International POPs Elimination Project

Fostering Active and Efficient Civil Society Participation in Preparation for Implementation of the Stockholm Convention

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Lysá nad Labem - hazardous waste incinerator and POPs waste stockpile in Milovice

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On May 1, 2004, the International POPs Elimination Network (IPEN http://www.ipen.org) began a global None Governmental Organisation (NGO) project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to each country's efforts in preparing for the implementation of the Stockholm Convention;

- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;

- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support the preparation of reports on a country's situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

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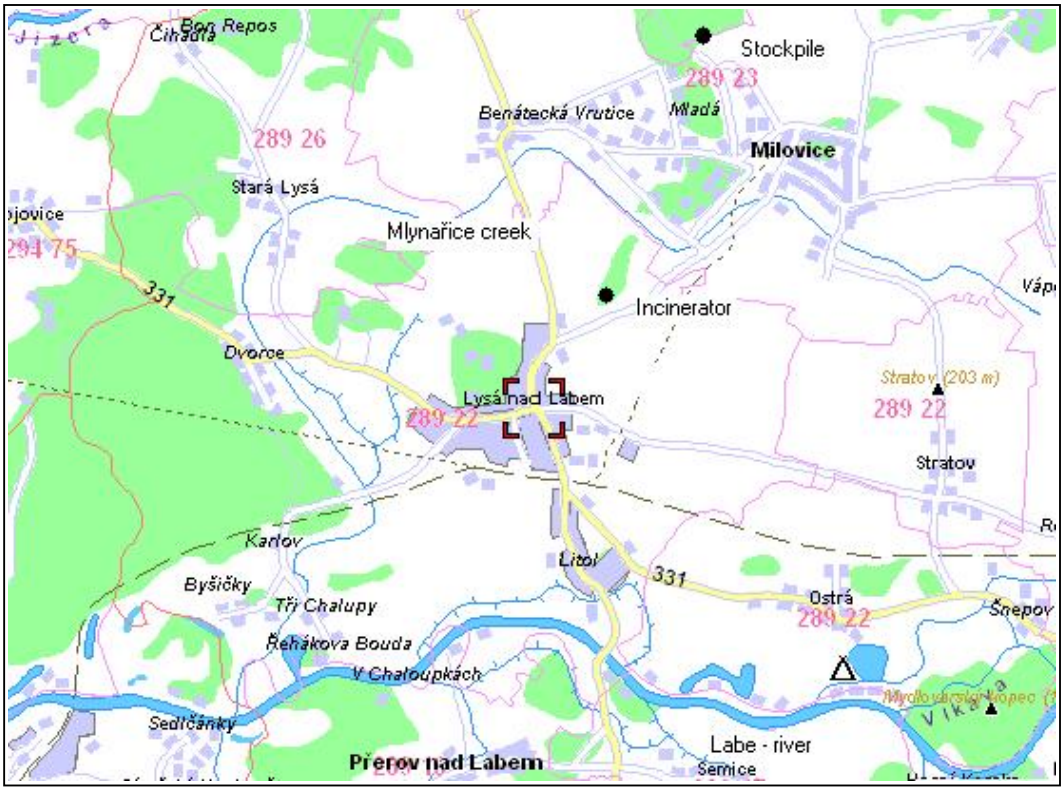
Locations of sites

The Lysá nad Labem hazardous waste incinerator is located at 50°13´ north latitude and 14°51´ east longitude. The Milovice - POPs waste stockpile is located at 50°14´ north latitude and 14°52´ east longitude. Lysá nad Labem and Milovice are northwest of the city of Prague in the valley of the Czech Republic's largest river, the Elbe. The hazardous waste incinerator is situated on the northern border of Lysá nad Labem on the hill, Šibák, at an altitude of about 227 metres, 4 kilometres north of the Elbe riverbank and 600 metres from the nearest residential property in Lysá.

The hazardous waste stockpile near Milovice was located in a former military battle site and became contaminated as a result of the abandoned construction of a hazardous waste incinerator. The original owner filled it with tons of hazardous waste containing PCBs, dioxins, and DDT. The hazardous waste stockpile was situated in the open air on the edge of the forest north of Milovice, elevation 205 metres and 6,5 kilometres in a beeline from the Elbe River and 2 kilometres from Mlynařice brook, which enters the Elbe under Lysá nad Labem.

Picture 1: General map of the region with hot spots. Incinerator = hazardous waste incinerator in Lysa nad Labem location, Stockpile = obsolete stockpile Milovice at the site of the proposed, then later abandoned incinerator.



Characteristic of the site

The results of laboratory measurements of PCDD/F, PCBs and HCB in poultry, hares, pheasants and fish conducted in 2003 showed levels exceeding government limits for food. The local waste incinerator and long-term storage of POPs waste in Milovice were recognized as the potential sources (in the former military Soviet Army base, abandoned since 1992). Most of inhabitants in this district are crowded together in the towns of Lysá nad Labem and Milovice. It is a densely inhabited area with strong agricultural production of fruits and vegetables, especially potatoes. The vast majority of the inhabitants raise barn fowl and or other farm animals (rabbits, goats, and sheep).

Characteristics of inhabitants in the area of hot spots

Milovice has a population of 5,770 and Lysá nad Labem, including surrounding municipalities, has 8,200 inhabitants. There are a lot of villages in the neighbourhood with populations ranging from 200 to 500. The whole district of Nymburk had at the beginning of 2004 approximately 85,500 inhabitants. The adjoining district Prague - East had over 100,000 inhabitants and Mladá Boleslav district 114,500 inhabitants. It is not possible to assume direct environment pollution to all those districts. We display these figures only to show the population density. The inhabitants of Lysá nad Labem and Milovice vary from the view point of average age. In Lysá nad Labem the average age is 41.1. In Milovice, the average age is 28.9.

Environmental, Socio-economic, and Health Consequences

The hazardous waste incinerator at Lysá nad Labem has operated since June 2000 (a trial operation was approved on April 12, 2000). In March - April 2001 the incinerator stopped operating because of financial problems not starting again until January 2002. At the end of May 2002, the incinerator closed down because it had no building permit. Finally permission was obtained and it resumed operations in February 2003. This operating summary gives us an idea of the periods when the incinerator influenced the environment with its pollution. All in all, the incinerator had been in operation for approximately 1.5 years from June 2000 until the end of March 2003. Even though this is a relatively short time, its impact on the food chain in the region could be displayed.

From the viewpoint of environment contamination by POPs it is important to mention, that on the same site of this new incinerator in Lysá nad Labem there was an older incinerator that operated up to the end of 1993. This older incinerator burned not only municipal waste, but also hazardous waste. The original incinerator was equipped with outdated technology that could not meet the demands of environment protection. This led to its closure on January 1, 1994. Construction of the new incinerator began the same year. [1]

From 1990 - 1994 liquid and solid waste containing polychlorinated biphenyls (PCBs) destined for the incinerator was dumped in the area of Milovice. PCB concentrations ranged from 2.1 to 730,000 mg/kg (see press release of Mid Czech District, 5 October 2004). Disposal of this waste (transformer oils, disabled equipment, absorption matter and polluted soil) was not properly secured from the point of view of environment and health protection. In 2000, the County Office in Nymburk invited applications for safer deposit of wastes

containing PCBs and disposal of wastes containing DDT. The wastes containing DDT were burnt in the Lysá nad Labem incinerator. The EKOBO firm transported the wastes containing PCBs in poorly secured deposits to the village of Mratín in the neighbouring district of Prague - East. There have been about 1,900 tons of soils contaminated with PCBs until this year exposed to the open environment in Milovice. The results of an analysis found that in one part of the deposit. PCB levels exceeded the limit allowed by Czech law for the controlled dumping of hazardous waste (more than 100 ppm PCB). We can assume, that since this waste was deposited there POPs chemicals have been leaking into the surrounding environment, especially during periods of snow and heavy rains. Measurements of PCB contamination in fish ordered by the Czech Environment Inspection in 2003 provide evidence of this type of leakage (see below).

The contamination of this region with POPs imperils the quality of agricultural produce. The most endangered groups of people are those inhabitants who live on products from domestic animals and anglers.

Based upon mass observation most of population from Lysá nad Labem (81%) favour selection and recycling of the waste, 15% consider combustion ecologically acceptable, and only 4% out of the people would opt for landfilling (Commercial Academy 2004).[2]

Health of the population

The only source of information on the state of inhabitants' health is a general balance sheet of a set of 107 men. They applied for blood tests analyzing concentrations of PCDD/Fs and PCBs (see n Černá, M. et al 2004). From this study we quote the following summary characteristics:

"There were 107 men in the basic set, ranging from 25 to 60 years of age, with the average age of 44 years. The vast majority were 40 – 50 years old (38.2%). There were 5 men (4.7%) with basic education, than there were 54 (50.9%) men in the group with secondary school education with no school leaving exams, 37people (34.9%) with full high school education and 10 undergraduates (9.4%).

There were 40 (37.7%) contemporary and 22 (20.7%) former smokers in the set. The average number of consumed cigarettes was 15 daily. The average BMI (body mass index) was 27.1 kg/m^2 (that is surplus weight), 20 men were obese (19.0%).

Twenty two men (21.4%) referred to current long-term health obstacles (lasting for more than 6 months) for which they are, or were, being observed or treated/cured by a doctor. The most highly represented – 8 men (7.5%) – were obstacles linked to liver malfunction and biliary tract, in the second position were circulatory problems - 6 men (5.6%) and then digestive system inconvenience - 5 men (4.7%).

Eighty seven men (81.3%) stated consuming home made, animal-originated products."[3]

Detailed information on hazardous waste incinerator in Lysá nad Labem

The current hazardous waste incinerator was built by the REAN Company between 1998 and 2000. Its annual capacity is 3500 tons of hazardous solid and liquid wastes. It has a rotary kiln and the technology was supplied by the Czech company ČKD-DIZ Prague.

The true amount of waste burnt by the incinerator varies depending on the length of operation per year. The data are summarized in Table 1.

Table 1. Overview of the amount of waste burnt in the incinerator at Lysá nad Labem. Processed from the annual specifications delivered to the Civil Services Body by companies running the incinerator.

Year	Amount of burnt waste (tons)
2000	742
2001	690
2002	1275
2003	3257

Note: During the year 2002 the incinerator operated for 6 months and in 2003 it operated for 9 - 10 months.

Air pollution control

Processing of combustion products occurs at several levels. At first the combustion products are cooled, and then the absorbent component is added (it is a mixture of lime and activated carbon, Sorbalite™. This mixture is introduced into the reactor, where the combustion gas and Sorbalite™ are mixed. The rigid parts (fly ash and Sorbalite™) are filtered from the combustion products through the sleeve fabric filter. Finally the combustion products enter the quench and alkaline washer, where they are quenched and washed by water and base. The quenching /washing waters are further refined in the vacuum filter and through the CINIS. Sorbalite™ is for the interception of PCDD/F.

During one hour in normal conditions the incinerator will produce about 4.000 – 4.500 m^3 of flue gas.

Data on smoke gas flow from observations dated 2-3 November 2004:

4.340 m^3 per hour of flue gas flow in normal conditions - for this value concentration of toxic pollutants is converted,
5.340 m^3 per hour gas volume flow in normal conditions
6.670 m^3 gas volume flow per hour

Data on the number of hours of operation over the year is not available to us. This value will be variable since the incinerator was not in operation for most of 2004 (and similarly in 2001). However, the total amounts of drained pollutants can be calculated out of the emission factors rated per ton of burned waste, listed in the single record pollutant measurement emitted to air. The amount of burned waste over the year is displayed in Table 1.

POPs in air emissions from the incinerator

Based upon the Law on Environmental Air no. 86/2002 Statutes and associated regulations, those who operate incinerators are obliged to execute a single measurement of PCDD/Fs twice a year. The emission measurements of PCBs or HCB are not demanded by law. For a better idea we displayed a summary of PCDD/Fs and PCBs measurements and also the concentrations of other pollutant emissions (see Table 1 in Annexes).

The PCB emissions have been probably measured in the incinerator in Lysá nad Labem during the time when the incinerator burned wastes including DDT from Milovice.

Arnika has an analysis of the mixed liquid waste since of the beginning of 2002. According to the analysis, they have burnt a mixture of wastes containing more than 10 ppm PCBs, which was at that time forbidden by Czech law.

The incinerator did not meet EU limit values for dioxin air emissions (0.1 ng I-TEQ/m^3)[1] until the middle of 2003 (see Table 1 in Annexes).

The waste produced by the incinerator as a source of POPs leaking into the environment

The incinerator produces these wastes:
- Ash, slag and fly ash from the afterburner (catalogue numbers 190111, 190113)
- A mixture of Sorbalite™ and fly ash from the sleeve filter (catalogue number 190107)
- Sediment including heavy metals from the vacuum filter after water refining from the gas scrubber is sublimated (catalogue number 190105)[4, 5]

The incinerator with an operating level of 3.500 tons per year will consume 40 tons of Sorbalite™ and 2 tons of ash CINIS yearly (it is a part of the sediment from the vacuum filter). The waste developed during reparations is not specified. The sediments from the vacuum filter are sublimated in the incinerator, but the record of their amount is missing - the incinerator does not mention it in its annual statement.

The mixture of Sorbalite™ and fly ash (190107) and sediment from vacuum filter (190105) show increased levels of POPs and heavy metals.

The results of PCDD/Fs measurement in Sorbalit™ and fly ash samples which we have available are in the Table 2 in Annexes (for comparison with the next data entry from other incinerators in the Czech Republic). Although much higher levels of PCDD/Fs in fly ashes from another (not specified) hazardous waste incinerator in the Czech Republic were found, the dioxins content in APC residues from Lysá nad Labem waste incinerator are relatively high.

Handling incinerator fly ash may play a crucial role in the contamination of the neighbouring environment. The fly ash is mechanically collected into bags, which are later carried away to the waste stockpile in Benátky nad Jizerou. The handling results in considerable dust rising

[1] This limit was approved as the Czech Republic limit after the country became an EU member state.

which can be clearly seen on the masonry from the surrounding driveway where the fly ash is collected.

As we discovered from reports on waste at the District Office, the wastes produced by the incinerator in Lysá nad Labem have been deposited in the former deep mine Jan Šverma near Lampertice in Žacléř county during 2000. They have been placed there by the company, SOH who are responsible for operating the landfill site in Benátky nad Jizerou (see map at Picture2). Elevated levels of POPs were found in the surroundings of the former mine near Žacléř. [6]

The incinerator does not drain off the wastewater from purification of combustion gas, but it is returned into the original process.

Detailed information about the obsolete waste stockpile in Milovice

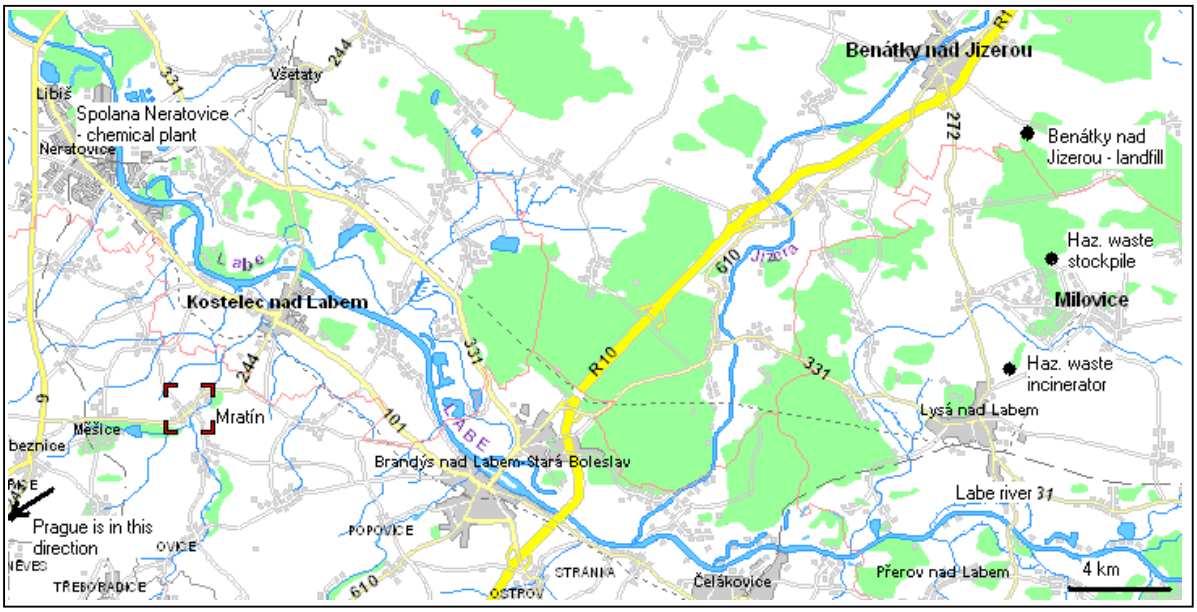
Approximately 2,000 tonnes of hazardous waste were stored in a unprotected, freely accessible space without any security. Here 428 disintegrating barrels containing PCBs, PCEs, DDT, cyanide and 1000 cubic meters of contaminated soil were 'dumped' rather than 'stored.' According to Greenpeace calculations, there were 5800 kg of PCBs and 40 g of PCDD/Fs in total in the stored wastes.[7] PCBs were in the wastes at levels ranging between 2.1 - 730,000 mg/kg. Wastes containing PCBs included transformer oils, obsolete equipment with PCBs containing oils, and contaminated soils.[8] The depot was located 2 km away from residence buildings and 10 km from sources of drinking water consumed by more than 1 million inhabitants of the capital city.

How did it get there?

Milovice – Mladá is a former military area. After the Soviet Army departure in 1991 heavy contamination by oil products was discovered in the area. The company PROEKO planned to build a hazardous waste incinerator there under somewhat unclear circumstances. Work on this plant was never permitted. The company concentrated the waste into the described area during the years 1990 - 1994. The building of the plant was probably financed by the means gained for the waste on the promise of a high return for dealing with the waste. Later PROEKO went into bankruptcy and ceased to be concerned about the future of waste. Municipal and state organizations were not prepared to resolve the situation so the freely accessible, disintegrating barrels and contaminated soils were gradually contaminating the surrounding environment.

The wastes from this place were partly burnt in two waste incinerators in the year 2000. Part of the waste containing PCBs in Ostrava and part of other wastes containing (for example) DDT was burnt in the hazardous waste incinerator at Lysá nad Labem. The rest of fluid wastes were stored by the company EKOBO at two different locations in Mratín, a village 30 - 32 km to the west of Lysá nad Labem (see map at Picture 2). Both locations were not permitted to store hazardous waste and despite this these illegal storage places were chosen and the estimated disposal costs were covered by state money. The private company EKOBO also stored other PCBs containing wastes gathered from other places there.

Picture 2: Map showing the larger region with marked important localities: Milovice - hazardous waste stockpile, Lysá nad Labem - hazardous waste incinerator, Mratín - village, where the wastes from Milovice were partly moved, Benátky nad Jizerou - landfill, a site of the company that takes fly ash and bottom ash from the incinerator in Lysá nad Labem and Spolana Neratovice – a chemical plant with serious dioxin contamination.



The NGO Arnika discovered that 40 tons of wastes containing PCBs disappeared from the illegal storage in Mratin at the end of year 2003 or at the beginning of 2004.[9] Czech Environment Inspection began court proceedings and these are currently under way.

The Middle Bohemian Region asked the Ministry of the Environment for money to cover the disposal of all remaining wastes at both Milovice and Mratín and to clean up the illegal storage in Mratín which was contaminated by PCBs. High levels of PCBs exceeding the limit for wastes that can be landfilled[2] were found in one part of nearly 2000 tons of contaminated soils that had been stored until 2004 in Milovice.

POPs wastes were disposed off in two ways: 1) dumped at a hazardous waste landfill at Lodín (Hradec Králové Region), 2) burnt in a hazardous waste incinerator at Ostrava.

The State Fund for Environment granted 16 458 900 CzK to cover disposal costs of all the remaining wastes: Clean up of the obsolete storage in Milovice, during which 1915,65 tons of contaminated soils was dumped at the hazardous waste landfill in Lodín. A total of 74,66 tons of contaminated soil was also burnt in the hazardous waste incinerator costing (9 557 836 CzK for the two operations.) Clean-up of the illegal PCBs storage in Mratín cost 6 654 767 CzK. During that operation 57,2 tons of fluid waste and 38,06 tons of solid waste were burnt in hazardous waste incinerator at Ostrava.[10]

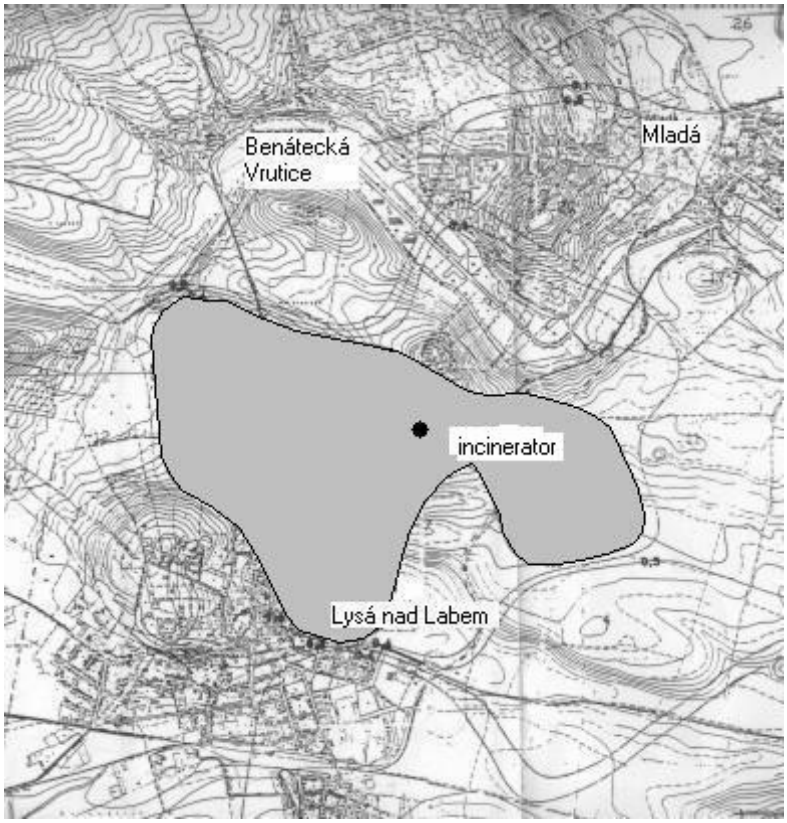
[2] This limit is 100 ppm of PCBs.

Potential POPs pollution pathways, other potential POPs sources

Pollutants distribution by air

The district potentially most affected by emissions from the hazardous waste incinerator is shown on the scatter map at Picture 3.

Picture 3: A scanned copy of a map enclosed to the scatter study in the documentation evaluating the impact to the environment surrounding the hazardous waste incinerator in Lysá nad Labem (source: Bláha, A. et al 1994).[11] We have highlighted in the map area with the isoline of higher value air pollution loads by toxic pollutants.



Pollution distribution in water

The area most affected by incinerator pollution (see Pictures 1 and 3) is drained off to the creek Mlynařice. Part of the mentioned area on the East from Lysá nad Labem leaks into an unnamed waterway where the little ponds Okrouhlík and Holaňák are situated. On the South of Milovice there is the Josefův pond neighbouring with Mlynařice.

The Mlynařice creek gathers also surface waters from area of hazardous waste stockpile in Milovice.

Other potential sources of POPs releases

Based upon results of an inquiry led by students in 2004, the heating of households in Lysá nad Labem is as follows: 56% are heated by gas, 20% by electricity, 8% by district heating,

9% by coal and 7% by wood. The possible sources of POPs emissions could be the last two groups of households (combined 16%).[12]

Besides the POPs leaking from the hazardous waste incinerator and the waste stockpile in Milovice, the sources of POPs leaking in the past that could have produced waste stockpiles or reserves of oils with PCBs were the munitions containing HCB, in the former Soviet Army military base. In Lysá nad Labem coal and wood burning in stoves are possible POPs sources, but only a relatively small percentage of households are heated this way. Central heating plant could be another source of POPs emissions but it has been using natural gas as a fuel over the last 10 years.

POPs measurements in the environment in Lysá nad Labem, Milovice and the surrounding area

At the beginning of 2003, the Arnika Association took the first samples for POPs analysis. Samples were collected on March 26, 2003 in the gardens of houses no. 538 and 960, in Lysá nad Labem and on the foothill of Šibák, in a beeline distance of 600 - 700 m from the incinerator. A sample of soil marked 3493 was collected near house no. 538 and a sample of cockerel leg marked 3494 was collected near house no. 960.[13]

New soil and animal sampling collections followed the publishing results of original samplings. The analysis results are below.

The Soil

Besides the soil analysis from a garden, ordered by Lysina and Arnika Association with the lab Axys Varilab (Petrlík, J., Havel, M. 2003), the town Lysá nad Labem (Vácha, R. et al 2003**)** ordered analysis of eight samples (see Table 3) and the Regional Office of Mid Czech District ordered analysis of six samples (see map in the Picture 6).[14, 15, 16 17]

In the research study ordered by Lysá nad Labem town the highest value 1.2 pg TEQ/g of dry weight was sample no. 5. The result of research was summarized by Vácha, R. et al (2003) with the words: "... the values discovered in Lysá nad Labem we range into a period of middle loading (0.5 - 1.3 pg TEQ/g), which we identified as a group of soils in area of a mixed loading and clean area." [18] The graph at Picture 4 shows measured levels of PCDD/Fs in eight individual soil samples.

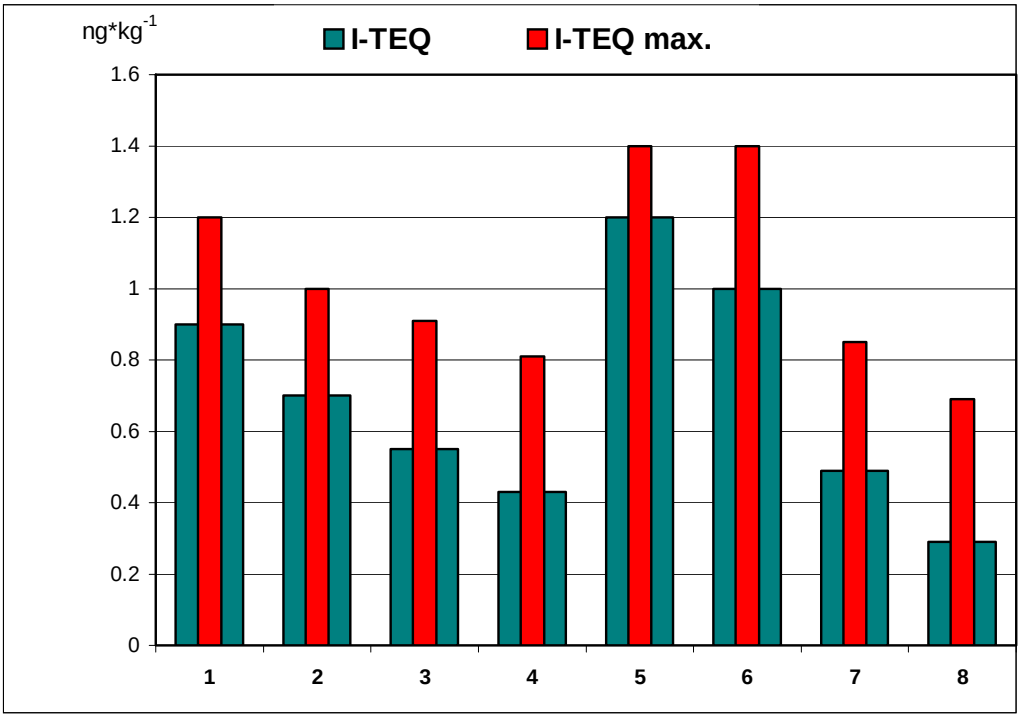
Table 2. The complete values of toxic materials recognized in a sample of soil no. 3493 from the garden of house no. 538 in Lysá nad Labem

Measured substance	**Observed value**
PCDD/Fs in TEQs	3.90 pg/g (I-TEQ)
Sum of all PCBs	7.34 ng/g
Sum of 7 indicator PCBs congeners	3.54 ng/g
PCBs in TEQs	0.60 pg/g (WHO-TEQ)
Hexachlorobenzene	0.15 ng/g
Arsenic (As)	11±20 mg/kg
Cadmium (Cd)	<0.20 mg/kg
Mercury (Hg)	<0.10 mg/kg

Table 3. List of sampling locations, a study by Vácha, R. et al (2003).[19]

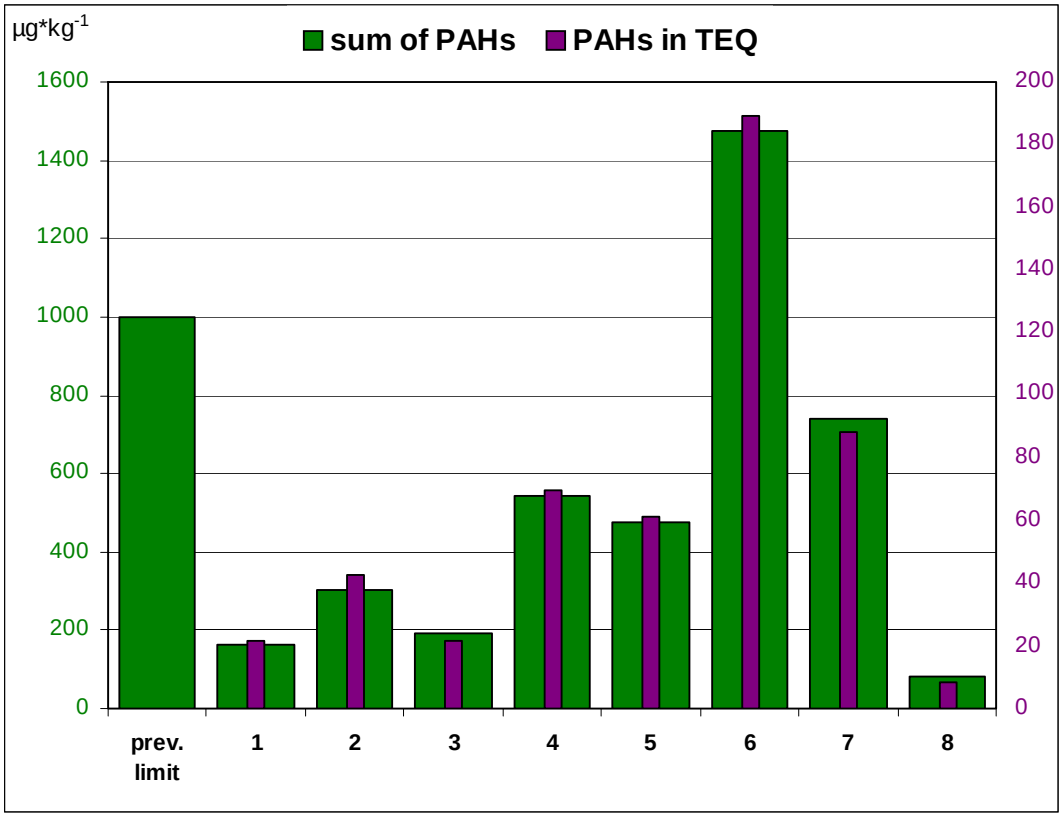
Location	Number	Soil type	Substrate	Agricultural land
Lysá-apricot orchard	1	KAa	Gravel terrace sand	orchard
Pod Velazem	2	KAa	Gravel terrace sand	field
Vrutický kopec	3	KAa	Gravel terrace sand	field
Milovice	4	HMg	Loess	field
Za spalovnou	5	PGm	Polygene clay	field
Poděbradova ul.	6	CCm	karb. Drifts	field
U Okrouhlíků	7	PRk	Aenaceous marl	field
Stratov	8	PRk	Aenaceous marl	field

Picture 4: Values I-TEQ PCDD/Fs in ng/kg dry weight in soils recognized and published by Vácha, R. et al (2003).



PAHs levels were measured in the sampled soils. The highest value was observed in a sample from Poděbradova, which is on the east edge of the city and close to the pond Okrouhlík, where the fish was sampled (No. 3646). At the same site, and also in Milovice, elevated levels of DDT and its metabolites were found. [20] The authors of the study think this is due to agricultural use in the past, but do not take into account potential contamination because of the hazardous waste stockpile in Milovice and later the burning of DDT in the hazardous waste incinerator.

Picture 5: Levels of PAHs and PAHs in TEQ in soils from Lysá nad Labem and surrounding area recognized and published by Vácha, R. et al (2003). For TEQ calculations we used TEFs by US EPA (see Table 3 in Annexes).



Holoubek, I., Čupr, P. (2003) and Petrlík, J., Havel, M. (2003) also tested soils from Lysá nad Labem (for example) the middle loaded areas of soil. The highest found value equaled the concentration of PCDD/Fs in the sample assayed by Lysin and Arnika Association in the garden of house no. 538, which indicates that it was not a regularly ploughed farmland.

Table 4. Overview of POPs concentrations found on site in Lysá nad Labem (source: Holoubek, I., Čupr, P. 2004). Note that 6 samples of soil were analyzed.

Observed parameters	**Range of concentration found on site [pg/g dry weight]**
ΣPCDDs/Fs	61.6 – 103
I-TEQ PCDDs/Fs	0.68 - 1.2
ΣPCBs	126 – 383
I-TEQ PCBs	0.0198 - 0.582
I-TEQ PCDDs/Fs + PCBs	0.73 - 1.6

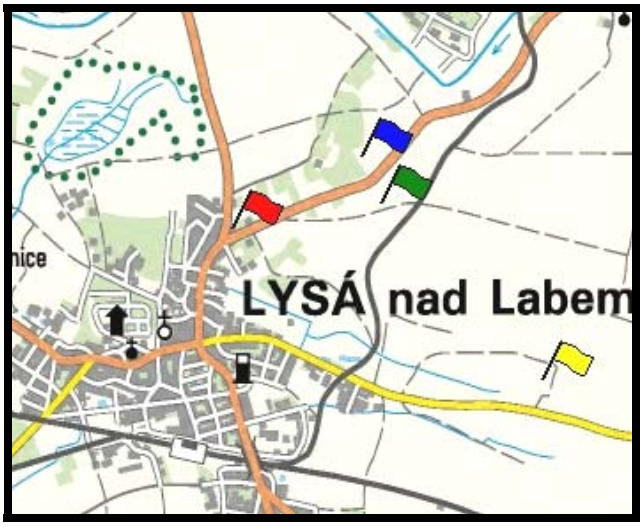
Concerning PCDD/Fs, soils in the Czech Republic could be divided into 3 categories:

- **14 – 1.6 pg TEQ/g** – soils in the vicinity of highly polluted watercourses, soils with high emission burden, and soils with long-term repeated application of sewage sludge;
- **1.3 – 0.5 pg TEQ/g** – soils from areas with mixed burden, as well as from relatively clean areas (especially in higher altitudes);
- **0.4 – 0.1 pg TEQ/g** – for the most part, soils from clean areas, but sometimes also from areas where industry is present.[21]

Most soils in Lysá nad Labem belong to a middle category "areas with mixed burden, as well as from relatively clean areas (especially in higher altitudes)". The results of the analysis for DDT residues in soils are interesting, but its interpretation needs further research.

Levels of PCDD/Fs, dioxin-like PCBs and PAHs in Lysá nad Labem are not high.

Picture 6: Map with highlighted places of sampling for the study of Holoubek, I., Čupr, P. (2004). The spot marked with a red flag is the place, where three samples of soil were withdrawn (this is the garden, where the sample of poultry was found, i.e. no. 3494). Other flags represent only one soil sample per flag.



Animals

An overview of samples taken from animals and eggs are displayed in Table 5 and Picture 7.

Fish

The Czech Environmental Inspection - the District Inspection Prague ordered fish sampling in July 2003. The fish sampling was made near Milovice in the Josefov pond under the incinerator (barbel american - sample no. 3643, and Roach - sample no. 3644). This pond is located about 1 kilometre NNW from Šibák hill, and also from the waste incinerator in Lysá nad Labem. From the pond Holaňák a sample of crucian carp (sample no. 3645) was taken and from the neighbouring Okrouhlík another sample of barbel american (sample no. 3646). Both ponds are next to each other and are situated at the East edge of Lysá nad Labem by

Poděbradova street. The beeline distance is 750 m South from the incinerator on the Šibák hill.

Table 5. Sampling history and PCDD/Fs results for poultry, game, fish and eggs samples in Lysá nad Labem and surroundings.

Type of sample	Organization	Sample No.	PCDD/Fs level in pg WHO-TEQ/g of fat	EU limits (2375/2001 EC)	Date of sampling
Cock	Arnika	3494	4.0	2	March 2003
Hen	Arnika	3648	3.5	2	July 2003
Hen	City of Lysá	3637	4.6	2	July 2003
Hen	City of Lysá	3636	3.5	2	July 2003
Hare	City of Lysá	3635	1.6	2	July 2003
Hare	City of Lysá	3634	0.8	2	July 2003
Pheasant	City of Lysá	3639	5.8	2	July 2003
Pheasant	City of Lysá	3638	14.6	2	July 2003
Fish	Czech Inspection for Environment	3643	22.9	-	July 2003
Fish	Czech Inspection for Environment	3644	17.5	-	July 2003
Fish	Czech Inspection for Environment	3645	5.6	-	July 2003
Fish	Czech Inspection for Environment	3646	6.9	-	July 2003
Eggs (4 eggs pool sample)	Arnika	4036	5.0	3	February 2004

Picture 7: Map with marked sampling places of poultry, game, fish and eggs. Other information is displayed in Table 7.

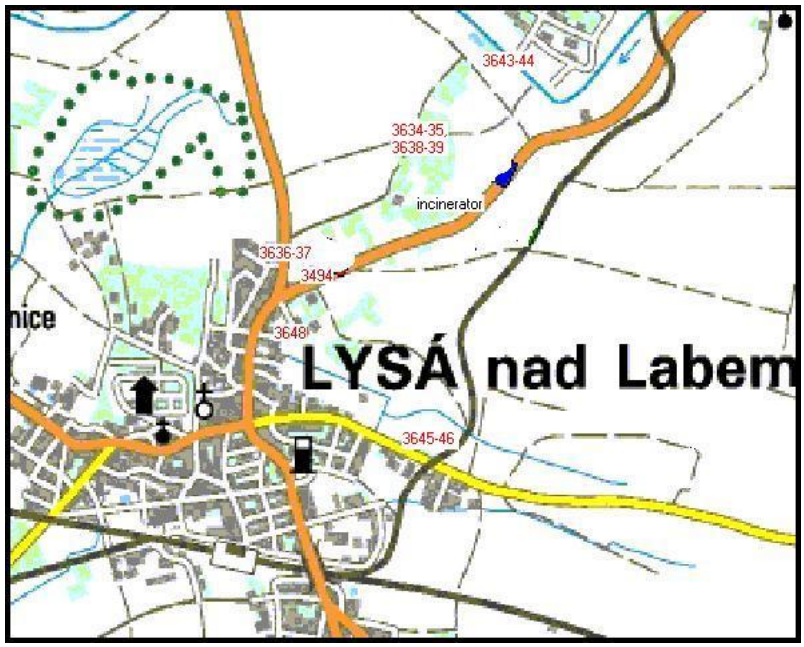


Table 6. Results of fish analysis, focused on concentration of PCDD/Fs and PCBs in pg WHO-TEQ/g fat.

Location	Species - sample	PCDD/Fs (WHO-TEQ pg/g fat)	PCB (WHO-TEQ pg/g fat)	WHO-TEQ (PCB + PCDD/Fs)
Milovice - Josefův	barbel american - 3643	22.9 – 25	188,1	211-213,1
Milovice - Josefův	roach - 3644	17.5 - 18.8	209.8	227.3-228.6
Lysá - Holaňák	crucian carp - 3645	5.6 - 8.1	36 - 36.8	41.6-44.9
Lysá - Okrouhlík	barbel american - 3646	6.9 - 13.6	28.6 - 30.5	35.5-44.1

Table 7. Results of fish analysis concerning concentration of PCDD/Fs in pgTEQ/g fresh weight.

Sample	Fat concentration in the sample	Amount of PCDD/Fs in WHO-TEQ pg/g fat	Conversion to PCDD/Fs in I-TEQ pg/g fresh weight	Limit EU valid for data in WHO-TEQ pg/g fresh weight
3643	1.79 %	22.9 - 25	0.41-0.45	4
3644	2.61 %	17.5 - 18.8	0.46-0.49	4
3645	3.09 %	5.6 - 8.1	0.17-0.25	4
3646	0.9 %	6.9 - 13.6	0.06-0.12	4

The fish contamination in the area of Milovice is probably associated with the former waste stockpile of PCB nearby Milovice. The PCB/dioxin proportions were two to three times higher than those found in other samples from European countries. The two other samples from ponds in Lysá nad Labem are not affected that way.[22]

Poultry and game samples

A brief history of taking samples and analysis of poultry and game in the neighborhood of Lysá nad Labem including a list of contractors is summed up in Table 5 in the introduction of this chapter and focused on the results of animal tissues analysis of POPs concentration.

Table 8 represents analysis results of PCDD/Fs and PCB concentration, provided by laboratory Axys Varilab and ordered by a number of different organisations. Since a more extensive analysis was carried out on the cockerel sample no. 3494, the results are presented separately in Table 9.

All free range poultry samples and pheasant samples from Lysá nad Labem and the surrounding area exceeded the EU limits for dioxins in food. Also seven PCBs congeners levels in cockerel meat were relatively high, but did not exceed the Czech limit value for food (200 ng/g of lipid).

Table 8. Concentration of PCDD/Fs and PCBs in WHO-TEQ in the samples of poultry and game from Lysá nad Labem and surroundings. The EU limit for PCDD/Fs concentration in meat of those animals is 2 pg WHO-TEQ/g lipids.

Poultry, game	Sample No.	PCDD/Fs in pg WHO-TEQ/g	PCBs in pg WHO-TEQ/g	Lipids content of sample in %
cockerel	3494	4	11.3	17
hen - fatty tissue	3648	3.5	9.9	75.6
hen	3637	4.6	NA	6.4
hen	3636	3.5	NA	2.1
hare	3635	1.6	NA	5.4
hare	3634	0.8	NA	1.3
pheasant	3639	5.8	NA	0.5
pheasant	3638	14.6	NA	0.3

NA = not analyzed

Table 9. The total sum of toxic chemicals examined in the meat sample of the cockerel bred in a garden in Lysá nad Labem under Šibák hill.

Tested chemical/-s	Found value in a gram of fat
PCDD/Fs	4,0 - 4,3 pg/g (WHO-TEQ)
Total PCBs	196.09 ng/g
7 PCB congeners	140.76 ng/g
PCBs in WHO-TEQ	11.3 pg/g (WHO-TEQ)
Hexachlorobenzene (HCB)	1.05 ng/g (= 0.105 pg TEQ/g)

Note: Source for HCB in TEQ calculation: Ruprich, J. 1999.[23]

Eggs

Because hens eggs are one of the most frequently consumed home produced foods, the Civic Association Lysina and Toxics and Waste Programme of Arnika Association ordered an analysis of POPs concentration in the eggs samples at the beginning of 2004. The samples were taken in the North West part of Lysá nad Labem and in Benešov, a town chosen by EHO (Environmental Health Officer) as a comparative location for study of blood samples of PCDD/Fs and PCBs concentration. In both of the locations we took 4 eggs (in Lysá nad Labem from one chicken and in Benešov from two hen breeders) and we ordered the testing of their pooled sample at the laboratory Axys Varilab. Later, at the beginning of 2005 Lysin and Arnika ordered another analysis of chicken eggs from the same farmer for organochlorine pesticides (OCPs) residues, PCBs and brominated flame retardants. The analysis was done by VSCHT laboratory (Chemical Technology Institute - chemical university in Prague).

The lower levels in eggs from Benešov were within the set limits. All tested toxic chemicals in eggs from Lysá exceeded all of the limits. The limit for dioxins was exceeded by 70% and for hexachlorobenzene and PCBs by 1.5 times and by 55% respectively.

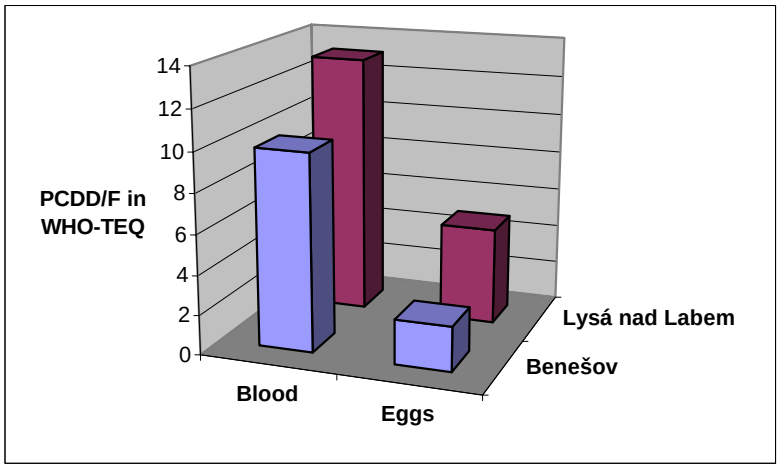
Tables V - VIII and related graphs at Pictures I - IV in Annexes show comparison of certain POPs levels in free range chicken eggs from Lysá nad Labem with other samples collected during the IPEN global monitoring project. [24]

Table 10. The results of toxic chemicals measurement in the eggs from Lysá nad Labem and from Benešov (the data are expressed per gram of lipids).

Measured chemicals per gram of lipids	Lysá nad Labem - 4 eggs pooled sample	Lysá nad Labem - 1 egg sample	Benešov - 4 eggs pooled sample	EU limits
Dioxins (PCDD/F) in pg TEQ/g	5 - 6.8	-	2.5 - 4.6	3
PCB in TEQ in pg TEQ/g	21.7 - 22.4	-	3.1 - 3.9	-
Total TEQ in pg/g	26.8 - 29.2	-	5.6 - 8.5	-
PCB (sum of 7 congeners) in ng/g	315.8	377.6	39.25	200
Hexachlorobenzene (HCB) in ng/g	46.2	46.4	14.9	20
Hexabromocyclododecan (HBCD) in ng/g	-	6.8	-	-
Deca-BDE (congener 209) in ng/g	-	9.4	-	-
sum of PBDEs (11 congeners) in ng/g	-	10.4	-	-
sum of DDT in ng/g	-	3349.2	-	500
p,p´-DDE in ng/g	-	2748,9	-	-
p,p´-DDT in ng/g	-	537.2	-	-
sum of HCH in ng/g	-	4.3	-	-
γ-HCH (lindane) in ng/g	-	2.9	-	100

Notes: EU limits applied for the Czech Republic before it became an EU member state. TEQ levels are calculated by using WHO TEFs.

Picture 8: Graph shows comparisons between levels of PCDD/Fs in the samples of eggs and in human blood from two locations - Lysá nad Labem and Benešov.



It is clear that the levels of HCB found in free range chicken eggs from Lysá nad Labem are very high levels and PCBs levels (for 7 PCB congeners as well as in WHO-TEQ) are among the highest in the free range chicken eggs collected during the IPEN global monitoring project. PCDD/Fs concentrations in eggs from Lysá nad Labem are higher (for example) than those in free range chicken eggs from the surrounding area of the hazardous waste incinerator

in Izmit (Turkey) and/or from surrounding of waste landfill in Bolshoi Trostenec (Belarus) for example, but lower when compared to some other localities (see Picture I in Annexes). Level of dioxins in eggs from Lysá nad Labem are also lower than the levels observed in chicken eggs from the surrounding area of the Spolana Neratovice chemical plant after the floods in 2002 (23.39 pg WHO-TEQ/g of fat). [25] Compared to other samples from the Czech Republic the level of dioxins in eggs from Lysá nad Labem are among the highest observed.

Also very high is the level of DDT observed in the chicken egg sample from Lysá nad Labem. It exceeded the EU limit for the sum of DDT in chicken eggs by six-fold. Although the level for the sum of HCH is not high, it is higher than levels found in eggs taken from Ústí nad Labem and Liberec during the IPEN global monitoring project.

Table IV in Annexes shows results of analysis of free range chicken eggs collected world-wide during the IPEN global monitoring project. It also shows that free range chicken eggs from Lysá nad Labem had higher levels of PBDEs and hexabromocyclododecane (HBCD) than other free range chicken eggs from the Czech Republic. It is also clear that deca-BDE was a major contributor to the relatively high level of PBDEs in the sampled eggs (see Table 12). This BDE congener is not often followed in monitoring projects although it seems to be a significant contaminant in general.[26]

Men

After these findings became available, the Region Office of Middle Bohemian Region together with the Health Institute in Ostrava (the National Reference Lab for Analysis of POPs) ordered an analysis of POPs in human tissues from near the site where the previously mentioned soil samples were taken. The Health Institute in Ostrava chose for its study samples of blood from 15 men who had never worked at an incinerator. The blood samples were collected on January – 29 - 2004.[27]

An analysis of persistent chlorinated organic materials was lead by Standard Execution of the lab in the National Reference Lab for Analysis of POPs of the Health Institute based in Ostrava. The State Institute of Health in Prague carried out the interpretation of the results (Černá, M. et al 2004).

The results of the analysis are summed up in Table 11 and graph at Picture 9.

Only dioxins and dioxin-like PCBs were studied in the blood of the Lysá nad Labem inhabitants. The group of 15 men showed a wide range of WHO-TEQ levels from 12.6 to 60.5 pg WHO-TEQ/g of lipids, where PCBs were a major contributor to these levels. On average the PCDD/Fs levels were higher than in Benešov and lower than in the surrounding area of Spolana Neratovice (with a chemical plant highly contaminated by dioxins). Table 12 shows a detailed comparison of measured levels in Lysá nad Labem with the other aforementioned localities.

Table 11. Individual results of blood analysis of 15 men from Lysá nad Labem for PCDD/Fs and PCBs concentration. Source: Information released by the Region Office of Middle Bohemian Region.

Sample number	**368**	**369**	**370**	**371**	**372**	**373**	**374**
	pg WHO-TEQ/g fat	**pg WHO-TEQ/g fat**	**pg WHO-TEQ/g fat**	**pg WHO-TEQ/g fat**	**Pg WHO-TEQ/g fat**	**pg WHO-TEQ/g fat**	**pg WHO-TEQ/g fat**
PCDD/Fs	5.5	30.5	9.4	11.5	9.4	11.4	13.0
PCBs	7.1	28.2	14.0	18.6	12.7	15.9	13.5

375	**376**	**377**	**378**	**379**	**380**	**381**	**382**
pg WHO-TEQ/g fat	**pg WHO-TEQ/g fat**	**pg WHO-TEQ/g fat**	**pg WHO-TEQ/g fat**	**pg WHO-TEQ/g fat**	**Pg WHO-TEQ/g fat**	**pg WHO-TEQ/g fat**	**pg WHO-TEQ/g fat**
5.5	13.7	17.2	15.3	10.9	14.2	20.3	8.9
10.7	30.3	30.9	31.0	15.3	17.9	40.2	9.3

Picture 9: Graph shows contributions of PCBs and PCDD/Fs to whole WHO-TEQ levels expressed in measured levels per gram of lipids in blood serum per each sample. Source: Information released by the Region Office of Middle Bohemian Region.

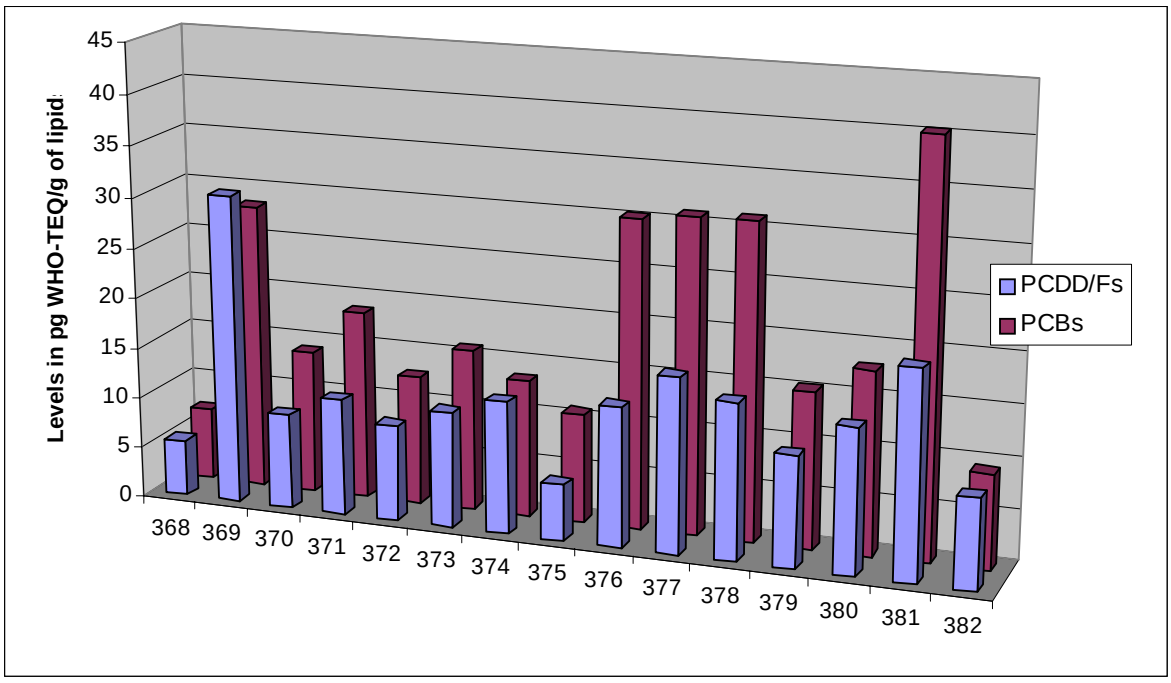


Table 12: PCDD/PCDF/PCB levels declared by value of WHO-TEQ in pg/g lipids in blood of examined people from Lysá n. L., and localities near Spolana Neratovice chemical plant (Neratovice, Libiš and Tišice), and a control group Benešov - the descriptive statistics (sources: Černá, M. et al 2004 [28] and Černá, M. et al. 2003 [29]).

Calculation WHO-TEQ	Indicators	PCDD	PCDF	PCB	Total TEQ
Lysá n.L. N = 15, below LOD = ½ LOD	Avg±SD Median Min-max	3.9±2.5 3.4 1.1-12	9.2±4.0 8.3 4.2-18.6	19.7±9.9 15.9 7.1-40.2	32.8±15.1 27.3 12.6-60.5
Benešov N=20, below LOD = ½ LOD	Avg±SD Median Min-max	3.3±1.6 2.7 1.6-7.1	6.6±2.2 6.2 2.8-11.8	15.4±6.3 13.4 7.6-27	25.4±8.9 24.0 13.0-45.0
Neratovice N=20, below LOD = ½ LOD	Avg±SD Median Min-max	5.6±3.0 4.5 2.7-15	12.3±5.1 11.8 5.6-24.9	33.4±19.1 28.9 14.7-92.6	51.2±24.3 49.5 24-118
Libiš N=20, below LOD = ½ LOD	Avg±SD Median Min-max	5.1±2.6 4.6 2.3-13.3	11.8±5.0 10.3 5.2-27.2	40.5±19.5 37.8 18.5-93.6	57.4±22.7 54.0 29-116
Tišice N=20, below LOD = ½ LOD	Avg±SD Median Min-max	5.3±6.2 3.6 2.2-30.9	14.8±13.3 10.7 5.3-58	34.4±28.0 27.8 11.7-134	54.5±46.4 42.0 22-223

LOD = level of detection
Min - max = minimum and maximum value

Conclusions and Recommendations

We have collected all available data about POPs measurements from the surroundings of two hot spots in the Middle Bohemian Region situated close to each other. POPs levels in biological samples from this area show elevated levels of dioxins, PCBs, HCB, DDT and brominated flame retardants (HBCD, deca-BDE). In some samples EU limits for food were exceeded (for dioxins in free range poultry, game meat and in free range chicken eggs, for DDT, HCB and PCBs in free range chicken eggs). In contrast, soils do not show high levels of POPs, and only at some locations do they exceed typical levels for clean or remote areas in the Czech Republic.

Only dioxins and dioxin-like PCBs were studied in the blood of Lysá nad Labem inhabitants. The group of 15 men showed a wide range of WHO-TEQ levels from 12.6 to 60.5 pg WHO-TEQ/g of lipids, and PCBs were a major contributor to these levels. No comparison with food and/or occupation was done therefore it is not possible to determine the reason for this wide range of measured levels.

Collected data about POPs measurements show that the Lysá nad Labem and Milovice regions belong to areas with biota highly contaminated by POPs. High PCBs levels observed in regions can be linked to the hazardous waste stockpile, which has thankfully been removed. Relatively high levels of other POPs show the importance of tracking and monitoring waste streams to a hazardous waste incinerator which can be a source of release and subsequent

contamination of the surrounding area by these compounds, because it is not equipped to destroy highly stabile chemicals such as POPs and/or brominated chemicals.

There is a lack of data on brominated chemicals in the Czech environment and on levels of DDT from the Lysá nad Labem and Milovice region.

Research on hazardous waste incinerator operations showed that following standard measurements of air releases does not necessary capture all air pollution flows by POPs. In the case of the Lysá nad Labem incinerator they can be released into the atmosphere by the inappropriate capture and handing of dust with APC residues. High levels of PCDD/Fs and even small amounts released in this manner can be a significant source of contamination.

To prevent POPs releases from waste incineration we suggest choosing alternative ways of hazardous wastes disposal. For example, a large proportion of the waste burnt in the hazardous waste incinerator at Lysá nad Labem is medical waste. This can be treated by autoclaves combined with shredders reducing significantly the volume of waste going to landfill. For each hazardous waste stream/flow great efforts should be made to find alternative disposal treatment to incineration.

Stricter control of POPs containing wastes and strict limits for POPs content in wastes should be introduced to prevent releases of these dangerous substances from sites like the Milovice hazardous waste stockpile.

Inappropriate POPs waste incineration should be avoided because burning waste with high levels of POPs (such as DDT and PCBs) could lead to the contamination of areas surrounding the hazardous waste incinerator in Lysá nad Labem and this facility has not shown it is able to secure both safe storage and safe disposal of POPs wastes.

Annexes

Table I. Results of emission concentrations in environmental air by official records of measuring firms, provided by Czech Inspection of Environment (units here)

Agent Name (Data in mg/m^3, if not stated otherwise)	Aug - 2 and 3 – 2000	Sep - 7 - 2000	Sep - 4 and 5 2000	Nov –13 and Dec - 11, 2000	Limits valid in Czech Rep. since of May, 1st 2004 in mg/m^3 (1)
Organic compounds (TOC index)	-	0.1	0.4±0.2	-	10
HCl	**139±7**	<0.28 (INPEK) 0.5±0.1 (TESO)	0.10±0.02	-	10
HF	0.14±0.01	**1.23**	<0.1	-	1
PCDD/PCDF (in ng I-TEQ/m^3)	**0.16±0.05**	0.0992	**0.20±0.05**	**0.2711** (13. 11.) 0.09±0.02 (11. 12.)	0.1 ng I-TEQ/m^3
Heavy metals of group I (Cd, Hg, Tl)	0.071±0.018	0.0137	0.049±0.012	-	0.1 for Cd and Tl, 0,1 for Hg
Heavy metals of group II (As, Co, Ni, Se, Te)	0.005±0.001	0.0005	0.001±0.0005	-	1 for total of metals group II. and III.
Heavy metals of group III (Sb, Pb, Cr, Cu, Mn, Pt, Rd, Rh, Sh)	0.005±0.001	0.0096	0.001±0.0005	-	
PCB (ng I-TEQ/m^3)	0.002±0.001				-

Agent Name (Data in mg/m^3, if not stated otherwise)	May - 6 and 7 - 2002	Apr - 23 -25 - 2003	Jul - 29 -31 - 2003	Jul - 26–and 27 - 2004	Nov – 2 and 3 - 2004	Limits valid in Czech Rep. since of May, 1st 2004 in mg/m^3
Organic compounds (TOC index)		2.6±1.1		2.1±1.1	<1.1 (1.0)	10
HCl		3.4±0.3		0.481±0.04	0.497±0.04	10
HF		<0.2 (0.055)		<0.2 (0.05)	<0.2 (0.06)	1
PCDD/PCDF (in ng I-TEQ/m^3)	**0,17**	**0.101±0.040**	0.033±0.013	0.037±0.01	0.031±0.01	0.1 ng I-TEQ/m^3
Heavy metals of group I (Cd, Hg, TI)		0.052±0.013		0.007±0.002	0.0041±0.001	0.1 pro Cd a Tl a 0.1 pro Hg
Hg				0.0061	0.0036	0.1
Heavy metals of group II (As, Co, Ni, Se, Te)		0.198±0.04		0.120±0.024	<0.001 (0.0008)	1 for total of metals II. and III.
Heavy metals of group III (Sb, Pb, Cr, Cu, Mn, Pt, Rd, Rh, Sh)		0.053±0.011		0.186±0.037	0.0089±0.002	

Table II. Results of measurements of dioxins content in samples of fly ash, Sorbalite™ and other residues from combustion gases treatment from different waste incinerators in the Czech Republic.

Incinerator location	Type of waste	Measured pg I-TEQ/g	Note	Source
Municipal Solid Waste Incinerator Liberec	fly ash	362 (ND=0) 363 (ND=1/2DL)	Sampling August 14, 2000	ECOCHEM 7707, sample 2911
Hazardous Waste Incinerator Lysá n/L	Sorbalite ™	2190.0	Sampling September 4, 2000, sample 1	Axys-Varilab 9216 sample 2360
Hazardous Waste Incinerator Lysá n/L	Sorbalite ™	4350.0	Sampling September 5, 2000, sample 2	Axys-Varilab 9217 sample 2361
Hazardous Waste Incinerator Lysá n/L	Sorbalite ™	6310.0	Sampling September 5, 2000, sample 3	Axys-Varilab 9218 sample 2362
Hazardous Waste Incinerator Lysá n/L	Sorbalite ™	1400.0	Sampling November 15, 2000	Axys-Varilab 9629 sample 2510
Hazardous Waste Incinerator in the Czech Republic	fly ash	860		Ecochem
Hazardous Waste Incinerator in the Czech Republic	fly ash	82400		PEKÁREK, V. (2003): Technology of Catalytic Dehalogenation of POPs Compounds.

Table III: Toxic Equivalency Factors according to US EPA used for PAHs in Vácha, R. et al. 2003[30]

PAH	TEF
benzo(a)pyrene	1
benzo(a)anthracene	0,1
benzo(b)fluorantene	0,1
benzo(k)fluorantene	0,01
indeno(1,2,3-cd)pyrene	0,1
fluorantene	0,01

Table IV: Sampling locations, concentrations of total PBDEs, HBCD, Lindane and Beta HCH in composite egg samples, and characterization of sampling sites. Source: Blake, A. 2005.[31]

Sample Location	Σ PBDEs (ng/g fat)	HBCD (ng/g fat)	Lindane (ng/g fat)	Beta HCH (ng/g fat)	Characterization of sample site
Belarus - Bolshoi Trostenec	NA	NA	0.58	2.40	Dumpsite (fires)
Bulgaria - Kovachevo	NA	NA	1.10	19.50	Power plants, industrial area
Czech Republic - Liberec (fresh eggs)	2.0	< 3.0	2.00	0.60	Municipal waste incinerator, secondary steel production
Czech Republic - Liberec (boiled eggs)	0.8	< 3.0	2.30	0.43	Municipal waste incinerator, secondary steel production
Czech Republic - Lysá nad Labem	10.5	6.8	NA	NA	Hazardous waste incinerator
Czech Republic - Usti nad Labem	1.0	< 3.0	0.68	0.54	Chlorine chemical industry site, hazardous waste incinerator
Egypt - Helwan	NA	NA	0.66	52.50	Metallurgy, cement kilns
India – Eloor	NA	NA	3.00	85.40	Organochlorine pesticides production
India - Lucknow	NA	NA	18.90	390	Medical waste incinerator
India – Takia	NA	NA	23.40	3100	Organochlorine pesticides production
Kenya - Dandora	29.3	160.3	1.40	1.10	Dumpsite (fires)
Mexico – Coatzacoalcos	30.8	90.8	2.20	1.40	Petrochemical complex
Mozambique - Santos	12.3	18.9	1.30	4.50	Cement kiln burning waste
Pakistan - Peshawar	NA	NA	0.75	4.70	Mixed waste dumpsite
Philippines – Barangay Aguado	33.6	8.7	1.30	6.80	Medical waste incinerator
Russia - Gorbatovka	NA	NA	0.50	100.00	Chlorine chemical industry site, hazardous waste incinerator
Russia - Igumnovo	NA	NA	1.10	36.30	Chlorine chemical industry site, hazardous waste incinerator
Senegal - Mbeubeuss	NA	NA	2.00	4.00	Dumpsite (fires)
Senegal - Sangalkam	NA	NA	21.40	41.10	Pesticides application area
Slovakia - Kokshov-Baksha	29.3	89.2	0.48	1.80	Municipal waste incinerator
Tanzania - Vikuge	NA	NA	2.30	310	Obsolete pesticides storage
Turkey – Izmit	106.8	42.8	0.60	3.70	Hazardous waste incinerator
Uruguay - Minas	1.8	89.2	0.51	2.00	Cement kilns burning waste
USA - Mossville	23.4	7.2	1.70	0.27	PVC and oil industries

Table V: Levels of dioxins (PCDD/Fs) in pool samples of free range chicken eggs from 17 countries.

Country/locality	Year	Number of analyzed eggs	Measured level in pg/g (WHO-TEQ) of fat	Source of information
Uruguay, Minas	2005	8/1 pool	2.18	Axys Varilab 2005
Czech Republic, Liberec I	2005	3/1 pool	2.61	Axys Varilab 2005
Czech Republic, Liberec II	2005	3/1 pool	2.63	Axys Varilab 2005
Czech Republic, Usti nad Labem	2005	6/1 pool	2.90	Axys Varilab 2005
Pakistan, Peshawar	2005	3/1 pool	2.91	Axys Varilab 2005
Tanzania, Vikuge	2005	6/1 pool	3.03	Axys Varilab 2005
Turkey, Izmit	2005	6/1 pool	3.37	Axys Varilab 2005
Belarus, Bolshoi Trostenec	2005	6/1 pool	3.91	Axys Varilab 2005
Mozambique, Santos	2005	6/1 pool	5.08	Axys Varilab 2005
USA, Mossville	2005	6/1 pool	5.97	Axys Varilab 2005
Czech Republic, Lysá nad Labem	2004	4/1 pool	6.77	Axys Varilab 2004
Philippines, Barangay Aguado	2005	6/1 pool	9.68	Axys Varilab 2005
Slovakia, Kokshov-Baksha and Valaliky	2005	6/1 pool	11.52	Axys Varilab 2005
Russia, Gorbatovka	2005	4/1 pool	12.68	Axys Varilab 2005
India, Eloor	2005	6/1 pool	13.91	Axys Varilab 2005
India, Lucknow	2005	4/1 pool	19.80	Axys Varilab 2005
Mexico, Coatzacoalcos	2005	6/1 pool	21.63	Axys Varilab 2005
Kenya, Dandora	2004	6/1 pool	22.92	Axys Varilab 2005
Senegal, Mbeubeuss	2005	6/1 pool	35.10	Axys Varilab 2005
Russia, Igumnovo	2005	4/1 pool	44.69	Axys Varilab 2005
Bulgaria, Kovachevo	2005	6/1 pool	64.54	Axys Varilab 2005
Egypt, Helwan	2005	6/1 pool	125.78	Axys Varilab 2005

Picture I: Graph levels of PCDD/Fs in different free range chicken eggs samples according to data in Table V.

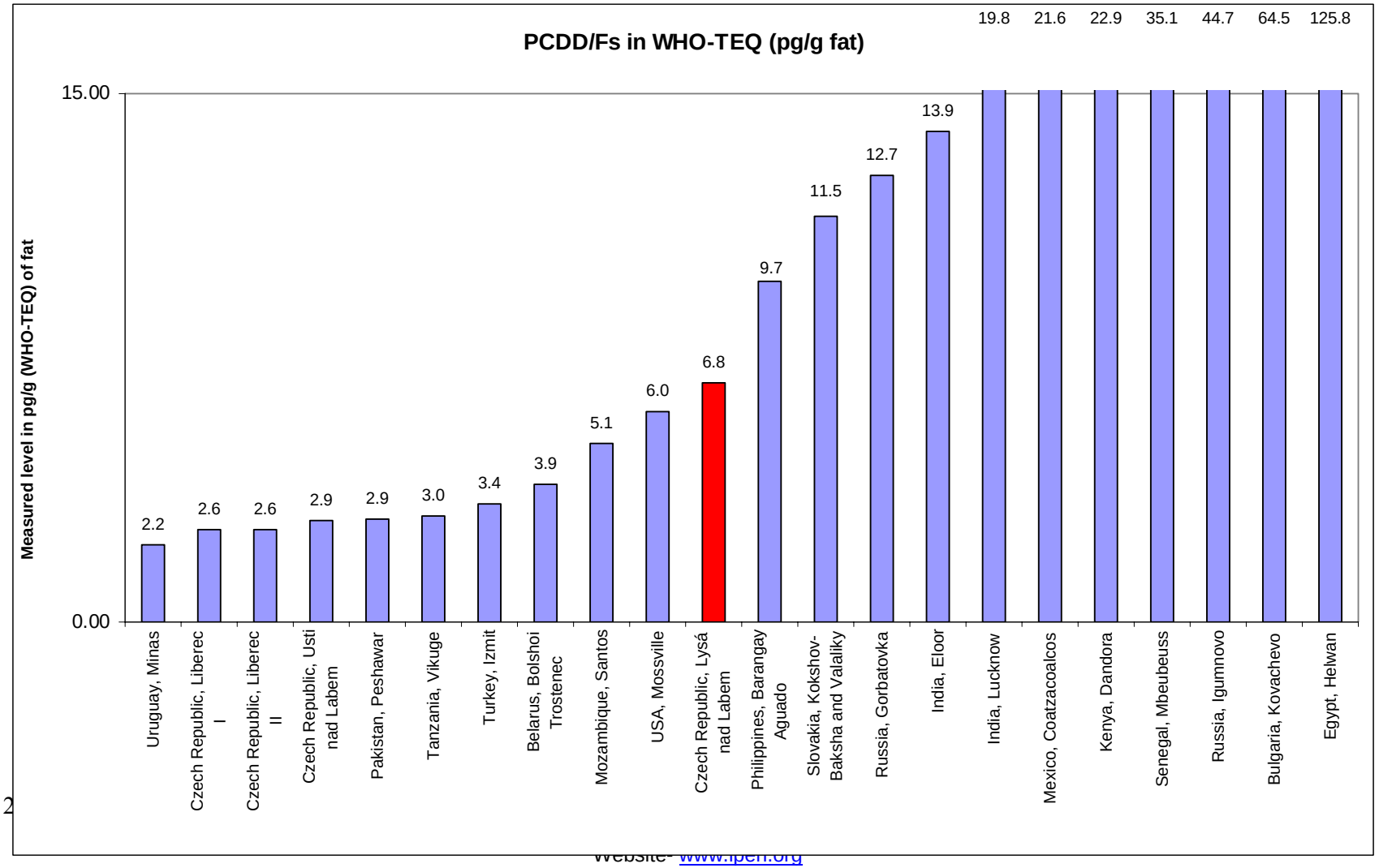


Table VI: HCB levels found in different free range chicken eggs samples.

Country/locality	Year	Number of analyzed eggs	Measured level in pg/g (WHO-TEQ) of fat	Source of information
Czech Republic, Liberec I	2005	3/1 pool	0.60	Axys Varilab 2005
Tanzania, Vikuge	2005	6/1 pool	0.70	Axys Varilab 2005
Pakistan, Peshawar	2005	3/1 pool	0.80	Axys Varilab 2005
Turkey, Izmit	2005	6/1 pool	0.93	Axys Varilab 2005
Czech Republic, Liberec II	2005	3/1 pool	1.07	Axys Varilab 2005
India, Eloor	2005	6/1 pool	1.17	Axys Varilab 2005
Czech Republic, Usti nad Labem	2005	6/1 pool	1.22	Axys Varilab 2005
USA, Mossville	2005	6/1 pool	1.74	Axys Varilab 2005
Philippines, Barangay Aguado	2005	6/1 pool	3.30	Axys Varilab 2005
Senegal, Mbeubeuss	2005	6/1 pool	3.44	Axys Varilab 2005
Uruguay, Minas	2005	8/1 pool	3.75	Axys Varilab 2005
Mozambique, Santos	2005	6/1 pool	4.37	Axys Varilab 2005
Slovakia, Kokshov-Baksha + Valaliky	2005	6/1 pool	4.60	Axys Varilab 2005
Mexico, Coatzacoalcos	2005	6/1 pool	4.69	Axys Varilab 2005
Bulgaria, Kovachevo	2005	6/1 pool	5.03	Axys Varilab 2005
Kenya, Dandora	2004	6/1 pool	8.10	Axys Varilab 2005
Russia, Gorbatovka	2005	4/1 pool	9.08	Axys Varilab 2005
India, Lucknow	2005	4/1 pool	9.40	Axys Varilab 2005
Belarus, Bolshoi Trostenec	2005	6/1 pool	9.83	Axys Varilab 2005
Egypt, Helwan	2005	6/1 pool	11.74	Axys Varilab 2005
Russia, Igumnovo	2005	4/1 pool	18.37	Axys Varilab 2005
Czech Republic, Lysá nad Labem	2004	4/1 pool	22.41	Axys Varilab 2004

Picture II: Graph levels of PCBs in WHO-TEQ in different free range chicken eggs samples according to data in Table VI.

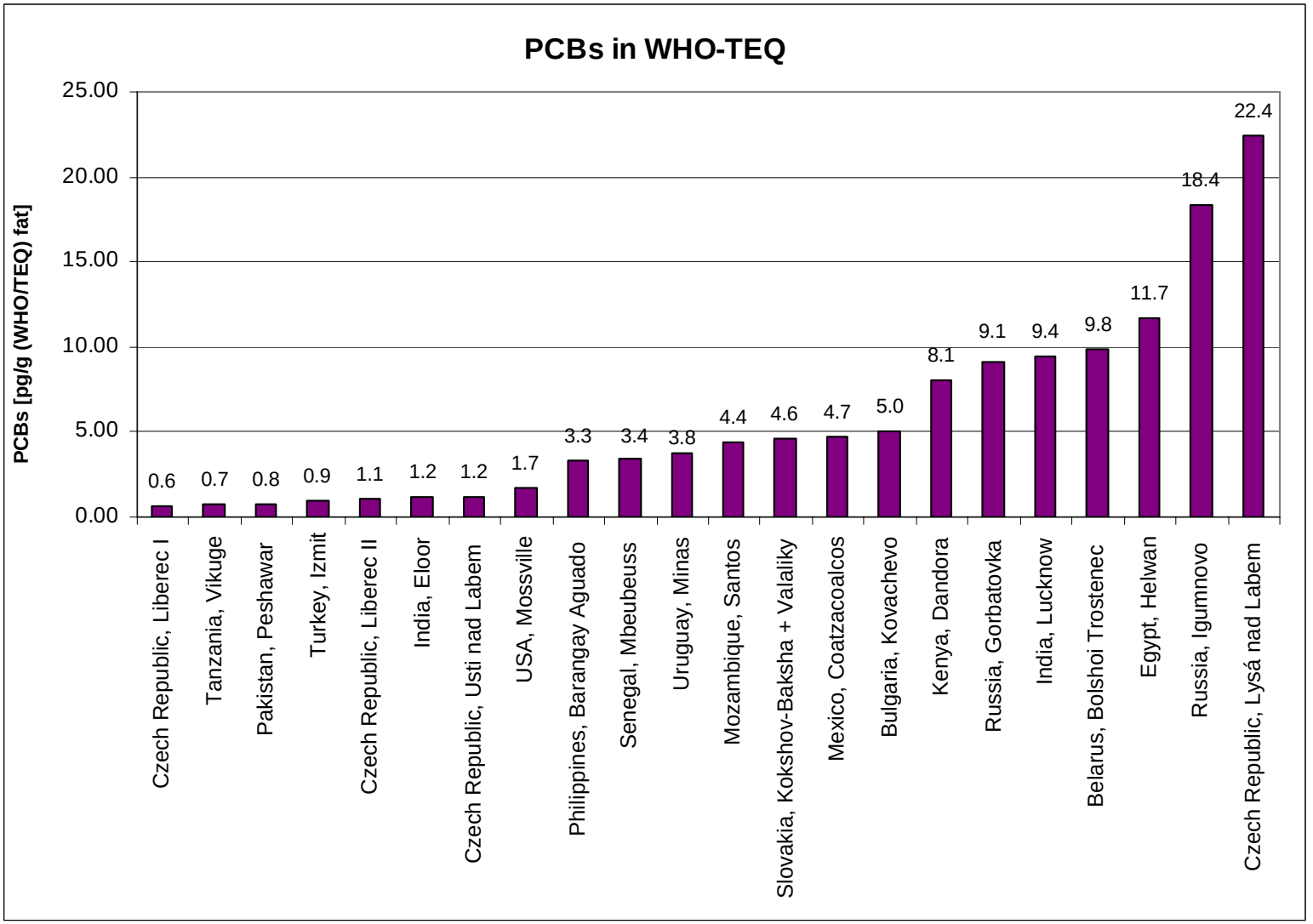


Table VII: Seven PCB congeners levels found in different free range chicken eggs samples.

Country	Year	Number of analyzed eggs	Measured level in ng/g fat	Source of information
USA, Mossville	2005	6/1 pool	1.70	Axys Varilab 2005
Bulgaria, Kovachevo	2005	6/1 pool	3.04	Axys Varilab 2005
Tanzania, Vikuge	2005	6/1 pool	4.10	Axys Varilab 2005
Pakistan, Peshawar	2005	3/1 pool	4.14	Axys Varilab 2005
India, Eloor	2005	6/1 pool	4.46	Axys Varilab 2005
Turkey, Izmit	2005	6/1 pool	5.13	Axys Varilab 2005
Egypt, Helwan	2005	6/1 pool	6.80	Axys Varilab 2005
Czech Republic, Liberec I	2005	3/1 pool	13.69	Axys Varilab 2005
Czech Republic, Liberec II	2005	3/1 pool	21.61	Axys Varilab 2005
Czech Republic, Usti nad Labem	2005	6/1 pool	26.32	Axys Varilab 2005
Uruguay, Minas	2005	8/1 pool	29.00	Axys Varilab 2005
Senegal, Mbeubeuss	2005	6/1 pool	29.17	Axys Varilab 2005
Mexico, Coatzacoalcos	2005	6/1 pool	30.62	Axys Varilab 2005
Kenya, Dandora	2004	6/1 pool	31.10	Axys Varilab 2005
Mozambique, Santos	2005	6/1 pool	39.17	Axys Varilab 2005
Philippines, Barangay Aguado	2005	6/1 pool	60.90	Axys Varilab 2005
Russia, Gorbatovka	2005	4/1 pool	63.50	Axys Varilab 2005
Belarus, Bolshoi Trostenec	2005	6/1 pool	70.87	Axys Varilab 2005
India, Lucknow	2005	4/1 pool	75.34	Axys Varilab 2005
Russia, Igumnovo	2005	4/1 pool	167.30	Axys Varilab 2005
Slovakia, Kokshov-Baksha + Valaliky	2005	6/1 pool	189.00	Axys Varilab 2005
Czech Republic, Lysa nad Labem	2004	4/1 pool	315.80	Axys Varilab 2004
Czech Republic, Lysa nad Labem	2005	1 individual	337.60	VSHCT 2005

Picture III: Graph levels of seven PCB congeners in different free range chicken eggs samples according to data in Table VII.

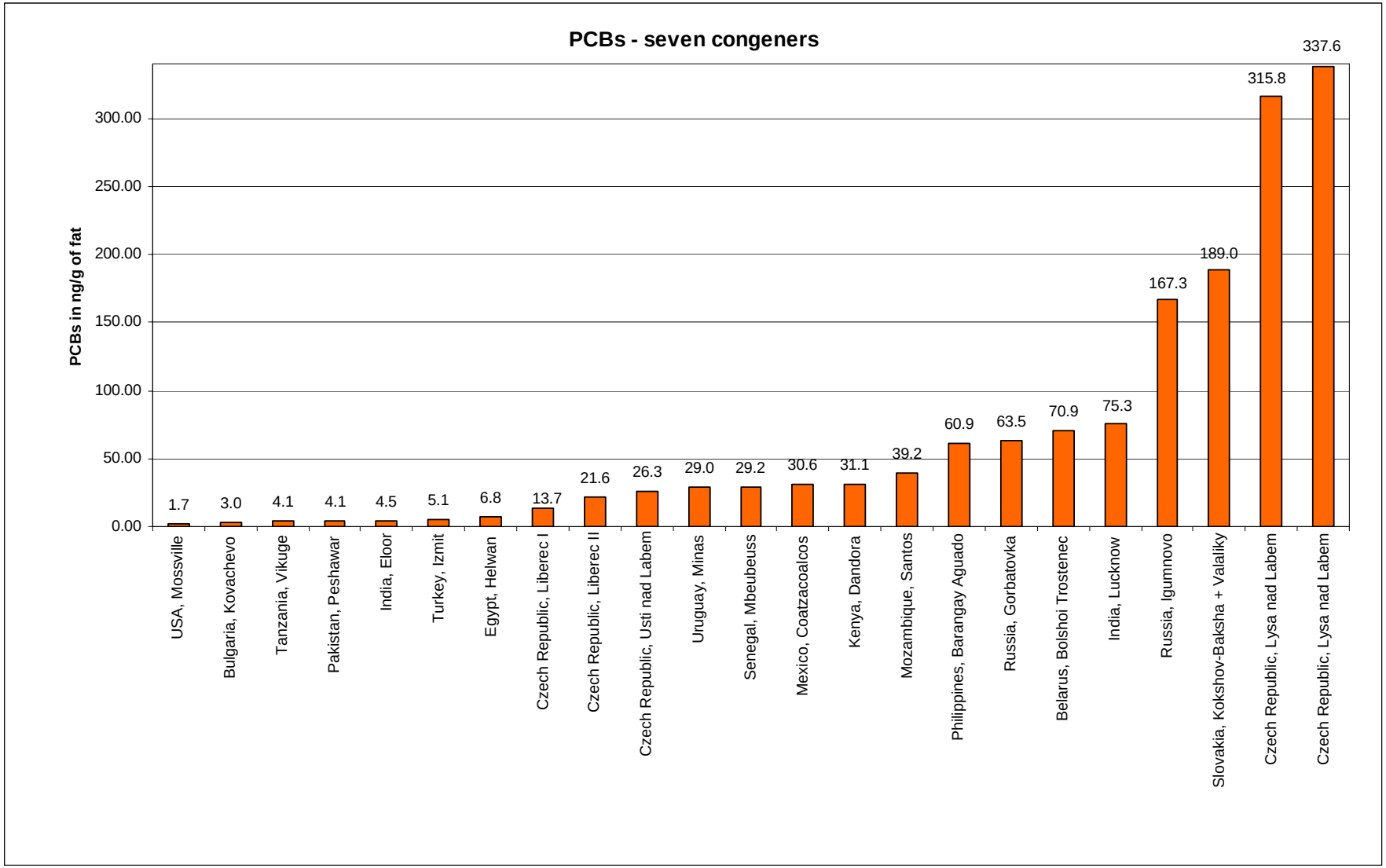
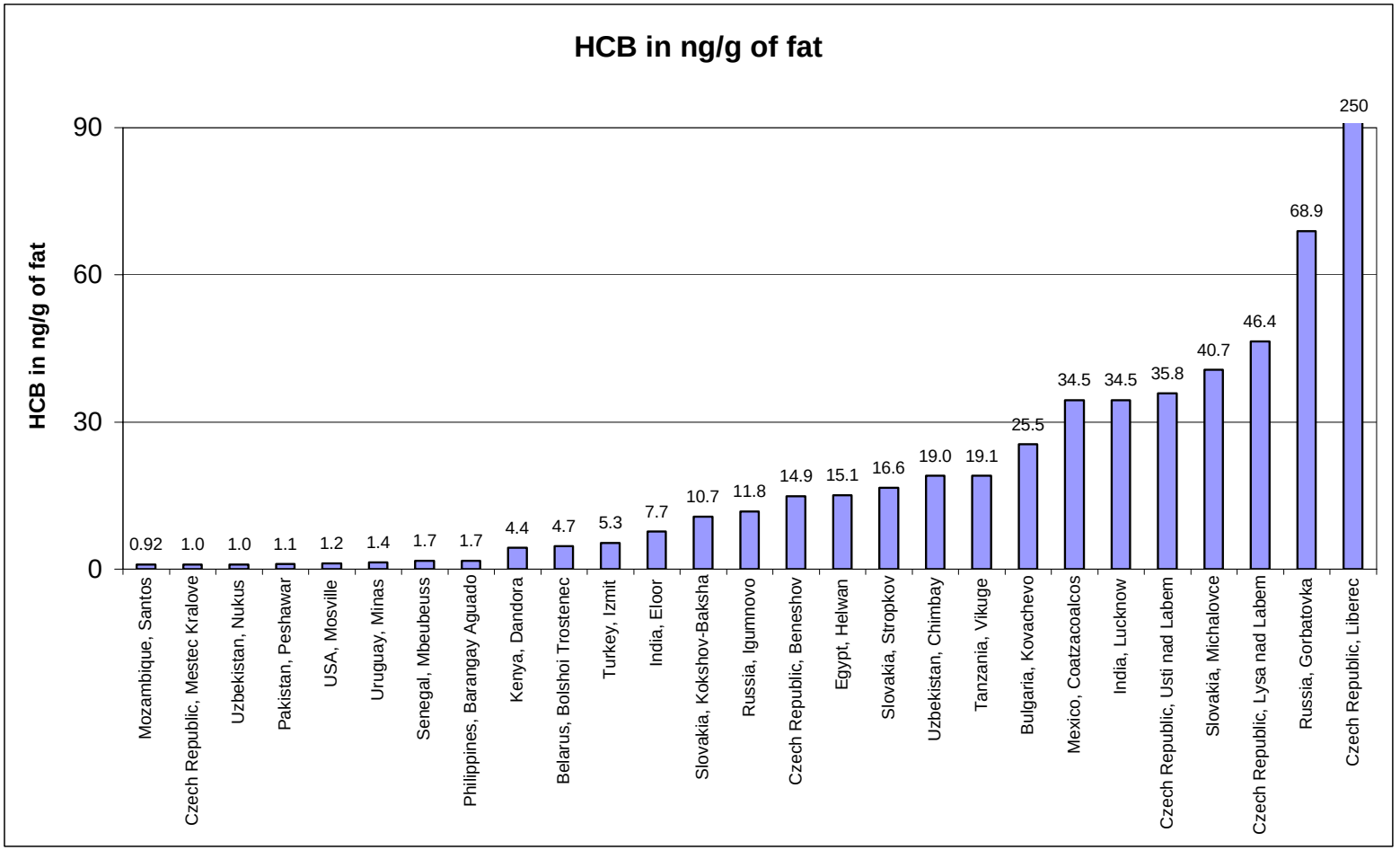


Table VIII: HCB levels found in different free range chicken eggs samples.

Country	Date/year	Group	Number of measured samples	Measured level in ng/g of fat	Source of information
Mozambique, Santos	2005	free range	6/1 pooled	0.92	Axys Varilab 2005[32]
Czech Republic, Mestec Kralove	2003	free range	3	1.0	SVA CR 2004[33]
Uzbekistan, Nukus	2001	free range	-	1.0	Muntean, N. et al. 2003[34]
Pakistan, Peshawar	2005	free range		1.1	Axys Varilab 2005
USA, Mosville	2005	free range	6/1 pooled	1.2	Axys Varilab 2005
Uruguay, Minas	2005	free range	8/1 pooled	1.4	Axys Varilab 2005
Senegal, Mbeubeuss	2005	free range	6/1 pooled	1.7	Axys Varilab 2005
Philippines, Barangay Aguado	2005	free range		1.7	Axys Varilab 2005
Kenya, Dandora	2004	free range	6/1 pool	4.4	Axys Varilab 2005
Belarus, Bolshoi Trostenec	2005	free range	6/1 pool	4.7	Axys Varilab 2005
Turkey, Izmit	2005	free range	6/1 pooled	5.3	Axys Varilab 2005
India, Eloor	2005	free range	6/1 pooled	7.7	Axys Varilab 2005
Slovakia, Kokshov-Baksha	2005	free range	6/1 pool	10.7	Axys Varilab 2005
Russia, Igumnovo	2005	free range	4/1 pooled	11.8	Axys Varilab 2005
Czech Republic, Beneshov	2004	free range	4/1 pool	14.9	Axys Varilab 2004
Egypt, Helwan	2005	free range	6/1 pooled	15.1	Axys Varilab 2005
Slovakia, Stropkov	before 1999	free range	1	16.6	Kocan, A. et al. 1999 [35]
Uzbekistan, Chimbay	2001	free range	-	19.0	Muntean, N. et al. 2003
Tanzania, Vikuge	2005	free range	6/1 pool	19.1	Axys Varilab 2005
Bulgaria, Kovachevo	2005	free range	6/1 pooled	25.5	Axys Varilab 2005
Mexico, Coatzacoalcos	2005	free range	6/1 pooled	34.5	Axys Varilab 2005
India, Lucknow	2005	free range	4/1 pooled	34.5	Axys Varilab 2005
Czech Republic, Usti nad Labem	2005	free range	6/1 pool	35.8	Axys Varilab 2005
Slovakia, Michalovce	before 1999	free range	1	40.7	Kocan, A. et al. 1999
Czech Republic, Lysa nad Labem	2004	free range	1	46.4	Axys Varilab 2005
Russia, Gorbatovka	2005	free range	4/1 pooled	68.9	Axys Varilab 2005
Czech Republic, Liberec	2005	free range	3/1 pool	250.0	Axys Varilab 2005

Picture IV: Graph levels of HCB in different free range chicken eggs samples according to data in Table VIII.



Photos

Photo 1: Hazardous waste incinerator in Lysá nad Labem (2002). Photo: Hana

Marcaníková.

Photo 2: Hidden storage of hazardous wastes outside of the hazardous waste incinerator building in Lysá nad Labem (Autumn 2002). Photo: Jana Maťková.

Photo 3: Is this really safe storage for hazardous waste? Barrels outside of the waste incinerator building. Year 2000. Photo: Mlady svět journal.

Photo 4: Public discussion organised by Arnika Association in May 2002. Expert Jiří Procházka talks about results of his research with Minister of the Environment Miloš Kužvart.

Photo 5: Milovice - hazardous wastes stockpile with contaminated soils and residues of hazardous wastes at the end of winter (2004). Photo: Jindřich Petrlík.

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