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**INTERNATIONAL PROGRAMME ON HEALTH EFFECTS
OF THE CHERNOBYL ACCIDENT
(IPHECA)**

**REPORT OF THE EXPERT MEETING
ON THYROID CANCER AFTER THE CHERNOBYL ACCIDENT**

KIEV, UKRAINE, 18-21 OCTOBER 1993

GENEVA 1994



**WHO INTERNATIONAL PROGRAMME ON THE HEALTH
 EFFECTS OF THE CHERNOBYL ACCIDENT (IPHECA)**

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 after the Chernobyl Accident**

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1. INTRODUCTION

In the Spring of 1991, the World Health Organization launched the International Programme on the Health Effects of the Chernobyl Accident (IPHECA) which is being implemented in the three most affected countries, Belarus, Russia and Ukraine. An important expected result of IPHECA is "improved understanding of the role of radiation and other factors in the onset and development of thyroid malignancies and other pathological states". (Technical Description of IPHECA, PEP/91.12, Geneva). This subject was addressed in a pilot project of IPHECA named "Thyroid". In accordance with the plan for implementation of that project in 1993, WHO convened this meeting.

2. OBJECTIVES

The purpose of the meeting was "to analyze data available at present on the detection of thyroid carcinoma, especially in children, its incidence rates, advanced diagnostics, treatment and possible association with radiation exposure". On the basis of this information provided through review reports from the three affected countries and ensuing discussions involving international experts, recommendations had to be made on further research needed to fill gaps in our present knowledge. It should be noted that a review of the implementation of IPHECA or its project Thyroid was not part of the purpose of the meeting.

3. COURSE OF THE MEETING

The meeting was hosted by the Research Institute of Endocrinology and Metabolism, Kiev, Ukraine. A list of those attending the meeting is attached (Annex I). The agenda is given in Annex II.

The meeting opened with introductory addresses by Dr Napalkov and Dr Riaboukhine of the WHO and Dr Tronko, Head of the Institute of Endocrinology and Metabolism. Drs Tsyb, Kazakov, Tronko and Riaboukhine chaired the meeting on 4 consecutive days. Drs Nagataki and Markov served as rapporteurs for the English and Russian minutes. The role of IPHECA and its pilot project Thyroid in the studies on thyroid cancer was presented by Dr Riaboukhine (see attached abstract in Annex III) and was discussed. Data relevant to the problem and derived from studies supported by a number of national and international agencies were then presented in 9 review talks, each followed by a discussion. Two visits to the laboratories and clinics of the Institute were then made with demonstration of patients, clinical facilities, laboratory techniques and histological material.

Summaries of the review presentations follow. Author abstracts for each presentation are attached in Annex III.

Dr N.D. Tronko reviewed the situation in the Ukraine, presenting evidence on the rise of the frequency of thyroid carcinoma in children and teenagers. The frequency was between 8 and 16/year throughout the Ukraine for the period of 1981-1985 and rose to 62/year in 1992. He showed data on the geographical and age distribution of the tumours and the rates in different parts of the country. In particular, the incidence rate rose to 2.45/100,000 in Kiev oblast. These data are being compiled in a specialized registry.

Dr V.I. Shatilo presented data on the numbers of thyroid cancers in Zhitomir oblast and Dr V.B. Voinolovich on those numbers in Chernigov oblast. Both contributions compared the frequencies of thyroid carcinoma in children and adolescents in different raions, again with details of numbers, ages, and relationships to areas of different fallout.

Dr G.M. Gulko characterized the doses to the thyroid received by members of the population in the Ukraine, describing dose reconstruction methods, the source of radiation, the numbers of people in whom direct radioactivity measurements had been made and the relationship of the reconstructed doses to the prevalence of thyroid cancer.

Dr L.N. Astahova described the investigation on thyroid cancer among children and adolescents in Belarus giving details of the algorithm used for preoperative diagnosis. She gave information on the distribution of the fallout and the numbers of cases of thyroid carcinoma detected in both children and adults. In adults the numbers of thyroid carcinoma had more than doubled between 1986 and 1992. In contrast the numbers in children had risen from 2 to 65/year. Details of the ultrasound characteristics of the lesions and the results of immunological investigations were given.

Dr E.P. Demidchik presented data on the geographic and age distribution of all cases of thyroid carcinoma in children in Belarus and on the TNM status of those cases. He also described the histological types and the treatment of thyroid carcinoma in children including the techniques used in surgery.

Dr A.E. Okeanov described the organization of the cancer registry in Belarus and evaluated the reliability of the data collected. He presented evidence on the definite increase of thyroid carcinoma incidence with time both in adults and children giving regression coefficients and statistical evaluation.

Dr E.M. Parshkov presented results on screening of about 30,000 children in six raions of Bryansk and Kaluga oblasts. Radiological characteristics of contaminated areas were also provided. Pathological changes in the thyroid were sought through general examination by endocrinologists, analysis for TSH, FT4 and TgAB, and ultrasound imaging. Three cases of thyroid cancer, about a hundred nodules and cysts, and 9 cases of clinically verified autoimmune thyroiditis were detected. Based

on laboratory findings, an appreciable group of children was identified with an enhanced risk of thyroid pathology. These children are under surveillance and get treatment if needed. Besides, a group at risk was identified with whole-body contents of Cs-137 higher than 10 kBq.

Dr V.V. Dorohov reported results on the thyroid morbidity in Bryansk oblast with particular reference to thyroid hyperfunction. He described a variable incidence of the thyroid carcinoma in adults and three cases of thyroid carcinoma in children, all occurring since 1992.

4. CONCLUSIONS AND RECOMMENDATIONS

It was reported at the meeting that there has been a very considerable and continuing increase in the number of cases of thyroid carcinoma in children in Belarus, 11 in the three years from 1986 to 1988 and 154 in the three years from 1991 to 1993 in a population of about 2.5 million children. A lesser increase has been reported in the Ukraine, rising from an average of 4 to 5 cases per year pre-Chernobyl to 45 in 1992 in a population of about 12 million children. The increase reported in Russia is very small or absent among children but it has been observed in adults. There has also been an increase in the number of thyroid carcinomas reported in adults in Belarus, Ukraine but this is relatively much less than that in children. It is important that the international scientific community recognized the gravity of the issues involved and that studies should be carried out to determine the origin of the cases of thyroid carcinoma occurring in the areas affected by fallout in the three countries concerned. The invited experts from outside CIS recommended that:

1. Long-term epidemiological studies should be established to determine the frequency of occurrence of thyroid tumours. These should include case control studies and other epidemiological investigations such as studies of one or more cohorts of children from areas exposed to high levels of radioactive iodine and appropriate control cohorts. The size of the cohorts should be based upon statistical projections of the numbers needed to give a reliable result.
2. Children in whom reliable direct measurements of thyroid radioactivity were carried out shortly after the accident should be monitored regularly to determine the relationship between thyroid dose and tumour development.
3. Dosimetric investigations of individual patients should be carried out. These should include dose reconstruction studies and assessment of radiation dose derived from biological measurements.
4. The importance of dietary iodide intake and other possible environmental factors which might modify the incidence of thyroid tumours should be evaluated so that they can be taken into account in studies of causation.

5. The occurrence of hypothyroidism, autoimmune thyroid disease and other possible effects of radiation on the thyroid should be monitored.
6. Accurate pathological diagnosis of thyroid tumours using modern techniques and classification should be continued and encouraged and should form the basis of complete registry coverage of Belarus, Ukraine and the relevant areas of the Russian Federation. Cooperation between the registries should be encouraged.
7. Molecular biological studies of tumours from exposed and unexposed individuals should be carried out.
8. Consideration should be given to studies of possible preventive measures that could reduce the development of thyroid tumours. Areas with iodine deficiency should have this corrected and the effects of such correction monitored.
9. Some of the above objectives may already be, in whole or in part, in progress through the efforts of several groups. Competition between different agencies should be avoided and cooperation encouraged.
10. Cooperation between the three affected countries and the international scientific community in the study of the effects of the Chernobyl accident must be encouraged.

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ANNEX II

International Programme on the Health Effects of the Chernobyl Accident

Expert Meeting on Thyroid Cancer after the Chernobyl Accident
(Kiev, 18-21 October 1993)

Agenda

Monday, 18 October

- 0900 Dr N.P. Napalkov (WHO) - Opening of the meeting
- 0905 Welcome address on behalf of the Ministry of Health of Ukraine, the Ukrainian health authorities and the hosting institution
- N.D. Tronko (Director of the Research Institute of Endocrinology and Metabolism)
- 0920 Election of Chairman and Rapporteurs
- 0930 The role of IPHECA and its pilot project "Thyroid" in studies of thyroid cancer.
- I. Riaboukhine, WHO
- 1010 Discussion
- 1030 Coffee/tea break
- 1045 Changes of incidence over time and clinico-morphological characteristics of thyroid cancer in children and adolescents in Ukraine following the accident at the Chernobyl Nuclear Power Plant.
- N.D. Tronko
- 1145 Discussion
- 1230 Lunch
- 1400 Some issues of the condition of the thyroid in inhabitants of the Zhitomir oblast affected by the accident at the Chernobyl Nuclear Power Plant.
- V.I. Shatilo

1440 Discussion

1500 The prevalence of thyroid cancer in the children of Chernigov Oblast.

V.B. Voinolovich

1540 Discussion

1600 Coffee/tea break

1614 Doses of irradiation of the thyroid gland among the population of Ukraine.

- G.M. Gulko

1715 Discussion

1800 Closure of the session

Tuesday, 19 October

0900 The detection and diagnosis of nodular pathology of the thyroid gland among children in Belarus following the accident at the Chernobyl Nuclear Power Plant.

- L.N. Astahova

1000 Discussion

1045 Coffee/tea break

1100 Features of the clinical course and surgical treatment of thyroid cancer in children.

- E.P. Demidchik

1200 Discussion

1230 Lunch

1400 The proportion of thyroid cancers among malignant neoplasms in Belarus.

- A.E. Okeanov

1440 Discussion

1500-1800 Visit to laboratories of the Research Institute of Endocrinology and Metabolism (laboratory tests, tissue specimen, etc.)

Wednesday, 20 October

0900 Problems in the study of thyroid pathology in the Bryansk oblast.

- V.V. Dorohov

1000 Discussion

1045 Coffee/tea break

1100 Morphology and function of the thyroid gland in children and adolescents living in the contaminated area of Bryansk and Kaluga Oblasts.

- E.M. Parshkov

1200 Discussion

1230 Lunch

1400 Discussion

1500-1800 Visit to clinical facilities of the Research Institute of Endocrinology and Metabolism

Thursday, 21 October

0900-0930 Elaboration of recommendations for further clinical and scientific studies.

- Group as a whole

1045 Coffee/tea break

1100 Adoption of the recommendations

- Group as a whole

1230 Lunch

1400 Any other issues

1500 Closure of the meeting

ANNEX III

ABSTRACTS OF INDIVIDUAL REPORTS

The detection and diagnosis of nodular pathology of the thyroid gland among children in Belarus following the accident at the Chernobyl Nuclear Power Plant
L.N. Astahova

Features of the clinical course and surgical treatment of thyroid cancer in children
E.P. Demidchik, V.Ya. Rebeko, Z.E. Gedrevich, Yu.E. Demidchik, T.A. Koren,
N.E. Kruglova and Ya.E. Sevkovski

Problems in the study of thyroid pathology in the Bryansk Oblast
V.V. Dorohov, A.D. Proshin, E.I. Frolova, P.S. Kuzmin, E.M. Parshkov,
V.V. Shahtarin, A.F. Tsyb

Doses of irradiation of the thyroid gland among the population of the Ukraine
I.A. Likhtarev, G.M. Gul'ko, I.A. Kairo and B.G. Sobolev

The proportion of thyroid cancers among malignant neoplasms in Belarus
A.E. Okeanov

Morphology and function of the thyroid gland in children and adolescents living in the contaminated area of Bryansk and Kaluga Oblasts
E.M. Parshkov, A.F. Tsyb, V.V. Shahtarin, E.G. Matveenko

Some aspects of the condition of the thyroid in inhabitants of the Zhitomir oblast affected by the accident at the Chernobyl Nuclear Power Plant
V.I. Shatilo

Changes of incidence over time and the clinico-morphological characteristics of thyroid cancer in children and adolescents in the Ukraine following the accident at the Chernobyl Nuclear Power Plant
N.D. Tronko, T.I. Bogdanova, E.V. Bolshova, V.I. Kravchenko, S.I. Rybakov,
V.A. Oleinik, E.V. Epshtein, N.V. Komissarenko, V.V. Markov, V.P. Tereshchenko,
A.D. Chernobrov, A.G. Biryukov, I.A. Likhtarev, G.M. Gul'ko, V.G. Sobolev and
I.A. Kairo

The prevalence of thyroid cancer in the children of Chernigov Oblast
V.A. Voinolovich

The role of IPHECA and its pilot project "Thyroid" in studies of thyroid cancer presented by I. Riaboukhine, World Health Organization

**The detection and diagnosis of nodular pathology of the thyroid gland
among children in Belarus following the accident at the
Chernobyl Nuclear Power Plant**

L.N. Astahova

Among children in Belarus exposed to radionuclides following the accident at the Chernobyl Nuclear Power Plant a considerable increase in nodular pathology of the thyroid (adenomas, nodular goitre and, in particular, carcinomas) is being observed. Most of the thyroid carcinomas in children are invasive and metastasizing. At the stage of differential diagnosis of nodular pathology the most informative method is ultrasound investigation combined with fine-needle biopsy. For a comprehensive evaluation of the prognosis and differential diagnosis, it is worthwhile to study the concentration of TSH, thyroglobulin, tumour necrosis factor and cytokines (IL-1, IF and T)

Features of the clinical course and surgical treatment of thyroid cancer in children

E.P. Demidchik, V.Ya. Rebeko, Z.E. Gedrevich, Yu.E. Demidchik, T.A. Koren, N.E. Kruglova and Ya.E. Sevkovski

Following the Chernobyl disaster the incidence of thyroid cancer among children in Belarus has increased sharply, particularly in the Gomel and Brest Oblasts. In 1992 the number of cases per 100 000 children was 2.77 in Belarus, 8.8 in Gomel Oblast and 4.76 in Brest Oblast. The incidence is continuing to rise in 1993. In the first nine months of 1993 there were 53 cases recorded among children, most of them living in the Gomel and Brest Oblasts.

Of the 225 children in whom thyroid cancer was detected in the Republic in 1988-1993, 223 were born before or during the accident. In only two children, one born at the end of 1986 and the other in 1987, did thyroid cancer occur when ^{131}I had fully decayed.

Thyroid cancer in children follows a more aggressive course than in the older age groups, as is evidenced by its more marked invasive properties and the frequent occurrence of metastases.

Among the 215 children we operated on in the period 1986-1993, the carcinoma had invaded the neighbouring tissues and organs of the neck in 102 cases (47.4%). Multiple metastases in the lymph nodes of the neck were found in 142 cases (66.0%).

The results of surgical treatment were followed up in 162 children. Within one year there had been a relapse of the cancer in 32 cases (19.7%). In 8 of these cases (4.9%) the cancer had recurred in remnants of thyroid tissue and in nine cases (5.5%) metastases had developed in lymph nodes. These 17 children were operated on again. A particularly high risk (9.2%) was associated with pulmonary metastases that had not been detected by X-ray before the operation.

Problems in the study of thyroid pathology in the Bryansk Oblast

**V.V. Dorohov, A.D. Proshin, E.I. Frolova, P.S. Kuzmin,
E.M. Parshkov, V.V. Shahtarin, A.F. Tsyb**

Reliable information has been obtained on the increase of thyroid cancer cases among adults in the post-accident period. The number of cases over the years has been: 1976 - 15; 1985 - 15; 1987 - 57; 1988 - 68; 1989 - 78; 1990 - 67; 1991 - 75; 1992 - 91. Cases of thyroid cancer in children living in the contaminated areas were registered for the first time: two cases in 1992, one in 1993. These cases were detected during complex examinations carried out under IPHECA.

A tendency has been noticed for the increase of thyrotoxicosis among children and adults with a high average dose to the thyroid. The most demonstrative data come from the raions of Novozybkov and Krasnaya Gora where the examinations had been carried out since the early months after the Chernobyl accident.

No differences have been found for other forms of thyroid pathology between the highly contaminated area and the areas with a low level of ^{137}Cs contamination (1-5 Ci/km.sq).

To obtain reliable information on the health effects of radiation, it is necessary to take into consideration the migration factor. In a number of raions (Krasnaya Gora, Gordeevka, Zlynka) the migration of people who are fit for work has reached 40%.

It would be worthwhile to study under IPHECA the process of migration in Novozybkov and Klinty raions as well as to follow up the children with thyroid pathology.

**Doses of irradiation of the thyroid gland among the population
of the Ukraine**

I.A. Likhtarev, G.M. Gul'ko, I.A. Kairo and B.G. Sobolev

Consideration is given to possible methods for reconstructing the doses of irradiation of the thyroid gland received by the population as a result of the Chernobyl accident and the possibilities of using these methods in practice are compared. The most promising reconstruction methods supported at present with data are based on direct measurements of ^{131}I activity during the iodine period of the accident, supplemented by an adequate model of the intake of radioiodine by the body and the results from questionnaires among the population. In addition, for areas not covered by measurements of the thyroid gland, a promising method is to use retrospective dose reconstruction based on data about levels of ^{137}Cs and ^{129}I contamination of the soil.

Altogether in the Ukraine about 152 000 direct measurements of activity in the thyroid gland were carried out, roughly 40% of them with the help of spectrometric instruments. A method was devised for evaluating the quality of the measurements and the effect on their results of the variability of morphological features of the thyroid and the depth at which it lies. Studies on phantoms were used to estimate the uncertainty interval for measurements of activity arising from possible deviations from the standard position of the detector in relation to the object measured. On the whole the quality of measurements in the Ukraine is considered to be high and they can be used to evaluate doses of irradiation of the thyroid received by the population.

The applicability is discussed of various models simulating the function of radioiodine intake by the body.

The data from direct measurements of ^{131}I activity has been used as a basis for calculating doses of irradiation of the thyroid gland received by the inhabitants of various regions of the Ukraine. Good concordance is shown between the number of cases of thyroid cancer recorded in 1990-1991 and the forecast estimates for children living in the areas most affected with radioiodine. This fact demonstrates the adequacy of the approaches used for reconstructing the doses and estimating the risk from irradiation of the thyroid gland.

The proportion of thyroid cancers among malignant neoplasms in Belarus

A.E. Okeanov

Data are presented from the Belarus Cancer Register on the prevalence of malignant tumours in the various oblasts of the Republic. In 1992 thyroid cancer made up 2% (males 1%, females 3%) of malignant tumours.

A statistically significant increase in the incidence of thyroid cancer was found among both children and adults. Among adults a rise in the incidence of thyroid cancer is being recorded in all oblasts, including Vitebsk Oblast, which is considered the least contaminated with radioiodine. Regression analysis for the two periods 1979-1985 and 1986-1992 (before and after the accident) has indicated a statistically significant increase in the coefficient of regression. For the Republic as a whole the coefficient had been 0.03 ± 0.006 but it became 0.50 ± 0.06 after the accident, ranging from 0.30 ± 0.04 in the Mogilev Oblast to 1.00 ± 0.16 in the Gomel Oblast. The most marked increase in the incidence of thyroid cancer was noted among children. Among young people there was on average a threefold rise, among the middle aged a twofold rise and among the over-65s a rise by one and a half times. Thus, the cancer has shifted to the younger age groups. The sex ratio in the incidence figures depends on age. Among children sex differences in incidence are statistically insignificant. Among young people aged 15-34 years the male:female ratio is 1:5, then it subsequently declines with age and over the age of 65 amounts to 1:1.5. The ratio was maintained in all age groups before and after the accident. Data have been recovered on all the children affected, including their place of residence at the time of the accident. The migration factor leads to considerable distortions in judgements about incidence levels in different oblasts. For example, in Minsk Oblast the incidence level was halved when allowance was made for migration.

Morphology and function of the thyroid gland in children and adolescents living in the contaminated area of Bryansk and Kaluga Oblasts

E.M. Parshkov, A.F. Tsyb, V.V. Shahtarin, E.G. Matveenکو

Results are presented for long-term observation of the state of health and in particular the condition of the hypophysio-thyroid system of children and adolescents living in radionuclide-contaminated areas of Bryansk and Kaluga Oblasts.

In accordance with the "dispensarization" plan put forward by the Ministry of Health of the Russian Federation and the Thyroid Gland Protocol of the WHO International Programme (IPHECA) about 30,000 children and adolescents have so far been examined. It has been established that in three raions of Bryansk Oblast (Klintsy, Gordeevsk, Krasnaya Gora) and three in Kaluga Oblast (Hvastovichi, Ulyanovo and Zhizdra) the mean levels of TSH, free thyroxin and antibodies to thyroglobulin in the population examined do not exceed the control levels.

Nodular lesions, whose structure was ultrasonically evaluated, were found in 2-4 cases per 1000 children examined. The number of cases of autoimmune thyroiditis detected by ultrasonic imaging and laboratory tests does not exceed 0.4-0.6%. Nine persons among those have pronounced clinical manifestations and they are under endocrinological surveillance.

No substantial differences in thyroid hormone and thyroglobulin levels were found among boys and girls in various age groups or among areas with different degrees of soil contamination with ^{137}Cs in which the children live. However, the levels of TSH and FT4 in the study groups are enhanced in 6.41% and 3.83% and reduced in 0.25% and 1.07%, respectively. The normal levels of TgAB are elevated in 4.15%. The children with those deviations in levels of hormones and TgAB constitute a group of risk for the development of thyroid pathology.

Fine-needle biopsy was carried out in 18 of the 54 cases of nodules in Bryansk Oblast. No signs of malignant growth were discovered. Operations were performed on 12 children with nodular structures more than 1cm in size. One case of papillary carcinoma was histologically confirmed. The second case developed from a cystic lesion. The third one was detected in a child who had the initial diagnosis of lymphadenopathy. Both cases were histologically confirmed and underwent surgery.

The more frequent occurrence of lymphadenopathy of obscure etiology calls for vigilance.

Some aspects of the condition of the thyroid in inhabitants
of the Zhitomir oblast affected by the accident at the
Chernobyl Nuclear Power Plant

V.I. Shatilo

As a result of the Chernobyl Nuclear Power Plant accident 740 centres of population in the Zhitomir Oblast, inhabited by 472 000 people, including 84 000 children, found themselves in a zone contaminated with radioactive substances. From 1 to 25 May 1986 about 20,000 children were given preparations of stable iodine. According to the results of direct dosimetry of the thyroid gland, in 12,000 children the dose of ^{131}I to the thyroid was 30 cGy or over. In 2,036 it was more than 200 cGy. Significantly higher doses of ^{131}I were recorded in the thyroid of children aged under four at the time of the accident.

A special service was established in the Oblast for the monitoring, diagnosis, prophylaxis and treatment of thyroid pathology. Between 1990 and 1992 22,000 children were screened. 172 cases of goitre in stages III and IV, 34 nodular goitres, 71 cases of children with autoimmune thyroiditis and 6 cases of thyroid cancer were detected and put on the register. Before 1990 no cases of thyroid cancer among children had been recorded.

Five of the children with thyroid cancer were under 5 years old at the time of the accident and one was seven years of age. 5 were girls, one was a boy. All the children were operated on. Histologically three cases of papillary cancer of the thyroid, two cases of follicular cancer and one case of carcinoma (what kind?) were established. Two of the children lived in the radiocontaminated zone and four lived outside the controlled area. The dose of ^{131}I was not determined and prophylaxis against thyroid damage was not carried out.

Ultrasound examination of the thyroid gland in 1 586 children aged 5 to 15 years (749 boys, 737 girls) five years after the accident revealed a statistically significant increase in the volume of the gland in children 12, 13 and 14 years old compared with that shown by examination in the third year after the accident and with data for controls (M.A. Kolesnik et.al, 1990)

The numbers of adult cases operated on for cancer of the thyroid gland at the Oblast Cancer Dispensary in the periods 1980-86 and 1987-92 were 81 and 171 respectively, including 18 and 66 respectively from the controlled areas. The ratio of men to women was 1:5. The papillary forms of thyroid cancer predominated.

**Changes of incidence over time and the clinico-morphological characteristics
of thyroid cancer in children and adolescents in the Ukraine
following the accident at the Chernobyl Nuclear Power Plant**

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An analysis is made of the incidence of thyroid cancer in children up to 14 years of age and adolescents aged 15 to 18 years living in the Ukraine for the period 1981-1992. The cytological, pathohistological and electron-microscope characteristics of papillary thyroid cancer are described. Compilation of the Thyroid Cancer Register showed that in the period 1981-1992 269 cases of thyroid cancer in patients aged 0-18 years were recorded in the Ukraine, 152 cases in the 0-14 age group and 117 among those aged 15 to 18 years (age at the time of surgery). 10 adult patients who were under 14 years old at the time of the accident were included in the Register. In the period 1981-85 thyroid carcinoma was detected in 25 children in the Ukraine and in 1986-1992 in 127 children in that country. 25 cases were noted in 1990, 21 cases in 1991 and 45 cases in 1992. From 1 January to 1 October 1993 in our institute's clinic alone 30 children, 2 adolescents and 1 adult (who had been under 14 years old at the time of the accident) were operated on. Thus, at the moment the Register contains information on 312 cases of cancer, 253 of them recorded after the accident (157 children, 85 adolescents and 11 adults who had been children at the time of the accident). The incidence of thyroid cancer per 100 000 of the child population had been 0.04 - 0.06 in the period 1981-85, but rose to 0.23 in 1990, was 0.19 in 1991 and increased to 0.41 in 1992. In some of the most highly contaminated areas of the Ukraine the 1992 index was even higher: 2.4 in Kiev Oblast, 1.1 in Chernigov Oblast; 1.7 in Rovno Oblast and 0.6 in Zhitomir Oblast. In 1981-85 not a single case of thyroid cancer was recorded in these areas.

Histological analysis showed that almost all the cancers were papillary. Electron microscopy demonstrated a considerable heterogeneity among the cancer cells, in regard to degree of differentiation, secretory activity and functional specificity. Considerable changes were demonstrated in the tumoral microvessels.

A special registry card was devised for each patient, containing clinico-morphological indications and making it possible to analyse the duration and clinical features of the illness, the extent of surgical intervention, the nature of the metastatic spreading and features of the macropreparations. Establishment of the Thyroid Cancer Register makes clearcut information available on every case of cancer so that it can be further analysed.

The prevalence of thyroid cancer in the children of Chernigov Oblast

V.A. Voinolovich

During the whole period before the accident only a single case of thyroid cancer had been recorded - in a 15-year-old youth in 1982. An operation was carried out. In the 7.5 years since the accident 16 cases of thyroid cancer have been detected among children and adolescents.

The number of cases has developed as follows: 1989 - 1 case; 1990 - 3 cases; 1991 - 4 cases (two children, two adolescents); 1992 - 4 cases (three children, one adolescent). In the present year -1993- there have been 4 cases of thyroid cancer among children. The sex ratio (boys/girls) is 1:1.7. All the cases have been outside the controlled areas and three quarters of the children are from Chernigov and its suburbs. The reconstructed doses of radiation to the thyroid gland have ranged from 4.9 to 29.3 cGy. By the time that signs of illness have been detected, the malignant process is usually widespread and metastases are present. In one patient a diagnosis of lipogranulomatosis was initially made, but more detailed examination established a diagnosis of papillary carcinoma.

The role of IPHECA and its pilot project "Thyroid" in studies of thyroid cancer

presented by I. Riaboukhine, World Health Organization

The International Programme on the Health Effects of the Chernobyl Accident (IPHECA) is a cooperative effort between the three affected countries, WHO and other parties, which may last for decades. Although its main objective is alleviating the health consequences of the accident, its other important goal is the consolidation of knowledge gained in post-Chernobyl studies. IPHECA covers actually all health-related problems resulting from the Chernobyl accident. However, it is not feasible to run all the activities simultaneously. The Programme, therefore, is being implemented in phases. The initial work consists of five pilot projects, one of which is called "Thyroid".

The description of IPHECA prepared as early as in 1990, called for the "study of possible long-term radiation effects in the thyroid...". "Investigation of the incidence of tumours.... of the thyroid in children" was also specified. The Thyroid project description published in 1991 stipulated that "all cases of thyroid cancer.... to be found in affected and control areas should be carefully investigated. Due to the higher sensitivity of the thyroid in children, one may expect excess occurrences of ... thyroid cancer....".

IPHECA and its pilot projects cannot do more than supplement the national efforts. According to the protocol for the thyroid project, the clinical examinations have thus been limited to children in the "strictly controlled zones", with the aim to detect all cases of cancer and other selected diseases (benign tumours, hypothyroidism, autoimmune thyroiditis). To strengthen national efforts in this direction, WHO provided equipment (ultrasound scanners with accessories, systems for enzyme immunoassay (EIA) automatic gamma-counters for RIA, spectrophotometers for stable iodine determination, various equipment for treatment and storage of samples, computers for field missions, etc.) and kits for RIA and EIA. More than 70 specialists have been trained and a number of them abroad. With the support of WHO and involvement of international expertise, standardized protocols were completed which are being used in all three affected States. To compile and advance scientific knowledge, WHO convened an international symposium on thyroid diseases after the Chernobyl accident (Minsk, October 1992, jointly with Belarus), a meeting on the reconstruction of doses to the thyroid (Munich, March 1993), a meeting on EIA techniques with emphasis on quality control (London, August 1993) and this meeting which aims at reviewing the present situation on thyroid cancer (especially among children) in all three States.

Any attempts to establish an association between the observed increase of thyroid cancer and radiation should take into consideration the differences among the incidence in the three States. These differences are shown in the table based on the data provided from the three States, estimations of collective thyroid doses by Dr Ilyin et al. and rough calculations of the expected incidence using a constant risk factor of $2.5 \times 10^{-4} \text{ Gy}^{-1} \text{ y}^{-1}$ since 1989. Among possible reasons for these differences is the practice of stable iodine administration in some affected areas many months or even years after the accident. This reason has also been assumed on biochemical grounds by Drs Poverenny and Tsyb.

OCCURENCE OF THYROID CANCER IN CHILDREN (0-14 Y)

Country	Collective dose, Gy.child.10 ⁴	Annual number of cases prior growth	Number of cases per year					Total/total minus background	Expected number in 4.5 latest years
			1989	1990	1991	1992	1 st half 1993		
Belarus	8.0	1.385 (averaged over 1976-88)	7	29	57	67	36	197/191	30
Russia (Bryansk and Kaluga oblasts only)	6.4	0-2 (guess)	-	-	-	2	1	3/0	24
Ukraine	24	5.75 (averaged over 1981-88)	13	25	21	45	~30	134/108	90