

AREQUIPA, PERU Noviembre, 2019



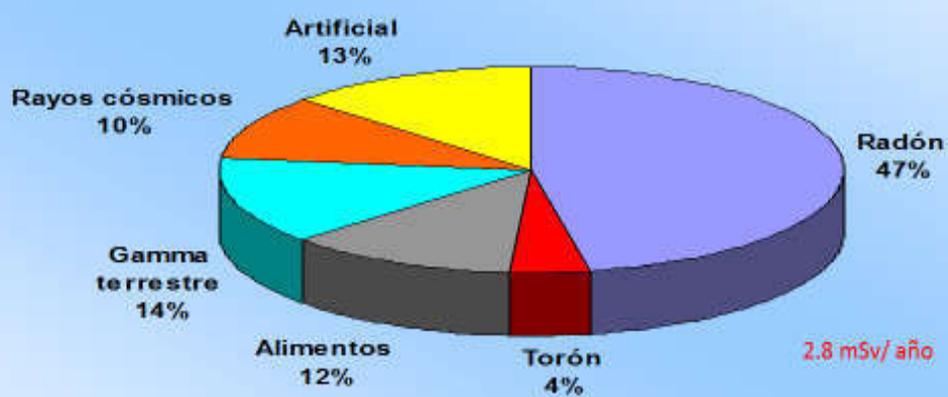
Fundamentos de radon. Conceptos básicos y riesgos para la salud

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GRUPO RADON

RADON

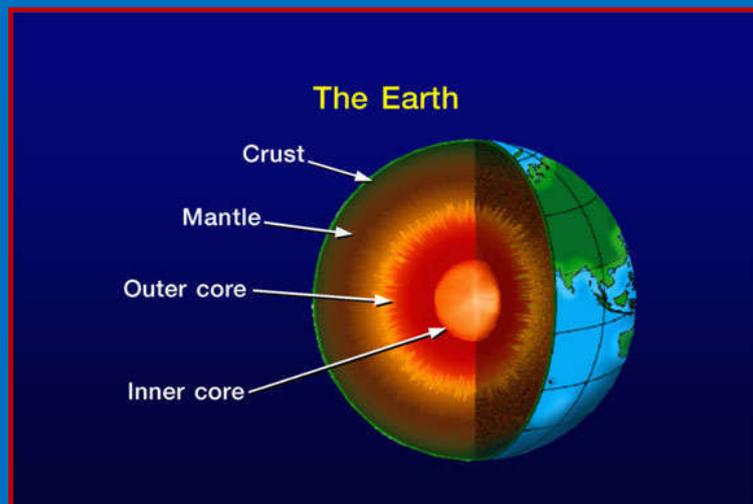
Exposición promedio del hombre a fuentes naturales y artificiales



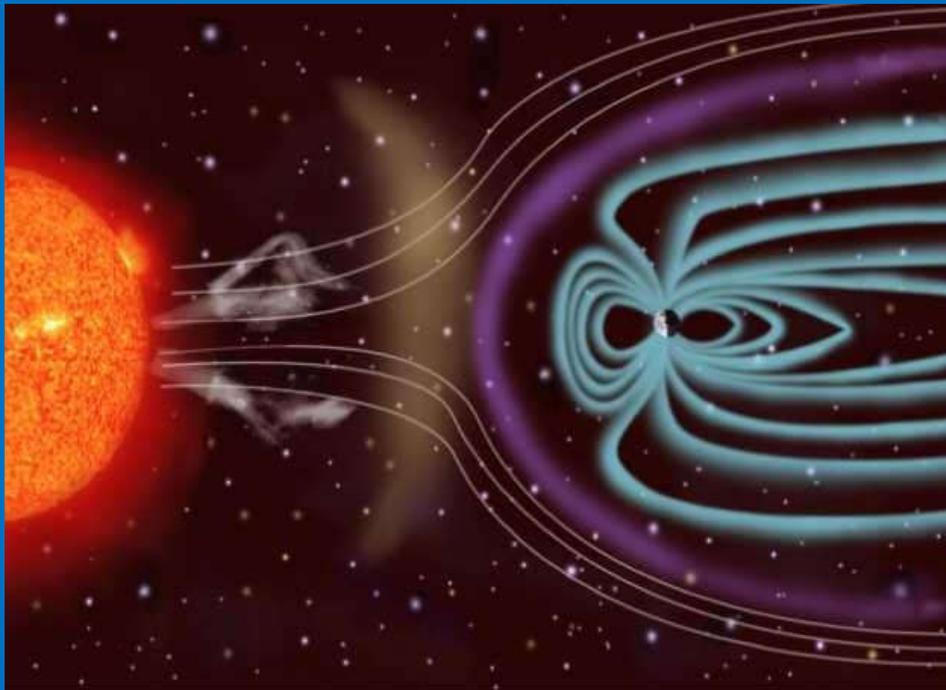
FUENTE: UC, CSN

14 % : RADIACION GAMMA TERRESTRE

1. Fuente de calor interno



10 %: RADIACION COSMICA



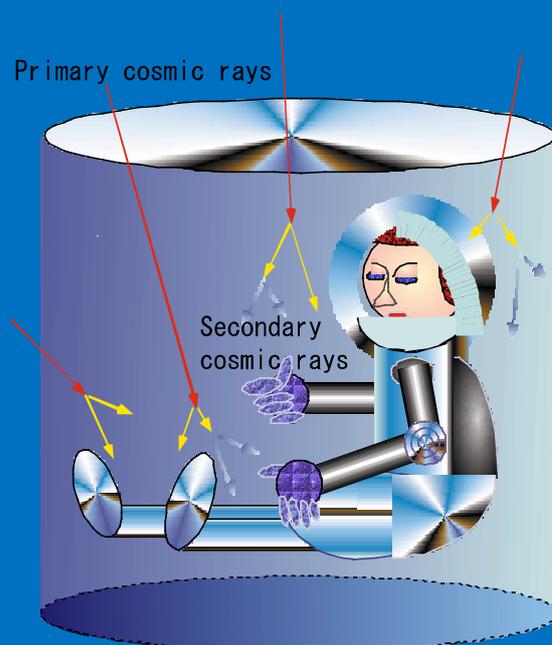
Fuente: Jose Carlos Saez Vergara. CIEMAT

Dosis recibidas en vuelos orbitales y estaciones espaciales (MIR, ISS)



•La tasa de dosis varía entre 5 y 40 $\mu\text{Sv/h}$, y las dosis por misión oscila entre 3 y 11 mSv.

Fuente: Jose Carlos Saez Vergara. CIEMAT



Aprox. 1 mSv/dia

Astronauts are also exposed to secondary part
(heavy ions, protons, neutrons,
pions, muons, electrons)

12 %: ALIMENTOS

5 % : GAS TORON

ARTIFICIAL: USO MEDICO : 13%

TOTAL ANUAL : 2.8 mSv

RADIOGRAFIA DE TORAX: 0.05 mSv

SCANNER, PROMEDIO: 10 mSv

¡CUIDADO LOS “POR QUE SI”

NOBLE GAS RADIOACTIVE: 47 %

Rn	86 (222)
F.E. Dorn, 1900	Density 9.73 g/L
<i>California Geological Survey Mineral Resources and Mineral Hazards Mapping Program</i>	Boiling point -62°C
	Melting point -71°C
	(Xe) 4f¹⁴ 5d¹⁰ 6s² 6p⁶
	Radon

LY

Origin of radon





Mineros (años 70)

Fuentes de radon

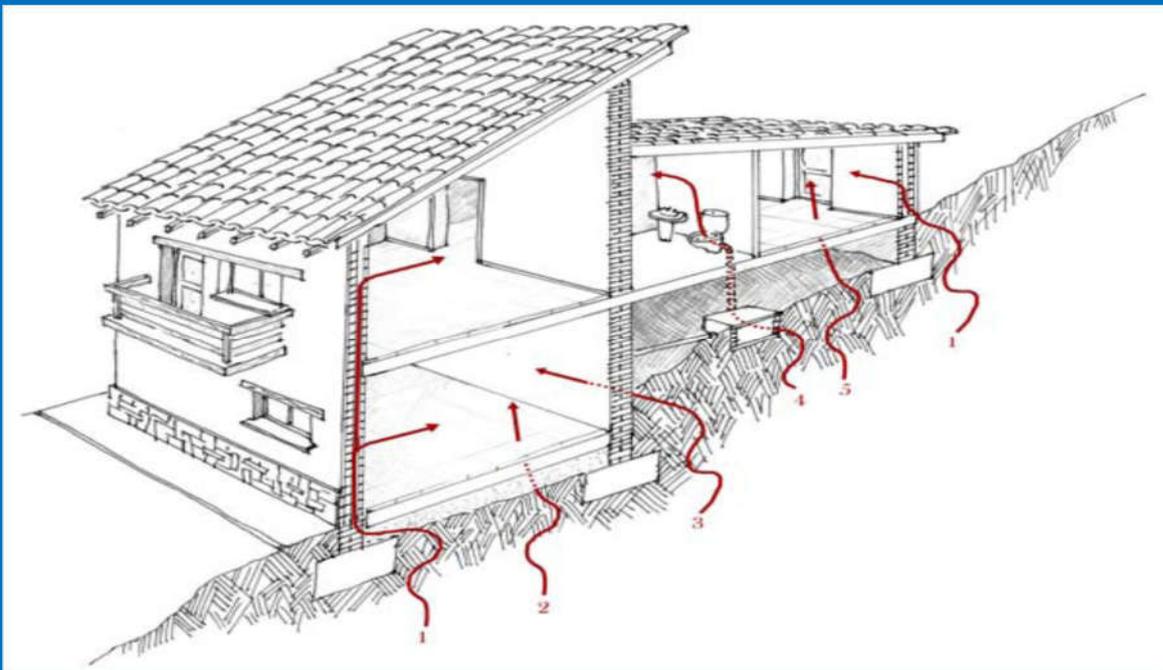


Transporte

Difusión
(<5%)

Convección
(95%)

Entradas de radon



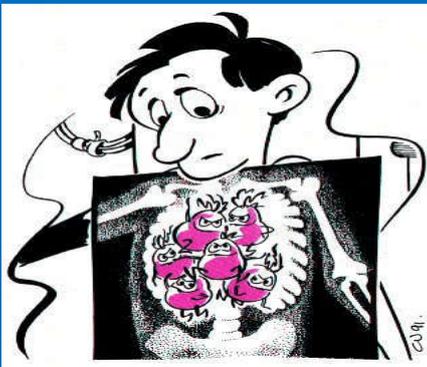
GRANITOS



Mas de 200 tipos....



Riesgo para la salud



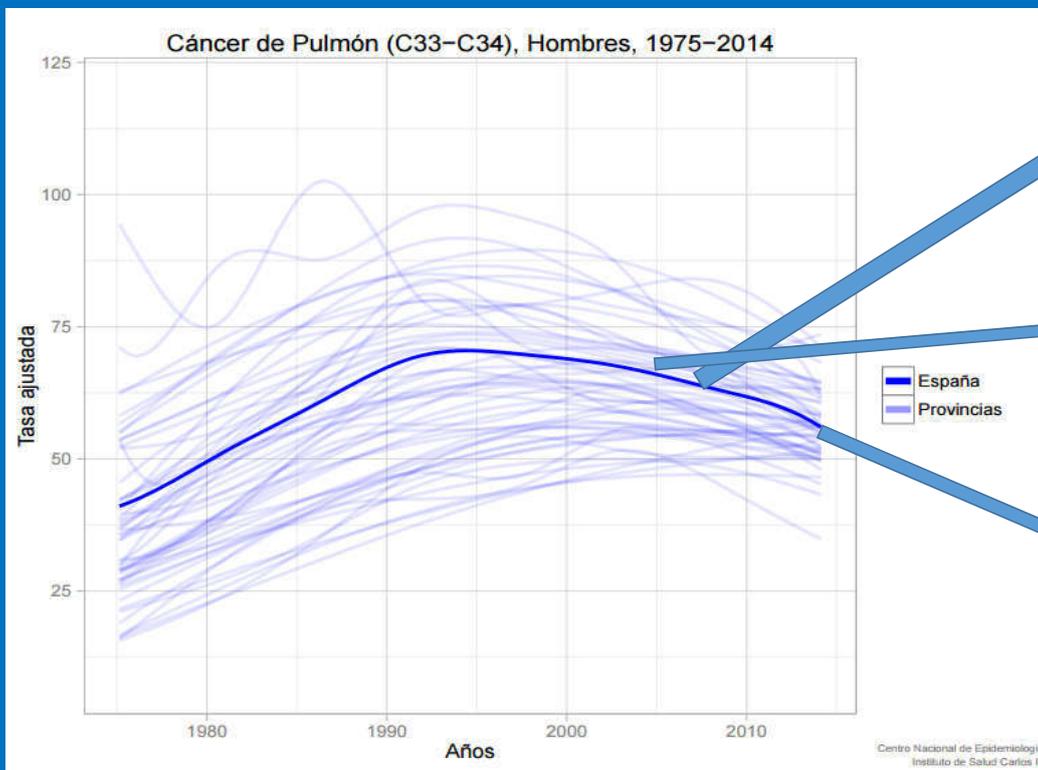
Inhalacion de descendientes del gas radon



Cancer de pulmon



Source:
INSTITUTO DE
SALUD CARLOS III

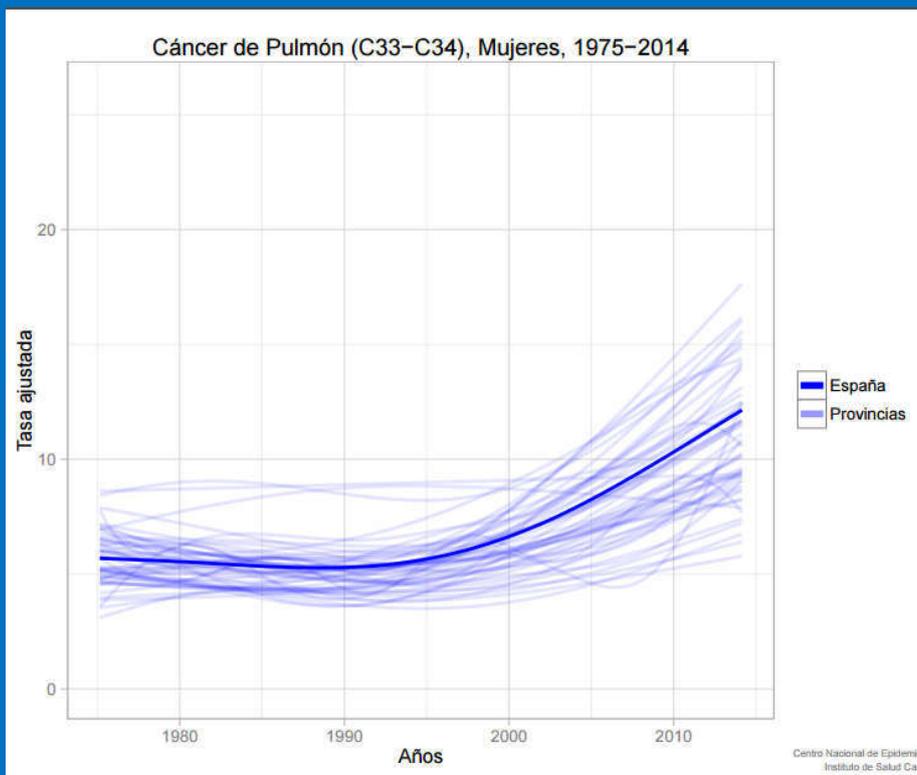


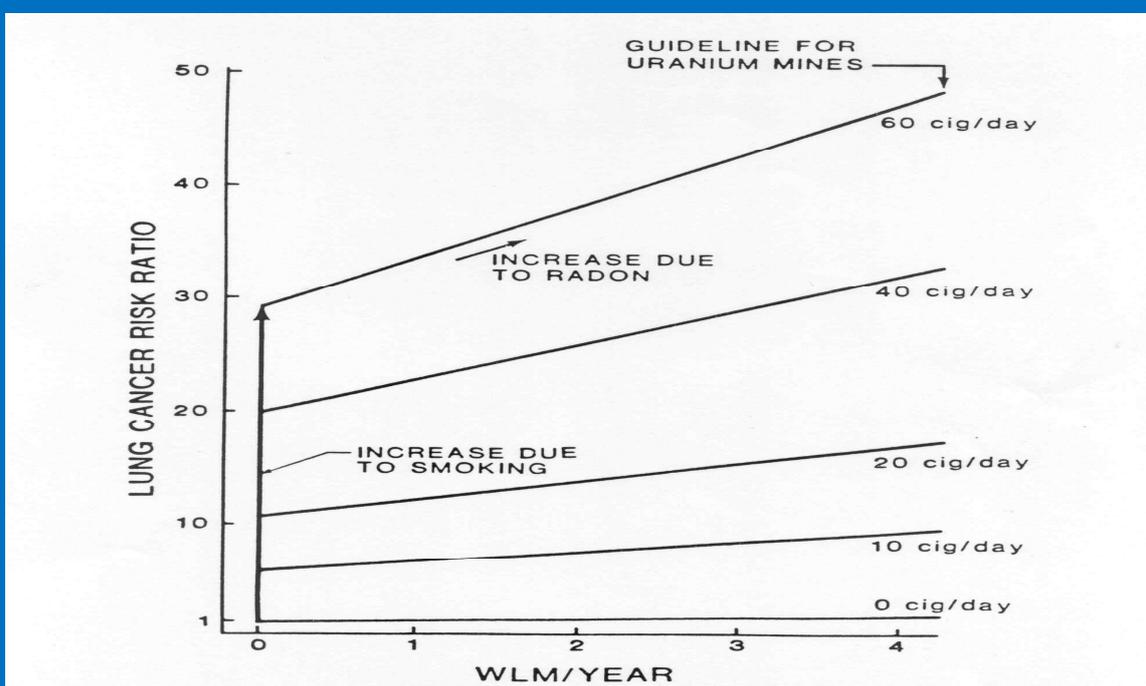
LEGISLATION,
2006

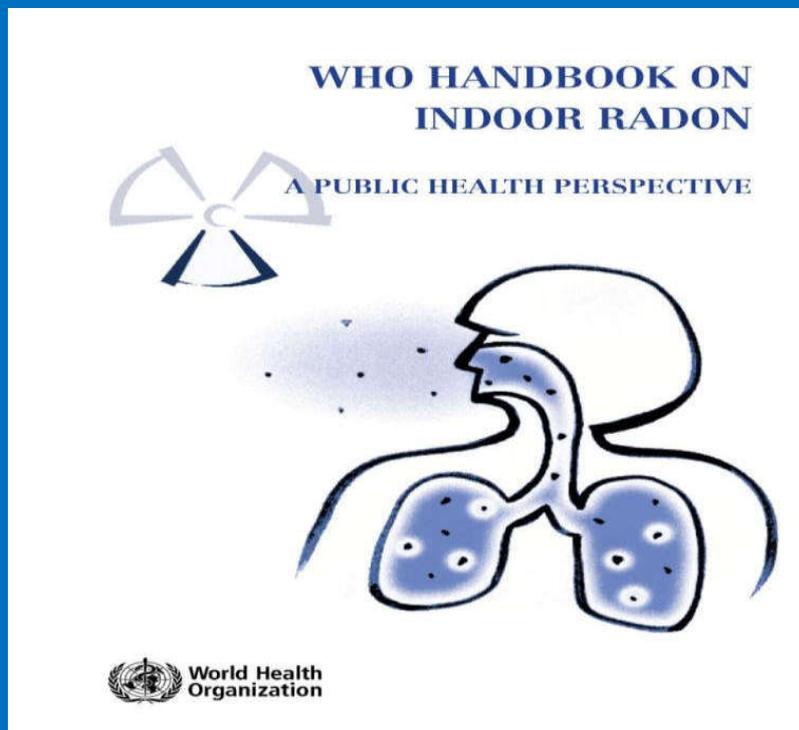
4,663
millones
de
cajetillas
2004

2,340
millones
de
cajetillas
2014

Source:
INSTITUTO DE SALUD
CARLOS III







INTERNATIONAL
RADON
PROJECT
(2005-2009)

Table 13. Number and percentage of the annual lung cancers attributable to radon and 95% confidence intervals (CI): males + females.

Country	Average Ra conc. (Bq m ⁻³)	Average LC deaths per year	Annual LC deaths attributable to Ra: Number (95%CI)	Annual LC deaths attributable to Ra: Percentage (95%CI)
EU MEMBER STATES				
1 Austria	99	3 533	483 (167-830)	14% (5%-23%)
2 Belgium	52	6 264	481 (159-870)	8% (3%-14%)
3 Bulgaria	29	3 372	150 (48-278)	4% (1%-8%)
4 Cyprus	29	177	8 (3-15)	4% (1%-8%)
5 Czech Republic	118	5 483	871 (305-1 468)	16% (6%-27%)
6 Denmark	53	3 551	278 (92-501)	8% (3%-14%)
7 Estonia	60	673	59 (20-105)	9% (3%-16%)
8 Finland	96	2 003	267 (92-459)	13% (5%-23%)
9 France	63	28 138	2 577 (859-4 597)	9% (3%-16%)
10 Germany	49	41 982	3 052 (1 004-5 536)	7% (2%-13%)
11 Greece	55	6 213	502 (166-905)	8% (3%-15%)
12 Hungary	107	8 046	1 176 (409-2 004)	15% (5%-25%)
13 Ireland	91	1 663	211 (72-366)	13% (4%-22%)
14 Italy	70	32 907	3 314 (1 113-5 867)	10% (3%-18%)
15 Latvia	70	1 062	107 (36-189)	10% (3%-18%)
16 Lithuania	55	1 414	114 (38-206)	8% (3%-15%)
17 Luxembourg	110	208	31 (11-53)	15% (5%-25%)
18 Malta	40	144	9 (3-16)	6% (2%-11%)
19 Netherlands	23	9 858	350 (112-656)	4% (1%-7%)
20 Poland	49	22 062	1 604 (528-2 909)	7% (2%-13%)
21 Portugal	62	3 381	305 (102-545)	9% (3%-16%)
22 Romania	50	9 343	855 (285-1 526)	9% (3%-16%)
23 Slovakia	108	2 052	302 (105-515)	15% (5%-25%)
24 Slovenia	87	1 078	132 (45-229)	12% (4%-21%)
25 Spain	53	19 856	1 552 (513-2 802)	8% (3%-14%)
26 Sweden	108	3 509	517 (180-880)	15% (5%-25%)
27 United Kingdom	20	34 538	1 071 (342-2 016)	3% (1%-6%)
SOME OTHER EUROPEAN COUNTRIES				
28 FYROM	105	618	89 (31-152)	14% (5%-25%)
29 Norway	89	2 049	255 (87-443)	12% (4%-22%)
30 Switzerland	78	2 747	305 (103-535)	11% (4%-19%)

RADPAR project UE (2009-2011)

EUROPEAN CODE AGAINST CANCER

12 ways to reduce your cancer risk

1. Do not smoke. Do not use any form of tobacco.
2. Make your home smoke free. Support smoke-free policies in your workplace.
3. Take action to be a healthy body weight.
4. Be physically active in everyday life. Limit the time you spend sitting.
5. Have a healthy diet:
 - Eat plenty of whole grains, pulses, vegetables and fruits.
 - Limit high-calorie foods (foods high in sugar or fat) and avoid sugary drinks.
 - Avoid processed meat; limit red meat and foods high in salt.
6. If you drink alcohol of any type, limit your intake. Not drinking alcohol is better for cancer prevention.
7. Avoid too much sun, especially for children. Use sun protection. Do not use sunbeds.
8. In the workplace, protect yourself against cancer-causing substances by following health and safety instructions.
9. Find out if you are exposed to radiation from naturally high radon levels in your home. Take action to reduce high radon levels.
10. For women:
 - Breastfeeding reduces the mother's cancer risk. If you can, breastfeed your baby.
 - Hormone replacement therapy (HRT) increases the risk of certain cancers. Limit use of HRT.
11. Ensure your children take part in vaccination programmes for:
 - Hepatitis B (for newborns)
 - Human papillomavirus (HPV) (for girls).
12. Take part in organized cancer screening programmes for:
 - Bowel cancer (men and women)
 - Breast cancer (women)
 - Cervical cancer (women).

The European Code Against Cancer focuses on actions that individual citizens can take to help prevent cancer. Successful cancer prevention requires these individual actions to be supported by governmental policies and actions.

Find out more about the European Code Against Cancer at: <http://cancer-code-europe.iarc.fr>



¿ ES IMPORTANTE LA POBLACION TRABAJADORA AFECTADA ?



Tabla 1. Estimaciones de exposición para los 15 cancerígenos más frecuentes en la población Española. Estimación para la población activa, 2004

Agente / N° exposiciones*

Radiación solar / 1.460.460
Silice, cristalino / 1.246.787
Humo de tabaco (ambiental) * / 1.223.146
Humo de motor diesel / 586.890
Polvo de madera / 497.332

Fuente:

**Informe Carex-
España, 2004**

Radón y sus productos descompuestos / 456.891

Fibras minerales artificiales / 176.054
Compuestos de Cromo VI / 150.539
Hidrocarburos poli cíclicos aromáticos (excluido humo de tabaco) / 138.181
Benceno / 128.589
Formaldehído / 113.403
Componentes del níquel / 90.964
Plomo y compuestos de plomo, inorgánico / 67.865
Amianto / 65.548

* Estimación antes de la Ley antitabaco

ARTIFICIAL vs NATURAL

AÑO 2009

Nº DE TRABAJADORES	Fondo	< 5 mSv	> 5 mSv	> 20 mSv	> 50mSv
			< 20 mSv	< 50 mSv	
89004 105150 (2013)	52325	35362	1255	53	9

Radon: 3000 Bq/m³; 1700 h; F=0.4 \longleftrightarrow **16.2 mSv/año**
38.8 mSv/año

Fuente: Consejo de Seguridad Nuclear

Upcoming legislation

ICRP Main Commission Meeting April 13–17, 2015– Sydney

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ICRP Main Commission Meeting
April 13–17, 2015– Sydney, Australia

A full year has passed since the last meeting of the Main Commission. Many items of business have had to be dealt with by the Main Commission, including the publication of the Report of the ICRP Working Group on Radon and its Decay Products (ICRP 115) and the publication of the ICRP Recommendations on Radiological Protection (ICRP 103).

Progress on the calculation of dose coefficients was reviewed, in particular for exposure to radon-222 and progeny. There is a remarkable consistency between radon dose coefficients obtained by dosimetric calculations and conversion coefficients based on epidemiological comparisons. In an upcoming publication, the Commission intends to recommend a single coefficient for use in most circumstances, with a value of 2 mSv/WLM ($3.4 \text{ mSv per mJ h m}^{-3}$). Additional data will be provided for circumstances significantly divergent from typical conditions where sufficient and reliable information is available to support an adjustment.

The ICRP Commission and all members of the Scientific Council of ICRP and the Scientific Advisory Committee and Working Group agreed to publish the full report of the meeting on the ICRP website. The full report of the meeting is available at www.icrp.org.

After the ICRP Main Commission Meeting in Sydney, the ICRP Commission will meet in Paris, France, in May 2015. The ICRP Commission will meet in Vienna, Austria, in June 2015. The ICRP Commission will meet in London, UK, in July 2015. The ICRP Commission will meet in Sydney, Australia, in August 2015. The ICRP Commission will meet in Sydney, Australia, in September 2015. The ICRP Commission will meet in Sydney, Australia, in October 2015. The ICRP Commission will meet in Sydney, Australia, in November 2015. The ICRP Commission will meet in Sydney, Australia, in December 2015.

www.icrp.org