

# Thyroid Doses from External Gamma-exposure following the Chernobyl Accident

Sergey Tretyakevich<sup>\*1</sup>, Tatyana Kukhta<sup>2</sup>, Victor Minenko<sup>2</sup>, Vladimir Drozdovitch<sup>3</sup>, Nickolas Luckyanov<sup>3</sup>, Paul Voillequé<sup>4</sup>, Yury Gavrilin<sup>5</sup>, Valeri Khrouch<sup>5</sup> and Sergey Shinkarev<sup>5</sup>

<sup>1</sup>*International Sakharov Environmental University, Minsk, Belarus*

<sup>2</sup>*Belarusian Medical Academy of Continuing Education, Minsk, Belarus*

<sup>3</sup>*Division of Cancer Epidemiology and Genetics, National Cancer Institute, National Institutes of Health, Department of Health and Human Services, Bethesda, USA*

<sup>4</sup>*MJP, Risk Assessment, Inc., Denver, USA*

<sup>5</sup>*State Research Center – Institute of Biophysics, Ministry of Health, Moscow, Russia*

## Abstract

An increase of thyroid cancer incidence among children in Belarus has been observed after the Chernobyl accident. The main contributor to the thyroid dose was caused by <sup>131</sup>I intake with fresh milk in 1986. Other contributions to the thyroid dose (external gamma-exposure, short-lived iodine isotopes, internal radiocesium) were small in comparison to the dose from <sup>131</sup>I intakes soon after the accident. However, exposures to external radiation continued for a number of years after the accident.

Thyroid doses from external gamma-exposure following the Chernobyl accident were mainly caused by gamma-exposure to 24 nuclides: <sup>95</sup>Zr, <sup>95</sup>Nb, <sup>99</sup>Mo, <sup>99m</sup>Tc, <sup>103</sup>Ru, <sup>103m</sup>Rh, <sup>106</sup>Ru, <sup>125</sup>Sb, <sup>125m</sup>Te, <sup>131m</sup>Te, <sup>131</sup>I, <sup>132</sup>Te, <sup>132</sup>I, <sup>133</sup>I, <sup>135</sup>I, <sup>134</sup>Cs, <sup>136</sup>Cs, <sup>137</sup>Cs, <sup>140</sup>Ba, <sup>140</sup>La, <sup>141</sup>Ce, <sup>144</sup>Ce, <sup>144</sup>Pr, <sup>239</sup>Np. Data of personal interview were used to take into account the personal residence history for the time elapsed from the Chernobyl accident until the interview (10 to 15 years later). Cumulative thyroid doses caused by external gamma-exposure during the passage of the radioactive cloud and from the ground contamination following the Chernobyl accident have been reconstructed.

The median thyroid dose from external gamma-exposure to ~11,770 cohort members of an epidemiological study was estimated to be ~6 mGy. There are ~3,400 persons with external dose estimates that exceed 20 mGy. Exposure from radionuclides deposited on the ground was the main source of external dose. The contribution from the passing radioactive cloud to external dose was found to be negligible.

**KEYWORDS:** *Chernobyl; thyroid; external; dose*

---

\* Sergey Tretyakevich, E-mail: tretss@tut.by