dose estimation*



# Radiation exposure How does it compare?

Exposure measured in mSv

<b>10,000</b> Fatal within weeks
<b>6,000</b> Typical dosage recorded in those Chernobyl workers who died within a month
<b>5,000</b> Single dose which would kill half of those exposed to it within a month
<b>1,000</b> Single dose which could cause radiation sickness, nausea, but not death
<b>400</b> Max radiation levels recorded at Fukushima plant 14 March, per hour
<b>350</b> Exposure of Chernobyl residents who were relocated
<b>100</b> Recommended limit for radiation workers every five years
<b>10</b> Dose in full-body CT scan
<b>9</b> Airline crew NYC -Tokyo polar route, annual
<b>2</b> Natural radiation we're all exposed to, per year
<b>1.02</b> Radiation per hour detected Fukushima site, 12 March
<b>0.4</b> Mammogram breast x-ray
<b>0.1</b> Chest x-ray
<b>0.01</b> Dental x-ray

esposizione  
quantificabile

effetti sulla salute  
conosciuti

Criteri per operare  
in sicurezza

Precauzioni per  
limitare  
l'esposizione



Get Inside



Stay Inside



Stay Tuned



Get Inside



Stay Inside



Stay Tuned

- Le mura di un'abitazione possono bloccare gran parte delle radiazioni
- La radioattività diminuisce nel tempo



<https://emergency.cdc.gov/radiation/>



Get Inside



Stay Inside



Stay Tuned





Get Inside



Stay Inside



Stay Tuned

- Radio (a batteria)
- Sms
- Email e social media



## Dose interna (inalazione, ingestione..)



## How does KI work?

The thyroid gland cannot tell the difference between non-radioactive and radioactive iodine. It will absorb both kinds.

KI works by keeping radioactive iodine out of the thyroid gland where it can cause damage. When a person takes KI, the thyroid absorbs the non-radioactive iodine in the medicine. Because KI contains so much non-radioactive iodine, the thyroid becomes "full" and cannot absorb any more iodine—either stable or radioactive—for the next 24 hours.

KI is a pill or liquid that can be used in radiation emergencies that involve radioactive iodine.

KI contains non-radioactive iodine. Non-radioactive iodine helps prevent radioactive iodine from being absorbed by the thyroid gland.



Without KI



With KI



KI does not keep radioactive iodine from entering the body and cannot reverse the health effects



## Dose unique recommandée de KI selon le groupe d'âge

Groupe d'âge	Dose d'iodure de potassium (KI) (mg)	N <sup>bre</sup> de comprimés de 130 mg	N <sup>bre</sup> de comprimés 65 mg
Adultes (18 ans et plus) et femmes enceintes ou qui allaitent <sup>3</sup>	130	1	2
Adolescents (12 à 18 ans) <sup>1</sup>	65	1/2	1
Enfants (3 à 12 ans)	65	1/2	1
Bébés (1 mois à 3 ans)	32	Utiliser une solution liquide de KI <sup>2</sup>	1/2
Nouveau-nés (< 1 mois) <sup>3</sup>	16	Utiliser une solution liquide de KI <sup>2</sup>	Utiliser une solution liquide de KI <sup>2</sup>

<sup>1</sup> Les adolescents dont la taille approche celle d'un adulte (plus de 150 lb/70 kg) devraient recevoir la dose pour adultes (130 mg).

<sup>2</sup> Voir « Préparation d'une solution liquide d'iodure de potassium (KI) ».

<sup>3</sup> Les femmes enceintes ou qui allaitent et les nouveau-nés devraient prendre une seule dose de KI.



- Non usare sale iodato da cucina: non contiene abbastanza iodio da indurre blocco tiroideo
  - Inutile usare integratori alimentari che contengono Iodio
  - Assumere solo dopo indicazione delle autorità
- 
- Una sola dose: blocco tiroideo per 24-48 ore dalla somministrazione
  - Assumere prima dell'inizio dell'esposizione
  - Non assumere dopo le 48 ore dall'esposizione

## Adverse effects of iodine thyroid blocking: a systematic review

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### Abstract

<sup>131</sup>I, when released in a radiological or nuclear accident as happened recently in Fukushima, Japan, may cause thyroid cancer as a long-term consequence. Iodine thyroid blocking (ITB) is known to reduce the risk of developing thyroid cancer. Potential adverse effects of ITB have not been systematically investigated so far. This article summarises the results of a review on adverse effects of ITB based on a systematic literature search in scientific medical databases. A meta-analysis was not performed as identified studies displayed major heterogeneity. The search resulted in 14 articles relevant to the topic, reporting mostly on surveys, ecological and intervention studies. Only one study from Poland focused on effects (both desired and adverse) of an ITB intervention following the Chernobyl accident. All other studies reported on iodine administration in a different context. Overall, the studies did not reveal severe adverse reactions to potassium iodide in the general public. Since ITB is a protective measure only applied in very specific circumstances, scientifically sound studies of adverse effects are scarce and consequently the evidence base is weak. The assessment of adverse effects of ITB relies on indirect evidence from related areas. This study may contribute to ongoing developments in pharmacoepidemiology aiming to better quantify adverse effects of medications and health care interventions including ITB.



- Direzione Centrale Salute partecipa con Prefetture e Protezione civile alla definizione delle azioni da mettere in atto in caso di incidente radiologico
- Le farmacie della nostra regione distribuiranno a tutti i minorenni e le donne gravide e in allattamento una dose di Iodio stabile da tenere in casa:
  - In definizione accordo con Federfarma FVG



- Approvvigionamento dosi necessarie da distribuire alla popolazione FVG suscettibile
  - Stima ca 200.000
- Distribuzione in luoghi di stoccaggio e distribuzione:
  - Farmacie/Ospedali
- Formazione popolazione e operatori sanitari:
  - Piano di comunicazione
- Distribuzione alla popolazione
  - AAS/Farmacie/PLS&MMG/PS/Protezione Civile
- Gestione informatica
  - INSIEL

Report of the

# Fukushima Health Management Survey



revised version (February 17, 2016)

## Psychological distress and the perception of radiation risks: the Fukushima health management survey

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**Objective** To assess relationships between the perception of radiation risks and psychological distress among evacuees from the Fukushima nuclear power plant disaster.

**Methods** We analysed cross-sectional data from a survey of evacuees conducted in 2012. Psychological distress was classified as present or absent based on the K6 scale. Respondents recorded their views about the health risks of exposure to ionizing radiation, including immediate, delayed and genetic (inherited) health effects, on a four-point Likert scale. We examined associations between psychological distress and risk perception in logistic regression models. Age, gender, educational attainment, history of mental illness and the consequences of the disaster for employment and living conditions were potential confounders.

**Findings** Out of the 180 604 people who received the questionnaire, we included 59 807 responses in our sample. There were 8717 respondents reporting psychological distress. Respondents who believed that radiation exposure was very likely to cause health effects were significantly more likely to be psychologically distressed than other respondents: odds ratio (OR) 1.64 (99.9% confidence interval, CI: 1.42–1.89) for immediate effects; OR: 1.48 (99.9% CI: 1.32–1.67) for delayed effects and OR: 2.17 (99.9% CI: 1.94–2.42) for genetic (inherited) effects. Similar results were obtained after controlling for individual characteristics and disaster-related stressors.

**Conclusion** Among evacuees of the Fukushima nuclear disaster, concern about radiation risks was associated with psychological distress.



# Grazie per l'attenzione

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