

Supplemental file S1.

Phantoms used for calibration of the whole body counter "SCRINNER-3M".

Phantoms of the human body, filled with dry radioactive filling, were created for WBC calibration. Examples of two phantoms, one of 5-year old child and one for an adult are shown in Picture 1. The set of phantoms consists of 6 phantoms (#1 through #6) with corresponding anthropometric characteristics presented in Table 1. The design of the phantoms of the human body was based on anthropometry, physiology, and chemical body composition from ICRP Publication (1).

Table 1. Anthropometric characteristics of a standard European by age group

Age, years	Weight, kg	Height, cm	Linear measurements, cm						
			Head			Trunk			Legs
			Height	Width	Thickness	Length	Width	Thickness	Length
0	3.15	52	13	9	10	23	11	10	16
1	9.11	78	16	13	14	33	16	14	29
5	18.12	111	20	13	15	45	22	15	46
10	30.57	131	22	13	16	54	28	16	64
15	53.95	165	23	14	18	65	36	18	78
Adult	69.88	174	24	14	20	70	40	20	80

The radioactive filling was made of dry peas grown in 1987 in Novozybkovsky area of Bryansk region where level of soil contamination with ^{137}Cs and ^{134}Cs was at least 500 kBq/m^2 . The proportion of ^{137}Cs and ^{134}Cs in this area is comparable to one in Chernobyl. Overall, 80 kg of peas were packed into 28 segments and assembled into 6 phantoms. These phantoms were compared with those used in other countries (2, 3).

The long term use of these phantoms of human bodies, filled with dry radioactive filling, has demonstrated high effectiveness of this method. The phantoms model the shape of the human body of different age groups well. The time of assembly of the entire set of 6 phantoms doesn't take more than 30 minutes. Phantom transportation is safe. The ratio of ^{137}Cs and ^{134}Cs is similar

to one in Chernobyl. The phantoms are suitable for calibration of whole body counters using geometry of Marinelli, “standard chair”, “lying”, etc.

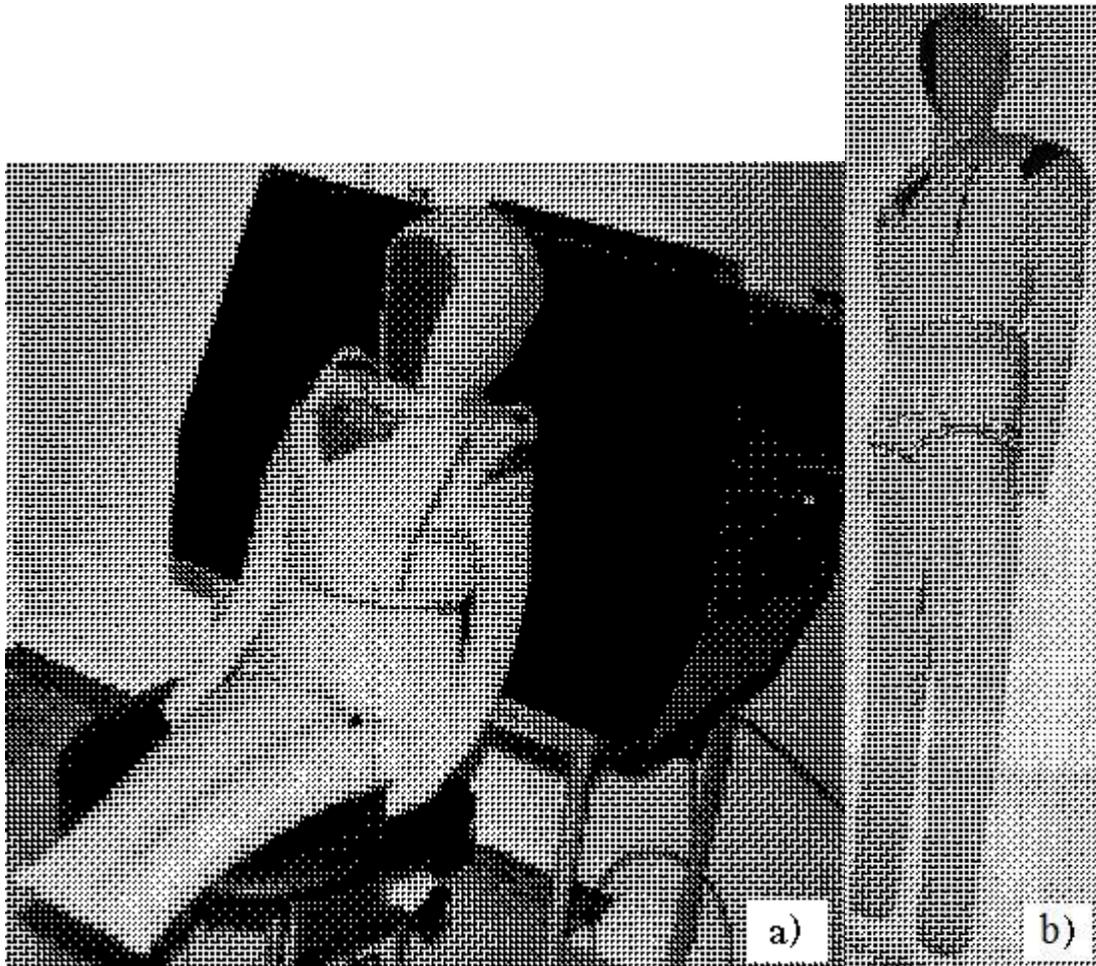


Figure 1. Phantoms of human body containing radioactive filling

- a) Phantom of 5-year old child.
- b) Phantom of an adult.

Table 2. Measurement variation for ¹³⁷Cs whole body counts in Russian-made phantom of an adult person at different institutions

Institution	Δp
ARC (Austria)	1.18
IAEA	0.85
NIRS (Japan)	1.03
JAERI (Japan)	1.03
SCRM ¹ (Ukraine)	1.00

¹Scientific Center of Radiation Medicine

Δp – The quotient between whole body count (WBC) measurements (Bq) performed using different models of whole body counters when applying the same standard Russian-made phantom. The WBC obtained using "SCRINNER-3M" at the SCRM was used as a standard and assigned the value of 1.0.

REFERENCES

1. ICRP, 1975. Report on the Task Group on Reference Man. Annals of ICRP/ICRP Publication 23: p.1-480.
2. Мониторинг индивидуальных доз облучения населения/ О.Н. Перевозников, Л. А. Литвинец, Д. В. Новак и др. //Проблемы радиационной медицины: Респ. межвед. сб., К.: Здоров'я, 1992.- Вып. 4.- С. 27-32. (Perevoznikov, O.N., Litvinets, L.A., Novak, D.V. et al. (1992)."Monitoring of individual doses of irradiation of a population". In: Problems of Radiation Medicine: National Interagency Collection.- Kiev: "Health", 1992. - Issue 4. - P.27-32 (in Russian).
3. IAEA - USSR Whole Body Counter Intercomparison/R. V. Griffith, R. Ouvrard, V. Bad'in, S. Ulanovsky, A. Kovtun, L. Litvinets, F. Steger// Proceedings of a sympos., Monreal, 20 - 25 May, 1992.