SOME INFLUENCING PARAMETERS OF THE RADON AND THORON DAUGHTERS CONCENTRATIONS IN DWELLINGS

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INTRODUCTION

Man spents at least 60% of his life indoor and this fact imposes a careful investigation of his habitual environment. Indoor exposure rises up to 50% of the total radiation exposure of the public to natural sources (1).

It is also well known that inhalation of radon is the principal mechanism of human exposure to ionising radiation and that the exposure to high levels of radon short-lived decay products (radon daughters) is undesirable since it has been shown to cause lung cancer.

In Romania, during the 80's, several industrial wastes with high natural radioactivity have been used as building materials. At the same time, the energetic problems of those years obliged the population to a very drastically dwelling isolation in order to preserve the heat. These factors, in addition with other influencing parameters have been investigated.

METHOD

Measurements of indoor and outdoor radon and thoron daughters concentrations were performed in 119 Romanian dwellings, by air samping on a membrane filter, followed by repeated gross-alpha countings. Several constructive and physical parameters have been recorded: construction type (detached houses, block of flats), constructive solution design (brick work, prefabricated reinforced concrete), floor and room position, building materials used, heating systems, season, indoor and outdoor temperature, pressure and relative humidity, direction and speed of wind. Knowing the radon and thoron daughters concentrations, the Potential Alpha Energy Concentration (PAEC), the Equilibrium Equivalent Concentration (EEC), the equilibrium factor (F) and the effective dose for adults (ED) have been calculated.

RESULTS

The results obtained are presented in Tables 1,2 and 3.

<u>Table 1.</u> Dependence of the indoor Radon and Thoron daughter concentrations on constructive type, solutions and building materials

Constructive type	Constructive solution	Building material	EEC (Rn) Bq/mc		F	EEC (Tn) Bq/mc	
			g	s		g	s
Detached houses	Brick work	Brick	29.0	4.1	0.68	1.17	0.30
Block of flats	P.R.C.	Concrete	21.0	4.6	0.64	1.40	0.30
	C.R.C.	Concrete	6.3	3.9	0.50	0.80	0.31
	Brick work	Red brick	2.1	3.9	0.46	0.93	0.30

P.R.C.: Prefabricated Reinforced Concrete; C.R.C.: Casted Reinforced Concrete;
g: geometric standard deviation

Table 2. Dependence on the season; gearing of the the flat: SW

Month	Wind speed	Wind dir.	Temp. (°C)		Press (mm Hg)		Humidity%		Indoor Conc.(Bq/mc)			F
			ind	out	ind	out	ind	out	Ra A	EEC (Rn)	Th B	ind
July	0.54	NE--SW	25	25	751	752	80	85	159,6	125,9	4,3	0,72
Nov.	0.30	N-S	15	7	750	752	80	77	50,4	22,6	1,4	0,52

Table 3. Dependence on floors and indoor humidity

Floor	Wind		Temp (C)		Press. (mmHg)		Hum (%)		Flat gea-ring	Indoor Conc. (Bq/mc)			F
	speed	dir.	ind	out	ind	out	ind	out		Ra A	EEC (Rn)	ThB	ind
Ground	1.01	SE-NW	14	7	755	760	93	53	NE	104.4	62.2	1.4	0.54
Ground	0.30	NE-SW	14	6	759	760	60	53	SW	18.7	15.5	1.3	0.76
Ground	0.30	N-S	15	7	750	754	80	77	SW	50.4	29.8	1.4	0.52
2nd floor	0.30	SE-NW	14	9	760	759	85	82	SW	60.3	31.6	0.6	0.48
5th floor	0.67	SW-NE	14	12	760	749	60	56	NE	49.9	43.7	1.1	0.81
6th floor	0.20	NW-SE	16	12	760	760	80	77	SW	43.0	37.8	1.4	0.80

CONCLUSIONS

EEC (Rn) experimental values ranged from 3 to 130 Bq.m^3. The main determined influencing parameters were: ventilation rate, type of building material and indoor relative humidity. It was also pointed out that the contribution of the thoron daughters to the total ED is about 20% (2).

REFERENCES

1. UNITED NATIONS, Sources and Effects of Ionizing Radiation, Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), U.N.,New York (1993).

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