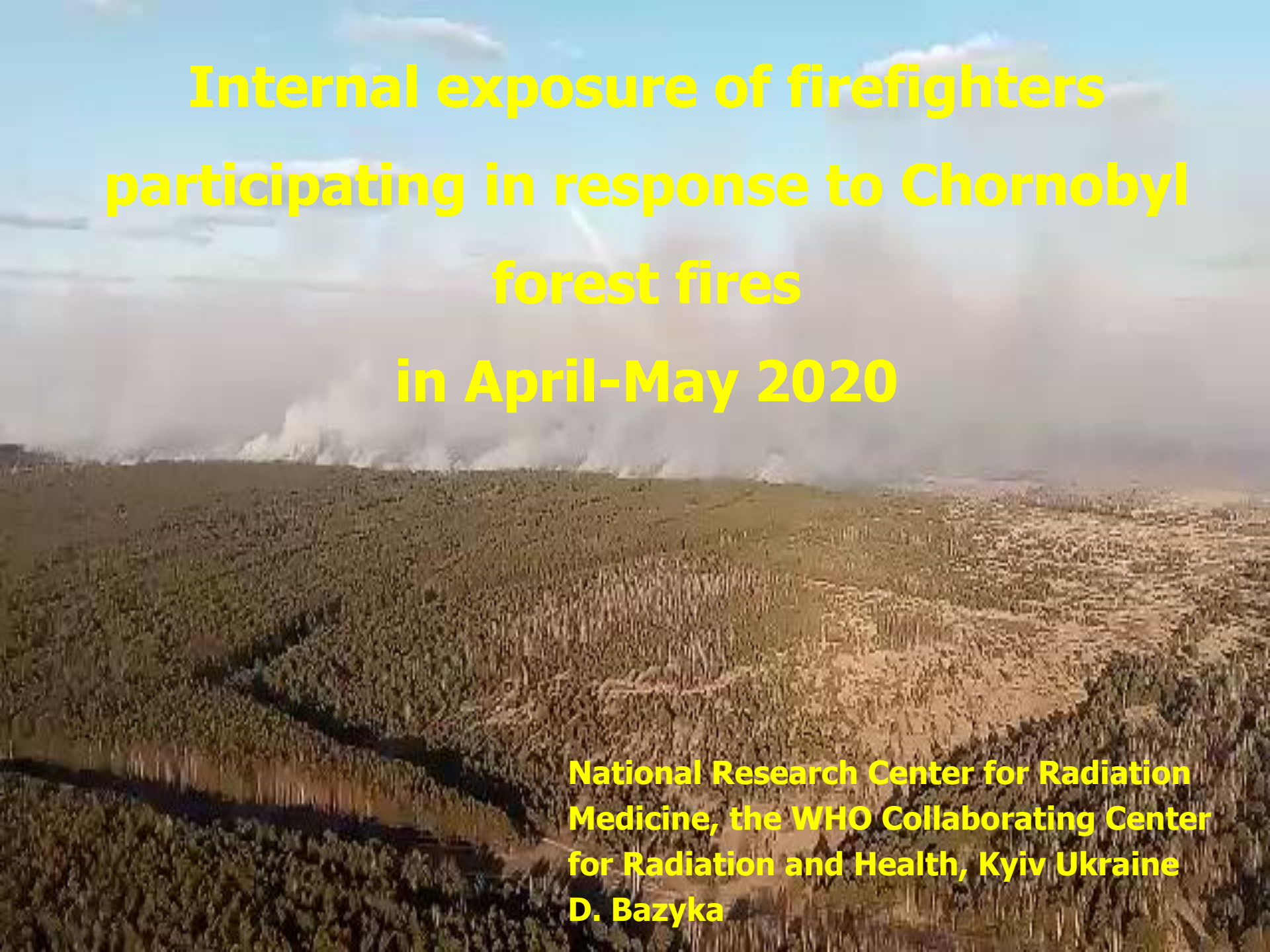
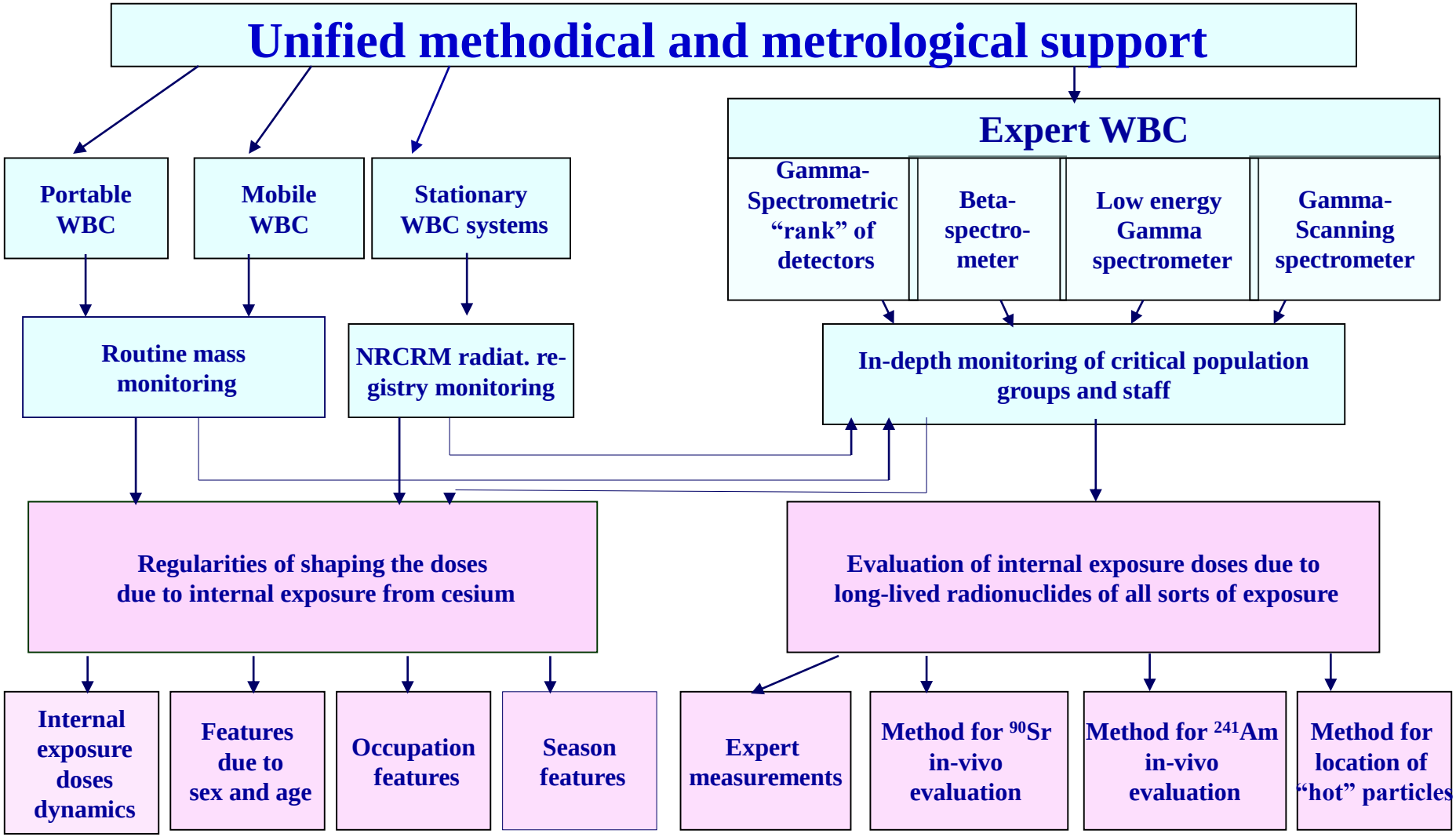


Internal exposure of firefighters participating in response to Chornobyl forest fires in April-May 2020

National Research Center for Radiation Medicine, the WHO Collaborating Center for Radiation and Health, Kyiv Ukraine
D. Bazyka


Health Risk Factors:
psychological and physical pressure,
high temperature,
smoke,
toxic compounds,
RN contamination and inhalation

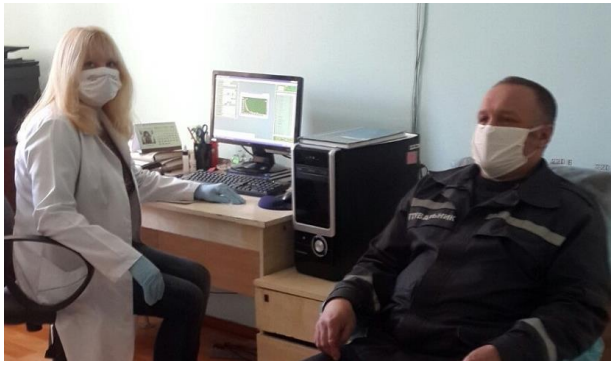
Comprehensive monitoring system of individual doses of internal exposure in the NRCRM



Created on the basis of dosimetry department of NRCRM the unified monitoring system of internal exposure provided with the software and methodical package support has been realized to two-level internal exposure doses monitoring system including whole body counters (WBCs) of different class of measurements aimed to both the current mass screening of population and advanced monitoring of critical groups, expert and metrological tasks solving

Whole body counters in the NRCRM (stationary facilities)

Screener-3M“ NaI(Tl) Ø150x100 mm^2



Screener-3M“ NaI(Tl) Ø100x100 mm^2

Expert whole body counters,
6 NaI(Tl) Ø150x100 mm^2

Alarm installation (РЗБ-05)

The main technical characteristics of the devices used for WBC monitoring

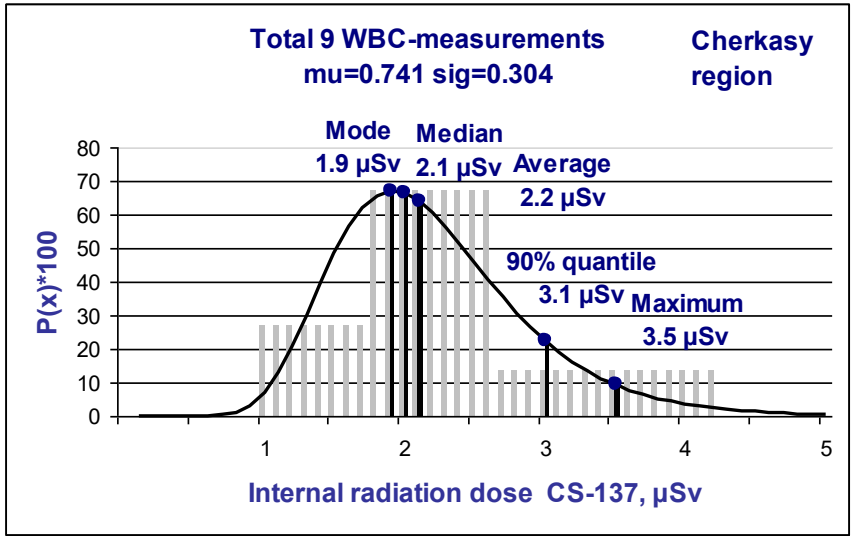
Detector	Exposition, min.	Background, ppm	MDA, кBq	Performance, persons per hour
“Screener-3M“ NaI(Tl) Ø150x100 mm	3 ÷ 10	1180	0.3*	6 ÷ 20
“Screener-3M“ NaI(Tl) Ø150x100 mm	3 ÷ 10	1450	0.5*	6 ÷ 20
Expert whole body counters 6 NaI(Tl)	10 ÷ 20	130	0.02**	3 ÷ 4
Alarm installation (РЗБ-05)	0,5 ÷ 2	10 β-particles · min^{-1} · cm^{-2}		30 ÷ 100

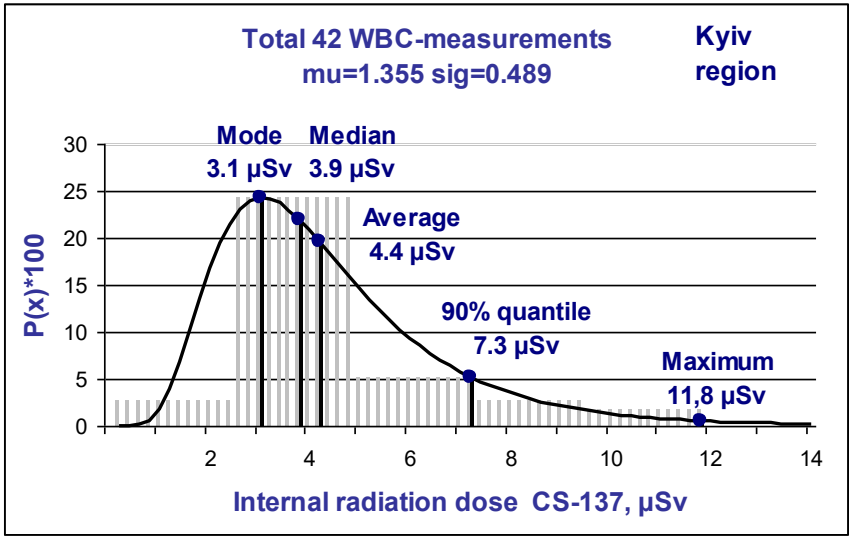
* This MDA fits with 5 minutes exposition. ** This MDA fits with 10 minutes exposition.

Results WBC-monitoring and evaluation of effective internal radiation doses from ^{137}Cs inflow during firefighting in the Chornobyl exclusion zone

Group	SES personnel	Period of involvement works in the exclusion zone	Amount of WBC measurements		Incorporated ^{137}Cs, Bq				Dose, μSv	
			total	expert. WBC	average	median	90 % quantile	max	average value	max
1	city Kyiv	04.04.2020-20.04.2020	254	26	194±157	162	347	881	2.5±1.1	5.1
2	Cherkasy region	19.04.2020 24.04.2020	104	9	136±96	132	194	221	2.2±0.6	3.5
3	Kyiv region	04.04.2020-05.05.2020	165	42	216±115	194	349	590	4.4+2.4	11.8

Statistical distribution of assessment of individual effective doses of internal irradiation due to receipt ^{137}Cs





Patient examination protocol

Национальный научный центр радиационной медицины
Национальной академии наук Украины
Лаборатория СИЧ

Швець Олександр Андрійович (Горенка) Инд. код: 0
Год рожд.: 1973 Пол: мужской Вес: 89 кг Рост 173 см

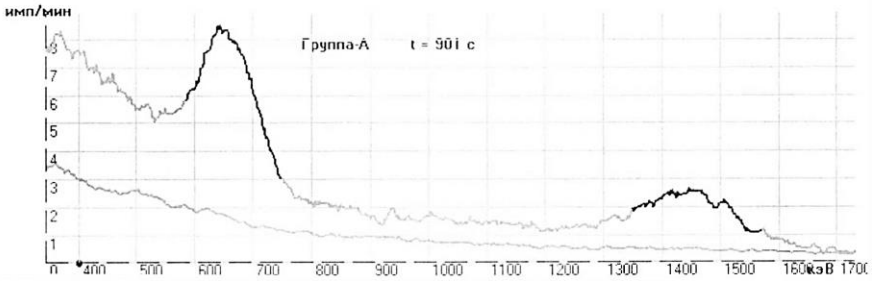
Контроль содержания радионуклидов, (МДА,Бк):
CS-137(19), K-40(140)

Результаты измерений:

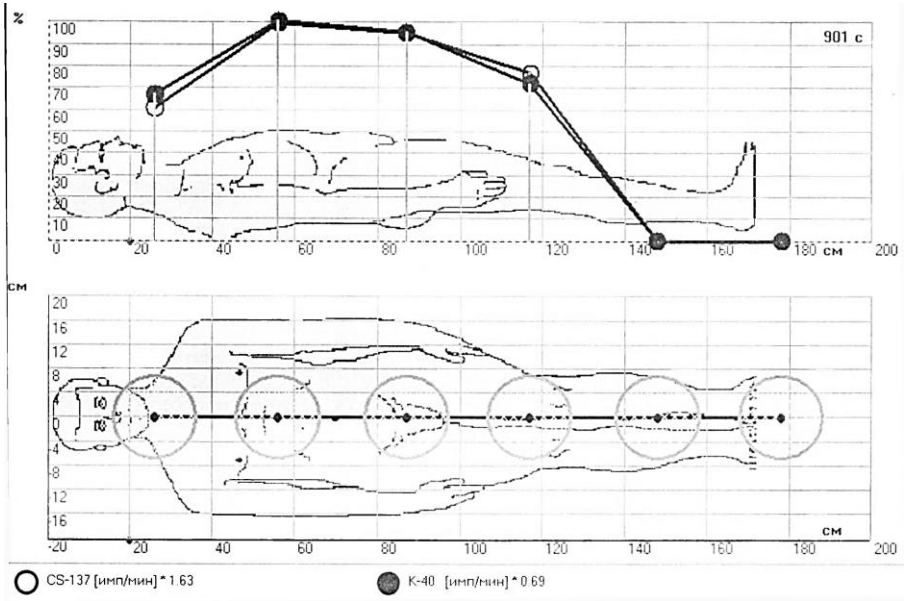
Нуклид	Содерж., Бк	Погреш., %	МДА, Бк	Net, имп/мин	*Год.доза, мЗв
CS-137	881	8.7	19	380	0.022
K-40	5003	8.9	140	182	0.158

Группа: Группа-А Время измерения: 901 с
Дата измерения: 10.04.20 Инженер 1 кат: Задорожная Г.М.

(*) характер поступления радионуклидов в организм
CS-137 - хроническое ежесуточное
K-40 - хроническое ежесуточное



Distribution of incorporated ^{137}Cs in the patient



CONCLUSIONS

- **Operational WBC monitoring results: The majority (95%) of internal ^{137}Cs exposure of personnel of the State Emergency Service of Ukraine participating in response to Chornobyl forest fires in April-May 2020 did not exceed the minimum detected dose (5 μSv -14 μSv)**

- **Expert WBC results: The individual effective dose of internal exposure of personnel of the State Emergency Service of Ukraine did not exceed 5.1 μSv in Kiev city; 3.5 μSv in Cherkasy Region; 11.8 μSv in Kiev region, which is much lower than the dose limit for the population according to the Ukrainian legislation**

- **Open problem of ^{90}Sr:**

25.04.2020 Cherkasy rescuers are returning home after a six-day firefighting in the exclusion zone. After dosimetry control in NSCRM