HEALTH AND ENVIRONMENT PROGRAMS AROUND THE CHERNOBYL EXCLUSION AREA. 

Led by Professor Yury Bandazhevsky

Speakers: 
Professor Yu. Bandazhevsky 
Associate Professor N. Dubovaya

https://chernobyl-health.org
RADIATION MONITORING
IVANKOV DISTRICT

Development, training and coordination of health-related projects.

The map of the Ivankov district terrestrial density of contamination with cesium-137 (2014)

Scale 1: 200 000
The map of the Ivankov district terrestrial density of contamination with strontium-90 (2014)
Starting with the sixties there has been a great number of Cs-137 radionuclides contents in foodstuffs consumed by the inhabitants of mentioned states within many years. (Marey A.N. and co-authors, 1974. Rusyayev A.P. and co-authors, 1974. Ternov V.I., Gurskaya N.V., 1974).

Cs-137 contents in villagers’ daily food allowance in pCi (Marey A.N. and co-authors, 1974).
Cow's milk is one of the basic products forming rather high levels of Cs-137 radionuclides contents in inhabitants of Belarus and Baltic lands. “Milk-Caesium Map” was created – the largest Cs-137 radionuclides contents were observed from 1967 to 1970 in Gomel region of the Republic of Belarus.

Cs-137 contents in cow's milk from different districts of Belarus in the sixties of the 20th century.
Radiometric examination 2014-2015 (n=3962)
- 92% less 5.0 Bq/kg
- 8% more or equal 5.0 Bq/kg
[1.98 – 307.29 Bq/kg]

Radiometric examination 2015-2016 (n=3626)
- 95.3% less 5.0 Bq/kg
- 4.7% more or equal 5.0 Bq/kg
[1.93 – 118.51 Bq/kg]

Radiometric examination 2016-2017 (n=3503)
- 96.1% less 5.0 Bq/kg
- 3.9% more or equal 5.0 Bq/kg
[1.91 – 111.48 Bq/kg]

Bandazhevsky Yu.I., Dubovaya N.F., 2017
SPECIFIC ACTIVITY
$^{137}\text{Cs}$ in the child’s body

All children

- 76.6% of children with the level of $^{137}$Cs below 5.0 Bq/kg in the body
- 23.4% of children with the level of $^{137}$Cs [6.08-307.2] Bq/kg in the body

CONTENT Cs-137 IN THE PLACENTA OF IVANKOV’S DISTRICT WOMEN WHICH HAS GIVEN BIRTH CHILDREN PER 2015-2017, (n = 400)

Removal of timber from the Exclusion Zone (Ivankov District)

<table>
<thead>
<tr>
<th></th>
<th>Cs-137</th>
<th>Sr-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>38.0 – 2 548.0 Bq/kg</td>
<td>670.0 – 11 000.0 Bq/kg</td>
</tr>
</tbody>
</table>

The territory contaminated with radionuclides

Trees containing radionuclides

Burning of wood in stoves of houses of inhabitants of Ivankov and Polesie districts

Soil of vegetable gardens

Ash containing radionuclides

Vegetables, berries and fruits containing radionuclides

INCORPORATION OF RADIONUCLIDES INTO HUMAN ORGANS

PATHOLOGICAL CHANGES IN ORGANS AND SYSTEMS

THE HEALTH OF CHILDREN
### Monitoring

<table>
<thead>
<tr>
<th>Year</th>
<th>Monitoring</th>
<th>Examined of Children</th>
<th>Examined of Pregnant Woman</th>
</tr>
</thead>
<tbody>
<tr>
<td>THE FIRST YEAR</td>
<td></td>
<td>3812</td>
<td>188</td>
</tr>
<tr>
<td>THE SECOND YEAR</td>
<td></td>
<td>3500</td>
<td>262</td>
</tr>
<tr>
<td>THE THIRD YEAR</td>
<td></td>
<td>3350</td>
<td>189</td>
</tr>
</tbody>
</table>

*Bandazhevsky Yu. I., Dubovaya N. F. (2017)*
Cs-137 radionuclides under conditions of permanent chronic intake by people with food are accumulated in vitally important organs: thyroid gland, heart, kidneys, spleen, cerebrum, and degree of expressiveness of incorporation is various.

1 – myocardium, 2 – brain, 3 – liver, 4 – thyroid gland, 5 – kidneys, 6 – spleen, 7 – skeletal muscles, 8 – small intestine.

NOMBRE D’ENFANTS SANS MODIFICATIONS DE L’ECG, FONCTION DU NIVEAU DE CONCENTRATION DU CS-137 DANS L’ORGANISME


DISTRIBUTION OF ADOLESCENTS WITH IDENTIFIED DISORDERS OF THE CARDIOVASCULAR SYSTEM AS A RESULT OF THE ECG DIAGNOSIS (POLESIE AND IVANKOV DISTRICTS OF KYIV REGION), %

- ECG with the revealed infringements: 82.6%
- Without ECG revealed infringements: 17.4%

THE STRUCTURE OF CARDIAC DISORDERS IN EXAMINED CHILDREN FROM POLESIE AND IVANKOV DISTRICTS, %

- The short PQ syndrome (22.4%)
- The moderate changes in the ventricular myocardium (19.3%)
- Wandering atrial pacemaker (17.8%)
- Ectopic atrial rhythm (14.2%)
- Incomplete right bundle branch block (9.6%)
- The early ventricular repolarization syndrome (7.5%)
- Sinus bradycardia (4.7%)
- Sinus tachycardia (3.4%)
- Irregular sinus rhythm (2.4%)

THE SEX AND AGE DISTRIBUTION OF EXAMINED CHILDREN FROM POLESIE AND IVANKOV DISTRICTS WITH DIAGNOSED EVRS (IN % TO THE NUMBER OF CHILDREN IN THE RELEVANT AGE GROUPS).

![Bar chart showing the sex and age distribution of children from Polesie and Ivankov districts with diagnosed EVRS.](chart.png)

**Note:** * - p <0.05 compared with the age group of 3-6 years.

DISTRIBUTION OF THE EXAMINED CHILDREN FROM IVANKOV AND POLESIE DISTRICTS BY ABP LEVELS, %

- 65.6% ABP within the norm values
- 34.4% ABP with deviations from the norm
- 15.6% ABP above the age norm
- 18.8% ABP below the age norm

### The Age Distribution of Examined Children with Elevated and Lowered Arterial Blood Pressure (in % of the Total Number of Children in the Age Group)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Incidence of Elevated ABP</th>
<th>Incidence of Lowered ABP</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-6 years</td>
<td>8.5%</td>
<td>33.3**</td>
</tr>
<tr>
<td>7-11 years</td>
<td>7.9%</td>
<td>18.4</td>
</tr>
<tr>
<td>12-17 years</td>
<td>7.9%</td>
<td>18.4</td>
</tr>
</tbody>
</table>

**Note:**
* - $p < 0.05$ compared with the age group of 3-6 years;
** - $p < 0.05$ compared with the age group 7-11 years and 12-17 years.

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MORBIDITY OF THYROID CANCER IN THE POPULATION OF THE KYIV REGION (PER 100 000 OF POPULATION)

Source: National Cancer Registry of Ukraine.

The preliminary analysis of children health results has showed that a significant part of children exhibits reduced indices of physical development, cardiac abnormalities (81.9% of the examined children according to data of the electrocardiographic examination), metabolism disorders, and in some cases, hyperplastic processes in the thyroid gland (6.7%).
FUNCTIONAL DISTURBANCES OF THE THYROID GLAND IN CHILDREN OF IVANKOV AND POLESSIE DISTRICTS

All children

- 60.8% Norm
- 39.2% Functional disorders of the TG

Boys

- 51.1% Norm
- 48.9% Functional disorders of the TG

Girls

- 70.3% Norm
- 29.7% Functional disorders of the TG

PATHOLOGICAL CHANGES IN THE LIVER OF CHILDREN ACCORDING TO ULTRASOUND DIAGNOSIS

- Absence of pathological changes in the liver
- Pathological changes in the liver

NORMAL

IN CASE OF DEVELOPMENT HYPOTHALAMIC SYNDROME
THE CONTENT OF NEUROACTIVE COMPOUNDS IN CEREBRAL HEMISPHERES OF RATS AFTER 28 DAYS OF INTAKE OF RADIONUCLIDES WITH FOOD*

INDICATORS OF DOPAMINE (NMOL/DAY) IN ADOLESCENTS IN KYIV AND ELSEWHERE IN THE KYIV REGION CONTAMINATED WITH RADIONUCLIDES

Dr. Viktoriia Pylypenko (2017)
GENETIC CHANGES AND METABOLISM
GENES OF FOLATE CYCLE

**MTHFR** - METHYLENETETRAHYDROFOLATE REDUCTASE

**MTR** - $B_{12}$-DEPENDENT METHIONINE SYNTHETASE

**MTRR** - METHIONINE SYNTHASE REDUCTASE
RECORDED POLYMORPHISMS

MTHFR : A 1298 C

MTHFR : C 677 T

MTR : A 2756 G

MTRR : A 66 G
THE FREQUENCY OF FOLATE METABOLISM GENE POLYMORPHIC ALLELES (FMGPA) IN EXAMINED CHILDREN, (%)

Boys and girls

- 31.3%
- 3.5%
- 3.0%
- 19.4%
- 42.8%

HYPERHOMOCYSTEINEMIA IS INFRINGEMENT METABOLISM METHIONINE AND FOLATE CYCLE FUNCTIONING

HYPERHOMOCYSTEINEMIA AT CHILDREN –
> 10.0 micromol/l
Among all the children studied

- **Norm**: 75.3%
- **Hyperhomocysteinemia**: 24.7%

Boys

- **Norm**: 86.5%
- **Hyperhomocysteinemia**: 13.5%

Girls

- **Norm**: 63.5%
- **Hyperhomocysteinemia**: 36.5%

**Hyperhomocysteinemia in Children of the Ivankov and Polesie Districts**

*Bandazhevsky Yu. I., Dubovaya N. F. (2017)*
EFFECTS OF HYPERHOMOCYSTEINEMIA

Trombotic vascular disease

- Heart attack
- Infarction
- Apoplexy
- Venous thromboembolism
- Atherosclerosis

Microthrombogenesis

- Infringement of the uterine and feto-placental circulation

Infertility, Incomplete pregnancy

Congenital Malformations (Neural tube defects)

Mental disorders, Depression

Oncological disease

INDICATORS OF GENERAL MORTALITY RATE (PER 1000 OF POPULATION) IN THE IVANKOV DISTRICT AND THE KYIV REGION (1961-2016)

*MSource: Data from the State Department of Statistics of Ukraine.*

*Bandazhevsky Yu. I., Dubovaya N. F. (2017)*
HYPERGOMOCYSTEINEMIA IN GIRLS WITH GENETIC POLYMORPHISM MTHFR: C 677 T

**MTHFR : 677 TT**
- Norm: 86.5%
- Hyperhomocysteinemia: 13.5%

**MTHFR : 677 CT**
- Norm: 67.2%
- Hyperhomocysteinemia: 32.8%

*Bandazhevsky Yu. I., Dubovaya N. F. (2017)*
STANDARDIZED (ON THE WORLD POPULATION STANDARD) MORBIDITY INDICATORS OF BREAST CANCER IN UKRAINE AND IN RADIOACTIVE CONTAMINATED REGIONS


The absence of specific activity with hyperhomocysteinemia Cs-137 in the body 6.8-140.29 Bq/kg

The absence of hyperhomocysteinemia at infringement of the thyroid

Hyperhomocysteinemia in specific activity of Cs-137 in the body 6.8-140.29 Bq/kg

Hyperhomocysteinemia at infringement of the thyroid

The absence of hyperhomocysteinemia with a deficiency of folic acid

Hyperhomocysteinemia with a deficiency of folic acid

Specific activity in the body\textsuperscript{137}Cs from 6.8 to 140.26 Bq/kg

Thyroid disorders

A disadvantage of folic acid in the body

Boys

Girls

INCREASING OF FREQUENCY CHANGE OF HOMOCYSTEINE CHILDREN FROM IVANKOV AND POLESIE REGION BEFORE AND AFTER FIRES 2015

Of the 84 persons level of homocysteine increased after fires in 66 children.

- Increased of homocysteine in children after the fires in 2015
- The absence of increase of homocysteine

HYPERHOMOCYSTEINEMIA IN EXAMINATION OF CHILDREN FROM POLESIE REGION

Examination of 02.04.2015

- 42,9%
- 57,1%

The absence of hyperhomocysteinemia

Examination of 18.12.2015

- 20,2%
- 79,8%

The absence of hyperhomocysteinemia

BURNING OF FOREST IN THE ZONE OF RADIOACTIVE CONTAMINATION

AIR WITH RADIONUCLIDES

RADIONUCLIDES IN CHILDREN’S AND ADULT’S ORGANISM

METABOLIC DISORDERS, HYPERHOMOCYSTEINEMIA, PATHOLOGICAL CHANGES IN ORGANS AND SYSTEMS

CAUSES OF HYPERHOMOCYSTEINEMIA

Genetic changes in folate cycle

Radiation factor

The deficit of B12, B6, folic acid

Chronic renal failure

Reception of medical products

Use alcohol, coffee, tobacco smoking

Hypothyroidism

THE INFORMATION AND CONSULTATION CENTER ON FOOD HYGIENE AT IVANKOV HOSPITAL - THE MAIN LINK IN THE PREVENTION OF DISEASES RELATED TO EXPOSURE TO RADIOACTIVITY
THE CONTRIBUTION OF FOOD TO THE FORMATION OF INTERNAL EXPOSURE DOSES OF THE UKRAINE’S POPULATION

Milk – 45 %
Fish – 1%
Bread, flour, cereals – 4 %
Vegetables – 6 %
Potatoes – 6 %
Meat – 8 %
Mushrooms and berries – 30 %

Sale of mushrooms by local residents gathered in the forests of Ivankov district

CONTENTS OF $^{137}\text{Cs}$ IN FRESH WILD MUSHROOMS IN IVANKOV DISTRICT OF KYIV REGION

*THE AVERAGE AND MAXIMUM LEVELS OF CONTAMINATION CESIUM-137 BUSHMEAT, Bq/kg*

- **Hare Meat**
  - Average: 19 Bq/kg
  - Maximum: 25 Bq/kg
  - Sample Size: 2154

- **Reindeer Meat**
  - Average: 21 Bq/kg
  - Maximum: 18840 Bq/kg
  - Sample Size: 507

- **Roe Deer Meat**
  - Average: 389 Bq/kg
  - Maximum: 389 Bq/kg
  - Sample Size: 199

- **Moose Deer Meat**
  - Average: 300 Bq/kg
  - Maximum: 300 Bq/kg
  - Sample Size: 199

- **Wild Boar Meat**
  - Average: 18840 Bq/kg
  - Maximum: 18840 Bq/kg
  - Sample Size: 1416

- **Beaver Meat**
  - Average: 997 Bq/kg
  - Maximum: 997 Bq/kg
  - Sample Size: 997

*References*

CONTENTS OF $^{137}$CS IN MILK IN IVANKOV DISTRICT OF KIEV REGION

Average value
Maximum value

Bq/l

Permissible level

Social and economic crisis

The population living on the radioactive contaminated territory

Consumption of low quality products containing radionuclides

Deficiency of vitamins, macro- and micronutrients in the body of children and adults

Metabolic disorders, hyperhomocysteinemia

SPECIFIC ACTIVITY $^{137}$Cs IN THE CHILD’S BODY (POLESIE AND IVANKOV DISTRICTS)

POLESIE DISTRICT

- $\%$ of children with the level of Cs-137 [6.08-307.2] Bq/kg in the body: 65.9%
- $\%$ of children with the level of Cs-137 below 5.0 Bq/kg in the body: 34.1%

IVANKOV DISTRICT

- $\%$ of children with the level of Cs-137 [6.64-90.71] Bq/kg in the body: 85.6%
- $\%$ of children with the level of Cs-137 below 5.0 Bq/kg in the body: 14.4%

INCIDENCE OF HYPERHOMOCYSTEINEMIA IN GROUPS EXAMINED CHILDREN

POLESIE DISTRICT

- The absence of hyperhomocysteinemia: 46.8%
- Hyperhomocysteinemia: 53.2%

IVANKOV DISTRICT

- The absence of hyperhomocysteinemia: 67.4%
- Hyperhomocysteinemia: 32.6%

THE INCIDENCE OF THYROID DISORDERS IN THE GROUP OF SURVEYED CHILDREN

IVANKOV DISTRICT, density of soil contamination Cs-137 < 2 Ci/km²

<table>
<thead>
<tr>
<th>Without thyroid disorders</th>
<th>With thyroid disorders</th>
</tr>
</thead>
<tbody>
<tr>
<td>67.6%</td>
<td>32.4%</td>
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POLESIE DISTRICT, density of soil contamination Cs-137 < 2 Ci/km²

<table>
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<th>With thyroid disorders</th>
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<tbody>
<tr>
<td>43.0%</td>
<td>57.0%</td>
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IVANKOV DISTRICT, density of soil contamination Cs-137 > 2 Ci/km²

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<th>With thyroid disorders</th>
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<tr>
<td>46.5%</td>
<td>53.5%</td>
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</tbody>
</table>

THE INCIDENCE OF REDUCING THE CONCENTRATION OF T4 IN BLOOD SERUM OF CHILDREN SURVEYED GROUP

IVANKOV DISTRICT, density of soil contamination Cs-137 < 2 Ci/km²
- 80,4%
- 19,6%

POLESIE DISTRICT, density of soil contamination Cs-137 < 2 Ci/km²
- 31,0%
- 69,0%

IVANKOV DISTRICT, density of soil contamination Cs-137 > 2 Ci/km²
- 62,8%
- 37,2%

P < 0,05

DISTRIBUTION OF THYROID DISORDERS IN CHILDREN SURVEYED GROUPS BY SEX

The frequency of cases, %

<table>
<thead>
<tr>
<th>Polesie district, Cs-137 &lt; 2 Ci/km²</th>
<th>Ivankov district, Cs-137 &lt; 2 Ci/km²</th>
<th>Ivankov district, Cs-137 &gt; 2 Ci/km²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls 39.1</td>
<td>Boys 60.9</td>
<td>Girls 35.9</td>
</tr>
<tr>
<td>Girls 60.9</td>
<td>Boys 64.4</td>
<td>Boys 60.9</td>
</tr>
</tbody>
</table>

FREQUENCY OF CHILDREN WITH VITAMINS LEVEL IN BLOOD BELOW PHYSIOLOGICAL VALUES

Ivankov district
- Vitamin B12: 4.4%
- Vitamin B9: 16.2%

Polesie district
- Vitamin B12: 8.8%
- Vitamin B9: 25.5%

INFORMATION AND CONSULTATION CENTER FOR HYGIENE AND NUTRITION

FORMS OF INFORMATION ACTIVITIES

- SCIENTIFIC AND PRACTICAL COLLECTION «CHERNOBYL: ECOLOGY AND HEALTH»
- ARTICLES IN SCIENTIFIC PUBLICATIONS
- PREPARATION OF INFORMATION BROCHURES, BOOKLETS, LEAFLETS AND OTHER PRINTED MATTER
- INTERACTION WITH THE MEDIA (Publications in local newspapers, magazines, radio and television performances)
- VERBAL INFORMATION (information meetings, lectures, conferences, etc.)
- SITE
- TRAINING
- CREATION OF VIDO-MATERIALS
- GROUP AND INDIVIDUAL CONSULTATION OF RESIDENTS
- QUESTIONING OF THE POPULATION
- ANALYSIS OF THE EFFECTIVENESS OF PUBLIC AWARENESS
- ORGANIZATION OF INTERNATIONAL HUMANITARIAN ASSISTANCE

Bandazhevsky Yu.I., Dubovaya N.F., 2017
I THE NAME OF THE FUTURE

CREATING A MODERN MAP OF RADIOACTIVE CONTAMINATION OF IVANKIV DISTRICT

In the framework of the project for the first time, a modern map of radioactive contamination of Ivankiv district on the basis of the analysis of soil samples and built contamination density map 90 Sr and 137 Cs study area (scale 1: 200,000, 1: 50,000).

PROFESSOR YURI BANDAZHEVSKY: RADIATION IN BELARUS APPEARED LONG BEFORE THE CHERNOBYL
To a question!

Nutrition largely determines the state of human health.

Ukraine remains one of the few in Europe, where there is no national program aimed at solving the problems of nutrition of the population.

It is worth mentioning that in Ukraine there are less than 100 certified nutritionists.

Bandazhevsky Yu.I., Dubovaya N.F., 2017
LECTURES ARE CONDUCTED BY EXPERTS OF THE PROJECT – DOCTORS OF MEDICAL SCIENCES
Yu.I. Bandazhevsky, N.F. Dubovaya

Protection of human health in terms of radiation pollution.

The participants of the project published 71 scientific publications for the period 2013-2017.

**Among them:**
5 monographs (2 in Japan, 1 in Germany, 2 in Ukraine);
1 patent,
1 information sheet.
TO INFORM THE POPULATION OF IVANKIV AND POLESIÉ DISTRICTS, THE CENTER HAS PRODUCED VIDEO MATERIALS
Children in a school dining room
(Radynka village, Polesie district)

DISTRIBUTION OF CHILDREN WITH DIFFERENT LEVELS OF $^{137}$Cs CONTENT IN THE ORGANISM (2014-2017)

I - Radiometric examination 2014-2015
II - Radiometric examination 2015-2016
III - Radiometric examination 2016-2017

Bandazhevsky Yu.I., Dubovaya N.F., 2017
THANK YOU FOR ATTENTION