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Contamination of chicken eggs near the hazardous waste incinerator in Izmit, Turkey by dioxins, PCBs and hexachlorobenzene

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“Keep the Promise, Eliminate POPs!” Campaign Report

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Istanbul - Prague (April - 8 - 2005)

Executive Summary

Free-range chicken eggs collected near the Izaydas hazardous waste incinerator in Izmit (Turkey) showed levels of dioxins exceeding EU limits for chicken eggs and elevated levels of HCB. The dioxin levels in eggs exceeded background levels by almost 2-fold. HCB levels were five times higher than background levels. To our knowledge, this study represents the first data about U-POPs in chicken eggs from Turkey.

The most obvious potential source of POPs releases at the site is the waste incinerator burning different types of hazardous wastes. The incinerator has operated either illegally or under a temporary permit that has long since expired.

The toxic substances measured in this study are slated for reduction and elimination by the Stockholm Convention which holds its first Conference of the Parties beginning 2 May 2005. Turkey has signed the Convention in May 2001 but has not ratified it. The Convention mandates Parties to take specific actions aimed at eliminating these pollutants from the global environment. We view the Convention text as a promise to take the actions needed to protect Turkish and global public’s health and environment from the injuries that are caused by persistent organic pollutants, a promise that was agreed by representatives of the global community: governments, interested stakeholders, and representatives of civil society. We call upon the Turkish government to ratify the Stockholm Convention and urge governmental representatives and all stakeholders to honor the integrity of the Convention text and keep the promise of reduction and elimination of POPs.

Recommendations

1) More POPs monitoring in Turkey is needed;

2) More publicly accessible data about U-POPs releases from all potential sources in the region are needed to address them properly; the data given by the UNEP Toolkit are not satisfactory;

3) Waste incineration of POPs-containing waste should be replaced by alternative technologies or practices that considerably reduce or eliminate the formation of dioxins and other U-POPs. This is promoted in the Stockholm Convention text but somewhat compromised in the proposed documents for COP1 of the Stockholm Convention.

4) PVC-containing waste should not be burned and preferably other materials that do not contain chlorine should be substituted for products currently using PVC.

5) Turkey should ratify Stockholm Convention.

Introduction

Persistent organic pollutants (POPs) harm human health and the environment. POPs are produced and released to the environment predominantly as a result of human activity. They are long lasting and can travel great distances on air and water currents. Some POPs are produced for use as pesticides, some for use as industrial chemicals, and others as unwanted byproducts of combustion or chemical processes that take place in the presence of chlorine compounds. Today, POPs are widely present as contaminants in the environment and food in all regions of the world. Humans everywhere carry a POPs body burden that contributes to disease and health problems.

The international community has responded to the POPs threat by adopting the Stockholm Convention in May 2001. The Convention entered into force in May 2004 and the first Conference of the Parties (COP1) will take place on 2 May 2005. Turkey signed the Convention in May 2001.

The Stockholm Convention is intended to protect human health and the environment by reducing and eliminating POPs, starting with an initial list of twelve of the most notorious, the "dirty dozen." Among this list of POPs there are four substances that are produced unintentionally (U-POPs): polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs) The last two groups are simply known as dioxins.

The International POPs Elimination Network (IPEN) asked whether free-range chicken eggs might contain U-POPs if collected near potential sources of U-POPs named by the Stockholm Convention. The surroundings of the hazardous waste incinerator in Izmit was selected as a sampling site since it is known to be a significant source of dioxins and furans and a potential source of hexachlorobenzene as by-products.[1] Chicken eggs were chosen for several reasons: they are a common food item; their fat content makes them appropriate for monitoring chemicals such as POPs that dissolve in fat; and eggs are a powerful symbol of new life. Free range hens can easily access and eat soil animals and therefore their eggs are a good tool for biomonitoring of environmental contamination by U-POPs. This study is part of a global monitoring of egg samples for U-POPs conducted by IPEN and reflects the first data about U-POPs in eggs ever reported in Turkey.

Materials and Methods

Please see Annex 1.

Results and Discussion

U-POPs in eggs sampled in Izmit, Turkey

The results of the analysis of a pooled sample of 6 eggs collected within a 2 km distance from the hazardous waste incinerator in Izmit are summarized in Tables 1 and 2. Pooled sample fat content was measured at 13.8%.

The sampled eggs exceeded the EU limit for dioxins by 1.13-fold. In addition, the eggs showed elevated levels of HCB. The sum of PCDD/Fs and PCBs is close to the proposed EU limit for total WHO-TEQs.

Table 1: Measured levels of POPs in the sample from Izmit, Turkey per gram of fat.

	Measured level	Limits	Action level
PCDD/Fs in WHO-TEQ (pg/g)	3.37	3.0[a]	2.0[b]
PCBs in WHO-TEQ (pg/g)	0.93	2.0[b]	1.5[b]
Total WHO-TEQ (pg/g)	4.30	5.0[b]	-
PCB (7 congeners) (ng/g)	5.13	200[c]	-
HCB (ng/g)	5.30	200[d]	-

Abbreviations: WHO, World Health Organization; TEQ, toxic equivalents; pg, picogram; g, gram; ng, nanogram.

[a] Limit set up in The European Union (EU) Council Regulation 2375/2001 established this threshold limit value for eggs and egg products. There is even more strict limit at level of 2.0 pg WHO-TEQ/g of fat for feedingstuff according to S.I. No. 363 of 2002 European Communities (Feedingstuffs) (Tolerances of Undesirable Substances and Products) (Amendment) Regulations, 2002.

[b] These proposed new limits are discussed in the document Presence of dioxins, furans and dioxin-like PCBs in food. SANCO/0072/2004.

[c] Limit used for example in the Czech Republic according to the law No. 53/2002 as well as in Poland and/or Turkey.

[d] EU limit according to Council Directive 86/363/EEC.

Table 2 shows the levels of U-POPs in eggs expressed as fresh weight.

Table 2: Measured levels of POPs in the sample from Izmit in Turkey per gram of egg fresh weight.

	Measured level	Limits	Action level
PCDD/Fs in WHO-TEQ (pg/g)	0.47	1[a]	-
PCBs in WHO-TEQ (pg/g)	0.13	-	-
Total WHO-TEQ (pg/g)	0.59	-	-
PCBs (7 congeners) (ng/g)	0.71	-	-
HCB (ng/g)	0.73	-	-

[a] U.S. Department of Agriculture Food Safety and Inspection Service [Memo 8 July 1997] Advisory to Owners and Custodians of Poultry, Livestock and Eggs. Washington, DC:U.S. Department of Agriculture, 1997. FSIS advised in this memo meat, poultry and egg product producers that products containing dioxins at levels of 1.0 ppt in I-TEQs or greater were adulterated. There is even more strict EU limit at level of 0.75 pg WHO-TEQ/g of eggs fresh weight for feeding stuff according to S.I. No. 363 of 2002 European Communities (Feedingstuffs) (Tolerances of Undesirable Substances and Products) (Amendment) Regulations, 2002.

To our knowledge, the measurements of U-POPs in this study represent the first data on U-POPs in chicken eggs ever reported in Turkey. The levels of dioxins exceeding the EU limits and the elevated level of HCB observed in the egg samples support the need for further monitoring and longer-term changes to eliminate chlorinated chemicals that serve as donors for dioxins and furans releases in all environment compartments. As not all PCDD/Fs releases are fully covered by all relevant documents and/or their drafts prepared under Stockholm Convention, it is very important to cover this gap and develop further the UNEP's Toolkit as well as to introduce stricter rules for handling dioxins containing wastes.

Comparison with other studies of eggs

We compared the levels of PCDD/Fs measured in this study in eggs from the neighborhood of the hazardous waste incinerator in Izmit with data from other studies that also used pooled samples and/or expressed mean values of analyzed eggs (please see Annexes 2 and 3). The data for eggs described in this report follow on the heels of a similar studies in Slovakia, Kenya, Czech Republic, Belarus, India (Uttar Pradesh), Tanzania, Senegal and Mexico released since 21 March 2005.[2, 3, 4, 5, 6, 7, 8, 9] The dioxin levels in eggs in this study exceed background levels by almost 2-fold (0.2 - 1.2 pg WHO-TEQ/g of fat)

Some other studies showing elevated levels of dioxins include samples with comparable dioxins levels. These were found in eggs from Vikuge in Tanzania and in Klatovy in the Czech Republic[10] (both near obsolete pesticides stockpiles) for example (see chart and graph in Annex 3). Much higher levels were found near an old waste incinerator in Maincy, France [11] and an area affected by a spread mixture of waste incineration residues in Newcastle, UK,[12] with values of 42.47 pg WHO-TEQ/g and 31 pg WHO-TEQ/g respectively.

It is clear that HCB also represents a serious contaminant in the sampled eggs from Izmit, even though it did not exceed the regulatory limits. In fact, eggs from Izmit contained HCB levels that were five times higher than background levels of HCB (1 ng/g of fat).

Concerning the balance between the contribution of PCBs and PCDD/Fs to the whole WHO-TEQ, PCDD/Fs contribute almost 80% of the whole TEQ value in eggs as visible from graph in Annex 5.

Possible U-POPs sources

The elevated levels of dioxins and hexachlorobenzene in free range chicken eggs in these samples provoke the question of possible sources. As the samples were taken from villages 2 km downwind from the hazardous waste incinerator in Izmit and this waste incinerator is known to be a significant source of dioxins, it is also the most likely to be the biggest contributor to dioxin levels found in this area. On the other hand we can not simply exclude other potential sources such as local heating and/or uncontrolled burning at a waste landfill.

Identifying the source of the hexachlorobenzene is even more difficult as it can have an origin in hazardous wastes as technical chemical and/or in use as pesticide. In addition hazardous waste incinerators can produce HCB as by-product as previously seen in measurements in other countries. [13, 14, 15, 16]

It is clear that there is a gap in publicly accessible data and even existing measurements of U-POPs in Turkey. It is necessary to close this gap to address U-POPs sources properly in the National Implementation Plan of the Stockholm Convention.

The Izmit Waste and Residue Treatment , Incineration and Recycling Co.Inc. (Izaydas) in Turkey

The Izmit Waste and Residue Treatment, Incineration and Recycling Co.Inc. (Izaydas) was founded in 1996 by the Greater Izmit Municipality within the scope of the Izmit Integrated Environment Project. The company was formed to operate the Clinical and Hazardous Waste Incinerator and the Industrial and Domestic Wastewater Treatment Plant. Both the incinerator, which has an annual capacity of 35,000 tons, and the landfill are located just 2 km from the Solaklar village and only 10 km from the city of Izmit. The landfill has a capacity of 790,000 m^3 of industrial waste and 3,125,000 m^3 of household waste.[17]

Picture 1. Map of the Kocaeli Region and the land use in the area.

The waste incinerator was constructed by the German company Lurgi, with the intention of incinerating a range of wastes (including hazardous wastes) for "power generation". Hazardous wastes incinerated included:

- outdated herbicides and other pesticides
- cosmetic and pharmaceutical wastes,
- refinery waste and wastes from oil and coal processing plants,
- used lubricants and oil residues,
- soil and dust contaminated with oil,
- solvents and paints,
- resins, glues and pastes,
- plastic and rubber products (including polyester and PVC products),
- used tires,
- wastes from plastic production and chlorinated residues of plastic products.

Although it was planned to begin operation in August 1997, the Ministry of Environment refused to grant an operating permit on the basis of test burns, arguing that the plant had some technical deficiencies that would lead to emissions of toxic chemicals, especially dioxins and furans. According to information from the construction company, the plant was designed to meet German emission standards from 1986. At the same time, the area within which the industrial wastes and toxic ash from the incinerator would be landfilled did not meet the standards of Hazardous Waste Control Regılations of the Ministry.

The plant operated illegally, without any permit, until action by Greenpeace Mediterranean in the late 1990's led to an order from the Ministry of Environment to the Kocaeli Governship to stop the transportation of all hazardous wastes to Izaydas and their incineration on site (MoE).

After the major earthquake in August 1999, the Ministry of Environment granted Izaydas a temporary operating permit to incinerate the infected waste generated during and after the earthquake. The Ministry stated in its declaration, however, that no chlorinated waste would be incinerated, in order to

avoid the formation of dibenzo-dioxins and furans. But medical waste always includes some portion of chlorinated waste, what means that in reality it was burnt at Izaydas.
After the Volganeft tanker accident at Marmara sea in December 1999, thousands of tonnes of fuel oil Number six washed on the shores of Istanbul. The oily residues were collected in PVC bags and sent to Izaydas, despite repeated warnings from Greenpeace to the authorities that collected oil could be recycled and that the burning of PVC would lead to emissions of dioxins. The company running the incinerator still continues to burn waste there, despite the fact that the temporary permit has long expired.

POPs in the environment of the Izmit and surrounded areas

On 5 April 2000, represantatives of Greenpeace Mediterranean and Greenpeace International visited the incinerator compound and were permitted to collect a total of four samples of ash, taken from different sections of the installation:

- MI0064 — bottom ash from the combustion chamber
- MI0065 — ash from economiser / heat exchanger;
- MI0065/66 — fly ash from electrostatic precipitator (ESP).

All samples were analysed it the Greenpeace Research Laboratories, University of Exeter (UK), for heavy metal and organic contaminants. Two samples (MI0065, ESP ash; MI0067,economiser ash) were forwarded to an accredited laboratory for determination of concentrations of polychlorinated dibenzo-p-dioxins and dibenzofurans. Results were summarised in a Greenpeace study.[18]

With respect to organic contaminants, the greatest number were isolated from the bottom ash collected from the incinerator furnace, indicative of incomplete combustion of some components of the waste feedstock (see Table 2). Among the numerous aromatic organic compounds identified were 1,4-dicholorobenzene and two polychlorinated biphenyls (PCBs), though the latter were only detectable using selective ion monitoring. Although they can be produced as products of incomplete combustion in incinerators, their presence in the bottom ash residues strongly suggests the inclusion of PCBs or PCB-contaminated materials in the incinerator feedstock.

The presence of chlorinated contaminants in the ESP ash was further confirmed by the results of the dioxin analysis for this sample (280 pg I-TEQ/g, ppt).

Dioxins were also detectable in the ash from the economiser/ heat exchanger boiler, located between the furnace and the ESP, although at substantially lower concentrations (8.2 pg I-TEQ/g) than in the ESP fly ash.

It is worth noting that, in addition to chlorinated dioxins, it is also likely that other halogenated dioxins and furans are present in the incinerator ashes, and flue gases, such as brominated and mixed chlorinated/brominated compounds.

The results of the study also indicate that PCBs, or PCB-contaminated wastes, formed a significant part of the feedstock of the Izmit incinerator. This would appear to be in direct contradiction to the condition in the temporary operating permit from the Municipality that the incinerator should not handle chlorinated wastes. The incinerator was also clearly operating in April 2000, long after the temporary permit had first been issued as an emergency measure. Moreover, the appearance of PCB residues in the bottom ash is strongly indicative of inefficient and incomplete combustion of wastes within the furnace.

U-POPs and the Stockholm Convention

The U-POPs measured in this study are slated for reduction and elimination by the Stockholm Convention which holds its first Conference of the Parties in May 2005. Turkey signed the Convention in 2001 but has not ratified it.

The Convention mandates Parties to take specific actions aimed at eliminating these pollutants from the global environment. Parties are to require the use of substitute or modified materials, products and processes to prevent the formation and release of U-POPs.[a] Parties are also required to promote the use of best available techniques (BAT) for new facilities or for substantially modified facilities in certain source categories (especially those identified in Part II of Annex C).[b] In addition, Parties are to promote both BAT and best environmental practices (BEP) for all new and existing significant source categories,[c] with special emphasis on those identified in Parts II and III. As part of its national implementation plan (NIP), each Party is required to prepare an inventory of its significant sources of U-POPs, including release estimates.[d] These NIP inventories will, in part, define activities for countries that will be eligible for international aid to implement their NIP. Therefore it is important that the inventory guidelines are accurate and not misleading.

The Stockholm Convention on POPs is historic. It is the first global, legally binding instrument whose aim is to protect human health and the environment by controlling production, use and disposal of toxic chemicals. We view the Convention text as a promise to take the actions needed to protect Turkish and global public's health and environment from the injuries that are caused by persistent organic pollutants, a promise that was agreed by representatives of the global community: governments, interested stakeholders, and representatives of civil society. We call upon Turkish governmental representatives and all stakeholders to honor the integrity of the Convention text and keep the promise of reduction and elimination of POPs.

Generally, it should be also noted that a range of alternative (non-combustion) technologies already exist for the destruction of PCB stockpiles and PCB contaminated wastes, as well as other hazardous wastes. Several are already in commercial operation, handling PCBs and other chlorinated wastes. Alternatives to incineration also exist for sterilisation of clinical wastes, ,including autoclaves and microwave systems. Such systems destroy pathogens on all surfaces of the clinical waste materials without the need to destroy the waste material itself, thereby avoiding the formation of dioxins during incineration.

In selecting appropriate alternative destruction technologies for hazardous chemical wastes, a key criterion should be the ability to operate the process in closed-loop configuration, such that any waste streams which may contain hazardous residues may be re-circulated back through the process. It is only in this matter that the objective to eliminate the generation and output of hazardous by-products of destruction, including dioxins, may be achieved. Incinerator and related combustion technologies can never be operated in such a a closed-loop configuration.

Annex 1. Materials and Methods

Sampling

For sampling in Turkey, we have chosen the surroundings of the hazardous waste incinerator Izaydas located in the Kocaeli region.

[a] Article 5, paragraph (c)
[b] Article 5, paragraph (d)
[c] Article 5, paragraphs (d) & (e)
[d] Article 5, paragraph (a), subparagraph (i)

The eggs were collected from 3 different chicken fanciers at the same village, Solaklar, and one from the neighbor village, Durhasan. The hens from which the eggs were picked were all free-range of age between 4 months to 1 year although regularly provided with home food supplements - wheat, barley, oats, maize. Chicken fanciers grow these feedings by themselves.

Sampling was done by local activists on behalf of Arnika Association on 19 January 2005. Four chicken fanciers supplied 12 eggs from their free range chickens. The eggs were kept in cool conditions after sampling and then were boiled in Turkey for 7 - 10 minutes in pure water and transported to the laboratory at ambient temperature.

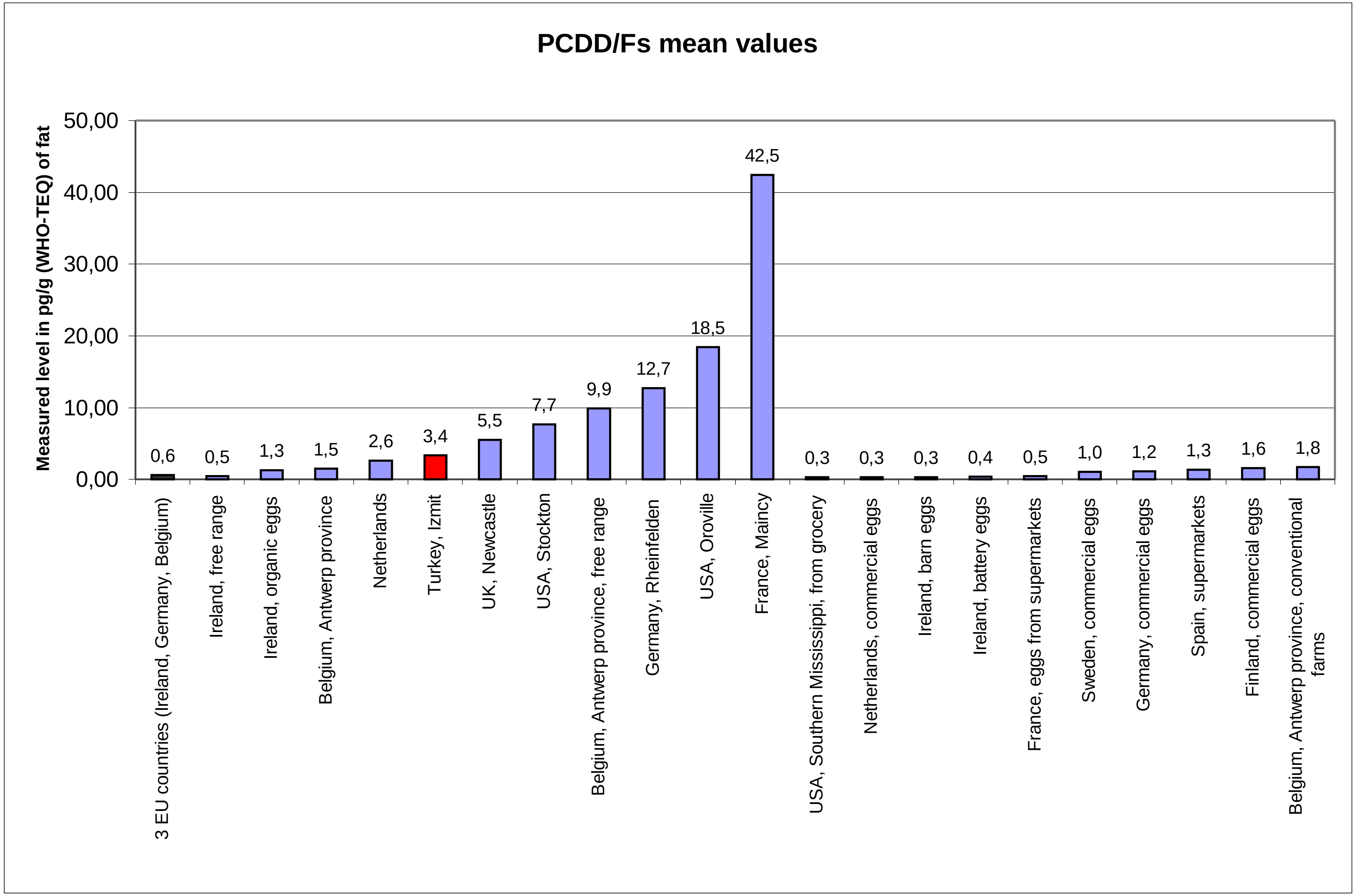
Analysis

After being received by the laboratory, the eggs were kept frozen until analysis. The egg shells were removed and the edible contents of 6 eggs were homogenised. A 30 g sub-sample was dried with anhydrous sodium sulphate, spiked by internal standards and extracted by toluene in a Soxhlet apparatus. A small portion of the extract was used for gravimetric determination of fat. The remaining portion of the extract was cleaned on a silica gel column impregnated with H_2SO4, NaOH and $AgNO_3$. The extract was further purified and fractionated on an activated carbon column. The fraction containing PCDD/Fs, PCBs and HCB was analysed by HR GC-MS on Autospec Ultima NT.

Analysis for PCDD/Fs, PCBs and HCB was done in the Czech Republic in laboratory Axys Varilab. Laboratory Axys Varilab, which provided the analysis is certified laboratory by the Institute for technical normalization, metrology and probations under Ministry of Industry and Traffic of the Czech Republic for analysis of POPs in air emissions, environmental compartments, wastes, food and biological materials.[a] Its services are widely used by industry as well as by Czech governmental institutions. In 1999, this laboratory worked out the study about POPs levels in ambient air of the Czech Republic on request of the Ministry of the Environment of the Czech Republic including also soils and blood tests.

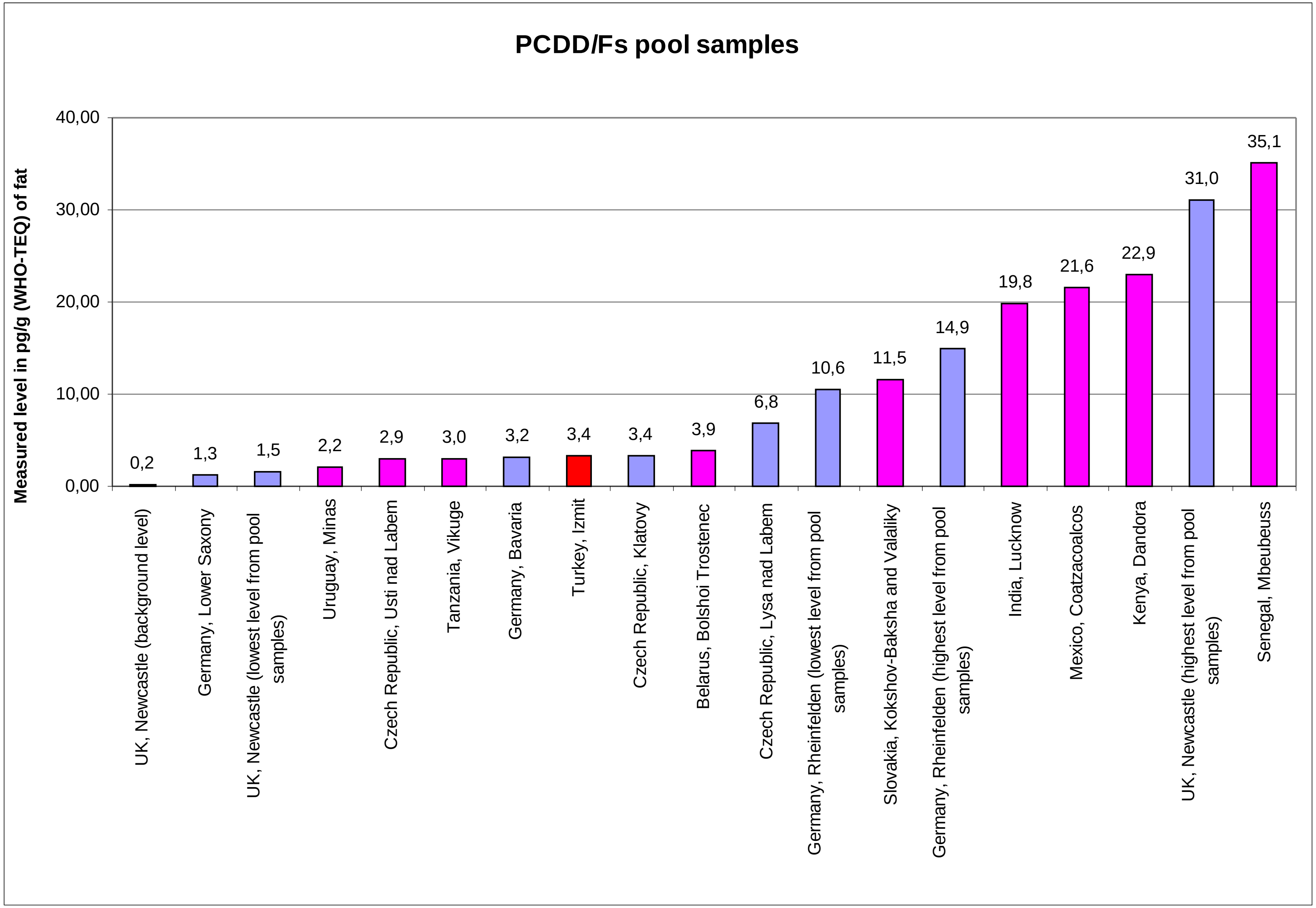
Annex 2: Mean values found within different groups of eggs from different parts of world

Country/locality	Year	Group	Measured level in pg/g (WHO-TEQ) of fat	Source of information
3 EU countries (Ireland, Germany, Belgium)	1997-2003	both	0,63	DG SANCO 2004
Ireland, free range	2002-2005	free range	0,47	Pratt, I. et al. 2004, FSAI 2004
Ireland, organic eggs	2002-2005	free range	1,30	Pratt, I. et al. 2004, FSAI 2004
Belgium, Antwerp province	2004	free range	1,50	Pussemeier, L. et al. 2004
Netherlands	2004	free range	2,60	SAFO 2004
Turkey, Izmit	2005	free range	3,37	Axys Varilab 2005
UK, Newcastle	2002	free range	5,50	Pless-Mulloli, T. et al. 2003b
USA, Stockton	1994	free range	7,69	Harnly, M. E. et al. 2000
Belgium, Antwerp province, free range	2004	free range	9,90	Pussemeier, L. et al. 2004
Germany, Rheinfelden	1996	free range	12,70	Malisch, R. et al. 1996
USA, Oroville	1994	free range	18,46	Harnly, M. E. et al. 2000
France, Maincy	2004	free range	42,47	Pirard, C. et al. 2004
USA, Southern Mississippi, from grocery	1994	not free range	0,29	Fiedler, H. et al. 1997
Netherlands, commercial eggs	2004	not free range	0,30	Anonymus 2004
Ireland, barn eggs	2002-2005	not free range	0,31	Pratt, I. et al. 2004, FSAI 2004
Ireland, battery eggs	2002-2005	not free range	0,36	Pratt, I. et al. 2004, FSAI 2004
France, eggs from supermarkets	1995-99	not free range	0,46	SCOOP Task 2000
Sweden, commercial eggs	1995-99	not free range	1,03	SCOOP Task 2000
Germany, commercial eggs	1995-99	not free range	1,16	SCOOP Task 2000
Spain, supermarkets	1996	not free range	1,34	Domingo et al. 1999
Finland, commercial eggs	1990-94	not free range	1,55	SCOOP Task 2000
Belgium, Antwerp province, conventional farms	2004	not free range	1,75	Pussemeier, L. et al. 2004


PCDD/Fs mean values
Measured level in pg/g (WHO-TEQ) of fat
50,00
40,00
30,00
20,00
10,00
0,00
0,6
0,5
1,3
1,5
2,6
3,4
5,5
7,7
9,9
12,7
18,5
42,5
0,3
0,3
0,3
0,4
0,5
1,0
1,2
1,3
1,6
1,8
3 EU countries (Ireland, Germany, Belgium)
Ireland, free range
Ireland, organic eggs
Belgium, Antwerp province
Netherlands
Turkey, Izmit
UK, Newcastle
USA, Stockton
Belgium, Antwerp province, free range
Germany, Rheinfelden
USA, Oroville
France, Maincy
USA, Southern Mississippi, from grocery
Netherlands, commercial eggs
Ireland, barn eggs
Ireland, battery eggs
France, eggs from supermarkets
Sweden, commercial eggs
Germany, commercial eggs
Spain, supermarkets
Finland, commercial eggs
Belgium, Antwerp province, conventional farms

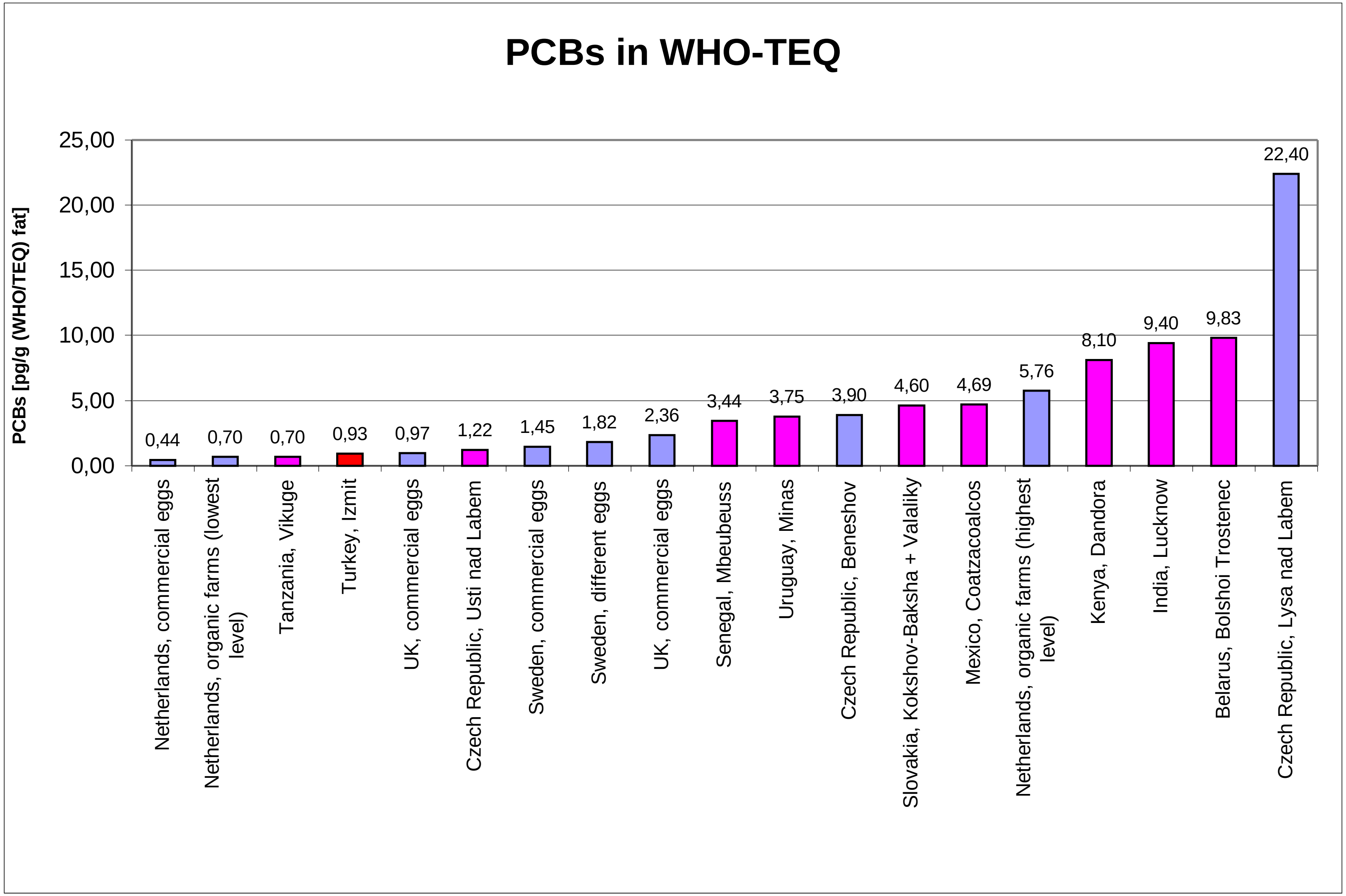
Annex 3: Levels of dioxins (PCDD/Fs) in different pool samples from different parts of world

Country/locality	Year	Group	Number of eggs/measured samples	Measured level in pg/g (WHO-TEQ) of fat	Source of information
UK, Newcastle (background level)	2000	free range	3/1 pooled	0,20	Pless-Mulloli, T. et al. 2001
Germany, Lower Saxony	1998	free range	60/6 pools	1,28	SCOOP Task 2000
UK, Newcastle (lowest level from pool samples)	2000	free range	3/1 pooled	1,50	Pless-Mulloli, T. et al. 2001
Uruguay, Minas	2005	free range		2,18	Axys Varilab 2005
Czech Republic, Usti nad Labem	2005	free range	6/1 pooled	2,90	Axys Varilab 2005
Tanzania, Vikuge	2005	free range	6/1 pooled	3,03	Axys Varilab 2005
Germany, Bavaria	1992	free range	370/37 pools	3,20	SCOOP Task 2000
Turkey, Izmit	2005	free range		3,37	Axys Varilab 2005
Czech Republic, Klatovy	2003	free range	12	3,40	Beranek, M. et al. 2003
Belarus, Bolshoi Trostenec	2005	free range	6/1 pooled	3,91	Axys Varilab 2005
Czech Republic, Lysa nad Labem	2004	free range	4	6,80	Petrlik, J. 2005
Germany, Rheinfelden (lowest level from pool samples)	1996	free range	-	10,60	Malisch, R. et al. 1996
Slovakia, Kokshov-Baksha and Valaliky	2005	free range	6/1 pooled	11,52	Axys VArilab 2005
Germany, Rheinfelden (highest level from pool samples)	1996	free range	-	14,90	Malisch, R. et al. 1996
India, Lucknow	2005	free range	4/1 pooled	19,80	Axys Varilab 2005
Mexico, Coatzacoalcos	2005	free range	6/1 pooled	21,63	Axys Varilab 2005
Kenya, Dandora	2004	free range	6/1 pooled	22,92	Axys Varilab 2005
UK, Newcastle (highest level from pool samples)	2000	free range	3/1 pooled	31,00	Pless-Mulloli, T. et al. 2001
Senegal, Mbeubeuss	2005	free range		35,10	Axys Varilab 2005


PCDD/Fs pool samples
Measured level in pg/g (WHO-TEQ) of fat
40,00
30,00
20,00
10,00
0,00
0,2
1,3
1,5
2,2
2,9
3,0
3,2
3,4
3,4
3,9
6,8
10,6
11,5
14,9
19,8
21,6
22,9
31,0
35,1
UK, Newcastle (background level)
Germany, Lower Saxony
UK, Newcastle (lowest level from pool samples)
Uruguay, Minas
Czech Republic, Usti nad Labem
Tanzania, Vikuge
Germany, Bavaria
Turkey, Izmit
Czech Republic, Klatovy
Belarus, Bolshoi Trostenec
Czech Republic, Lysa nad Labem
Germany, Rheinfelden (lowest level from pool samples)
Slovakia, Kokshov-Baksha and Valaliky
Germany, Rheinfelden (highest level from pool samples)
India, Lucknow
Mexico, Coatzacoalcos
Kenya, Dandora
UK, Newcastle (highest level from pool samples)
Senegal, Mbeubeuss

Annex 4: Levels of PCBs in WHO-TEQ in different chicken eggs samples from different parts of world

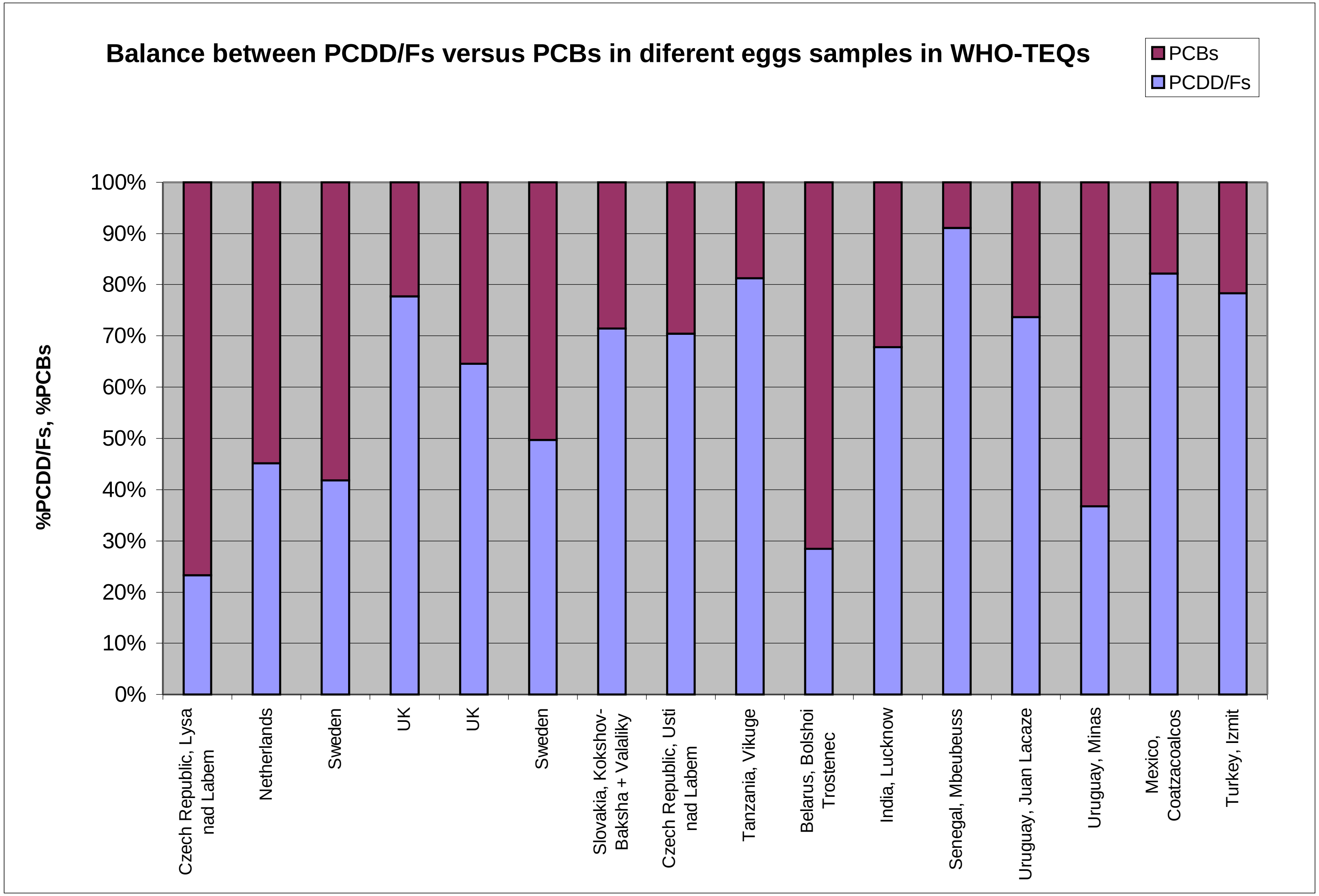
Country/locality	Year	Group	Number of measured samples	Specification	Measured level in pg/g (WHO-TEQ) of fat	Source of information
Netherlands, commercial eggs	1999	not free range	100/2 pools	pool, nonortho-PCBs	0,44	SCOOP Task 2000
Netherlands, organic farms (lowest level)	2002	free range	6	pool	0,70	Traag, W. et al. 2002
Tanzania, Vikuge	2005	free range	6/1 pool	pool	0,70	Axys Varilab 2005
Turkey, Izmit	2005	free range		pool	0,93	Axys Varilab 2005
UK, commercial eggs	1992	not free range	24/1 pool	pool	0,97	SCOOP Task 2000
Czech Republic, Usti nad Labem	2005	free range	6/1 pool	pool	1,22	Axys Varilab 2005
Sweden, commercial eggs	1999	not free range	32/4 pools	pool	1,45	SCOOP Task 2000
Sweden, different eggs	1993	mixed	84/7 pools	pool	1,82	SCOOP Task 2000
UK, commercial eggs	1982	not free range	24/1 pool	pool	2,36	SCOOP Task 2000
Senegal, Mbeubeuss	2005	free range		pool	3,44	Axys Varilab 2005
Uruguay, Minas	2005	free range		pool	3,75	Axys Varilab 2005
Czech Republic, Beneshov	2004	free range	4	pool	3,90	Axys Varilab 2004
Slovakia, Kokshov-Baksha + Valaliky	2005	free range	6/1 pool	pool	4,60	Axys Varilab 2005
Mexico, Coatzacoalcos	2005	free range	6/1 pooled	pool	4,69	Axys Varilab 2005
Netherlands, organic farms (highest level)	2002	free range	6	pool	5,76	Traag, W. et al. 2002
Kenya, Dandora	2004	free range	6/1 pool	pool	8,10	Axys Varilab 2005
India, Lucknow	2005	free range	4/1 pooled	pool	9,40	Axys Varilab 2005
Belarus, Bolshoi Trostenec	2005	free range	6/1 pool	pool	9,83	Axys Varilab 2005
Czech Republic, Lysa nad Labem	2004	free range	4	pool	22,40	Petrlik, J. 2005



PCBs in WHO-TEQ
PCBs [pg/g (WHO/TEQ) fat]
25,00
20,00
15,00
10,00
5,00
0,00
0,44
0,70
0,70
0,93
0,97
1,22
1,45
1,82
2,36
3,44
3,75
3,90
4,60
4,69
5,76
8,10
9,40
9,83
22,40
Netherlands, commercial eggs
Netherlands, organic farms (lowest level)
Tanzania, Vikuge
Turkey, Izmit
UK, commercial eggs
Czech Republic, Usti nad Labem
Sweden, commercial eggs
Sweden, different eggs
UK, commercial eggs
Senegal, Mbeubeuss
Uruguay, Minas
Czech Republic, Beneshov
Slovakia, Kokshov-Baksha + Valaliky
Mexico, Coatzacoalcos
Netherlands, organic farms (highest level)
Kenya, Dandora
India, Lucknow
Belarus, Bolshoi Trostenec
Czech Republic, Lysa nad Labem

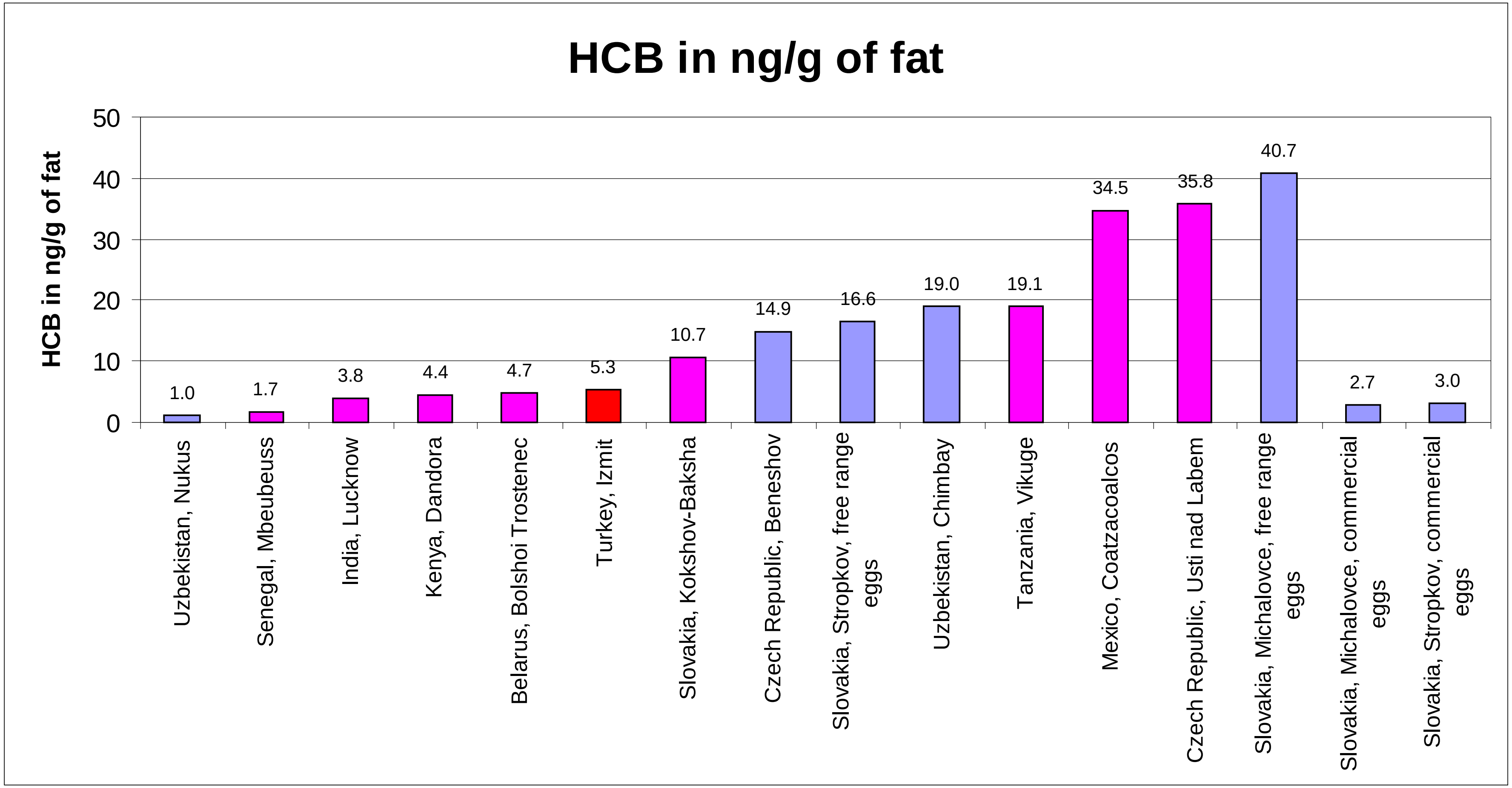
Annex 5: Balance between PCDD/Fs versus PCBs in diferent eggs samples in WHO-TEQs

Country/locality	Year	Group	PCDD/Fs	PCBs	Total WHO-TEQ	Source of information
Czech Republic, Lysa nad Labem	2004	free range	6,80	22,40	29,20	Petrlik, J. 2005
Netherlands	2002	free range	4,74	5,76	10,50	Traag, W. et al. 2002
Sweden	1993	mixed	1,31	1,82	3,13	SCOOP Task 2000
UK	1982	not free range	8,25	2,36	10,61	SCOOP Task 2000
UK	1992	not free range	1,77	0,97	2,74	SCOOP Task 2000
Sweden	1999	not free range	1,43	1,45	2,48	SCOOP Task 2000
Slovakia, Kokshov-Baksha + Valaliky	2005	free range	11,52	4,60	16,12	Axys Varilab 2005
Czech Republic, Usti nad Labem	2005	free range	2,90	1,22	4,12	Axys Varilab 2005
Tanzania, Vikuge	2005	free range	3,03	0,70	3,73	Axys Varilab 2005
Belarus, Bolshoi Trostenec	2005	free range	3,91	9,83	13,74	Axys Varilab 2005
India, Lucknow	2005	free range	19,80	9,40	29,20	Axys Varilab 2005
Senegal, Mbeubeuss	2005	free range	35,10	3,44	38,54	Axys Varilab 2005
Uruguay, Juan Lacaze	2005	free range	2,49	0,89	3,38	Axys Varilab 2005
Uruguay, Minas	2005	free range	2,18	3,75	5,93	Axys Varilab 2005
Mexico, Coatzacoalcos	2005	free range	21,63	4,69	26,32	Axys Varilab 2005
Turkey, Izmit	2005	free range	3,37	0,93	4,30	Axys Varilab 2005


Balance between PCDD/Fs versus PCBs in diferent eggs samples in WHO-TEQs
PCBs
PCDD/Fs
%PCDD/Fs, %PCBs
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Czech Republic, Lysa nad Labem
Netherlands
Sweden
UK
UK
Sweden
Slovakia, Kokshov-Baksha + Valaliky
Czech Republic, Usti nad Labem
Tanzania, Vikuge
Belarus, Bolshoi Trostenec
India, Lucknow
Senegal, Mbeubeuss
Uruguay, Juan Lacaze
Uruguay, Minas
Mexico, Coatzacoalcos
Turkey, Izmit

Annex 6: Levels of HCB in ng/g of fat in different chicken eggs samples from different parts of world

Country	Date/year	Group	Number of measured samples	Measured level in ng/g of fat	Source of information
Uzbekistan, Nukus	2001	free range	-	1,0	Muntean, N. et al. 2003
Senegal, Mbeubeuss	2005	free range		1,7	Axys Varilab 2005
India, Lucknow	2005	free range	4/1 pool	3,8	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		5,3	Axys Varilab 2005
Slovakia, Kokshov-Baksha	2005	free range	6/1 pool	10,7	Axys Varilab 2005
Czech Republic, Beneshov	2004	free range	4/1 pool	14,9	Axys Varilab 2004
Slovakia, Stropkov, free range eggs	before 1999	free range	1	16,6	Kocan, A. et al. 1999
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
Mexico, Coatzacoalcos	2005	free range	6/1 pool	34,5	Axys Varilab 2005
Czech Republic, Usti nad Labem	2005	free range	6/1 pool	35,8	Axys Varilab 2005
Slovakia, Michalovce, free range eggs	before 1999	free range	1	40,7	Kocan, A. et al. 1999
Slovakia, Michalovce, commercial eggs	before 1999	not free range	1	2,7	Kocan, A. et al. 1999
Slovakia, Stropkov, commercial eggs	before 1999	not free range	1	3,0	Kocan, A. et al. 1999



HCB in ng/g of fat
HCB in ng/g of fat
50
40
30
20
10
0
1.0
1.7
3.8
4.4
4.7
5.3
10.7
14.9
16.6
19.0
19.1
34.5
35.8
40.7
2.7
3.0
Uzbekistan, Nukus
Senegal, Mbeubeuss
India, Lucknow
Kenya, Dandora
Belarus, Bolshoi Trostenec
Turkey, Izmit
Slovakia, Kokshov-Baksha
Czech Republic, Beneshov
Slovakia, Stropkov, free range eggs
Uzbekistan, Chimbay
Tanzania, Vikuge
Mexico, Coatzacoalcos
Czech Republic, Usti nad Labem
Slovakia, Michalovce, free range eggs
Slovakia, Michalovce, commercial eggs
Slovakia, Stropkov, commercial eggs

7: Photos

Photo 1: View at the incinerator from sampling place. Photo by: Bumerang.

Photo 2: Chicken at sampling place in Izmit.. Photo by: Bumerang.

Photo 3: Sampled free range chicken eggs. Photo by: Bumerang.

Photo 4: Sampling procedure in Izmit. Photo by: Bumerang.

Photo 5: Free range chicken at sampling site with waste incinerator behind. Photo by: Bumerang.

References

[1] Labunska, I., Brigden, K., Johnston, P., Santillo, D. & Stringer, R. 2001: Concentrations of heavy metals and organic contaminants in ash collected from the Izmit hazardous/clinical waste incinerator, April 2000. Greenpeace Research Laboratories Technical Note 09/00, January 2001

[2] Friends of the Earth, Arnika, IPEN Dioxin, PCBs and Waste WG 2005. Contamination of chicken eggs near the Koshice municipal waste incinerator in Slovakia by dioxins, PCBs, and hexaclorobenzene. Available at www.ipen.org 21 March 2005

[3] ENVILEAD, Arnika, IPEN Dioxin, PCBs and Waste WG 2005. Contamination of chicken eggs near the Dandora dumpsite in Kenya by dioxins, PCBs, and hexaclorobenzene. Available at www.ipen.org 24 March 2005.

[4] Arnika, IPEN Dioxin, PCBs and Waste WG 2005. Contamination of chicken eggs near the Spolchemie factory in Usti nad Labem in the Czech Republic by dioxins, PCBs, and hexaclorobenzene. Available at www.ipen.org 25 March 2005.

[5] Foundation for Realization of Ideas, Arnika, IPEN Dioxin, PCBs and Waste WG 2005. Contamination of chicken eggs near the Bolshoy Trostenec dumpsite in Belarus by dioxins, PCBs, and hexaclorobenzene. Available at www.ipen.org 29 March 2005.

[6] Toxics Link, Arnika, IPEN Dioxin, PCBs and Waste WG 2005: Contamination of chicken eggs near the Queen Mary's Hospital, Lucknow medical waste incinerator in Uttar Pradesh (India) by dioxins, PCBs, and hexaclorobenzene. Available at www.ipen.org 30 March 2005.

[7] AGENDA, Arnika, IPEN Dioxin, PCBs and Waste WG 2005: Contamination of chicken eggs near the Vikuge obsolete pesticides stockpile in Tanzania by dioxins, PCBs, and hexaclorobenzene. Available at www.ipen.org 31 March 2005.

[8] PAN Africa, Arnika, IPEN Dioxin, PCBs and Waste WG 2005: Contamination of chicken eggs near the Mbeubeuss dumpsite, Dakar suburb in Senegal by dioxins, PCBs and hexachlorobenzene. Available at www.ipen.org 31 March 2005.

[9] RAPAM, Arnika, IPEN Dioxin, PCBs and Waste WG 2005: Contamination of chicken eggs near the Pajaritos Petrochemical Complex in Coatzacoalcos, Veracruz, Mexico by dioxins, PCBs and hexachlorobenzene. Available at www.ipen.org 31 March 2005.

[10] Beranek, M., Havel, M., Petrlik, J. 2003: Lindane - pesticide for the black list. Czech Ecological Society Report, Prague, Nov 2003.

[11] Pirard, C., Focant, J.-F., Massart, A.-C., De Pauw, E., 2004: Assessment of the impact of an old MSWI. Part 1: Level of PCDD/Fs and PCBs in surrounding soils and eggs. Organohalogen Compounds 66: 2085-2090.

[12] Pless-Mulloli, T., Edwards, R., Schilling, B., Paepke, O. 2001: Executive Summary. PCCD/PCDF and Heavy Metals in Soil and Egg Samples from Newcastle Allotments: Assessment of the role of ash from the Byker incinerator. (Includes comments from Food Standards Agency, Environment Agency). 12 February 2001. University of Newcastle.

[13] Bailey, R., 2001. Global hexachlorobenzene emissions. Chemosphere 43: 167-182.

[14] Berdowski, J., Bloos, J., 1997. European hexachlorobenzene inventory prepared at TNO, Netherlands. [Cited in Bailey, R., 2001. Global hexachlorobenzene emissions. Chemosphere 43: 167-182.

[15] Holoubek, I., et al., 2000. PCBs and PCDDs/Fs in the Czech Republic and Central and Eastern European Countries. In Proceedings from Subregional Workshop on Identification and Management of PCBs and Dioxins/Furans, Cavtat, Croatia, 19 May - 1 June 2000.

[16] Fara, M., Mitera, J., Bureš, V., 1999. Realizace měření emisí látek POP, stanovení hmotnostních toků a koncentrací látek POP na určených zdrojích. POPs emissions measurements, emissions default factors set up for specific sources - Final Report of Research Project VaV/520/1/97. Ministry of the Environment of the Czech Republic.

[17] IGCM 1994

[18] Labunska, I., Brigden, K., Johnston, P., Santillo, D. & Stringer, R. 2001: Concentrations of heavy metals and organic contaminants in ash collected from the Izmit hazardous/clinical waste incinerator, April 2000. Greenpeace Research Laboratories Technical Note 09/00, January 2001

References for Tables in Annexes

Anonymus 2004: Analytical results eggs from both free range chickens and not free range chickens from Netherlands. Information provided by Netherlands to other EU member states. November 2004.

Axys Varilab CZ 2004: Protokoly č. 537/1-4 o stanovení PCDD/F, PCB vyjádřených ve WHO-TEQ, kongenerových PCB a HCB vydané zkušební laboratoří firmy Axys Vailab. Protocols No. 537/1-4. Vrane nad Vltavou, 2004.

Axys Varilab CZ 2005: Reports No. 618/1-10 on PCDD/Fs, PCBs and OCPs determinations of samples No. 4443-4450, 5769-5779, 5781-5787, 5783B, 5802 and 5808 issued in March 2005 in Vrané nad Vltavou.

Beranek, M., Havel, M., Petrlik, J. 2003: Lindane - pesticide for the black list. Czech Ecological Society Report, Prague, Nov 2003.

DG SANCO 2004: Analysis of the data contained in the report "Dioxins and PCBs in Food and Feed : Data available to DG SANCO - Joint Report DG SANCO/DG-JRC-IRMM in the ight of the proposed maximum levels in document SANCO/0072/2004.

Domingo, J.L., Schuhmacher, M., Granero, S., Llobet, J.M. 1999: PCDDs and PCDFs in food samples from Catalonia, Spain. An assessment of dietary intake. Chemosphere. 38(15):3517-3528. In US EPA 2000.

Fiedler, H.; Cooper, K.R.; Bergek, S.; Hjelt, M.; Rappe, C. (1997) Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF) in food samples collected in southern Mississippi, USA. Chemosphere. 34:1411-1419. In US EPA 2000.

Harnly, M. E., Petreas, M. X., Flattery, J., Goldman, L. R. 2000: Polychlorinated Dibenzo-p-dioxin and Polychlorinated Dibenzofuran Contamination in Soil and Home-Produced Chicken Eggs Near Pentachlorophenol Sources. Environ. Sci. Technol.2000, 34,1143-1149

Kočan, A., Jursa, S., Petrík, J., Drobná, B., Chovancová, J., Suchánek, P. 1999: Stav kontaminácie poživatín polychlórovanými bifenylmi v zaťaženej oblasti okresu Michalovce a porovnávacej oblasti okresu Stropkov. In: Cudzorodé látky v poživatinách, 10. - 12. máj 1999, Tatranská Štrba, pp. 31 - 32.

Malisch, R. 1998: Update of PCDD/PCDF-intake from food in Germany. Chemosphere. 37 (9 -12):1687-1698. In US EPA 2000.

Malisch, R., Schmid, P., Frommberger, R., Fuerst, P. 1996: Results of a Quality Control Study of Different Analytical Methods for Determination of PCDD/PCDF in Eggs Samples. Chemosphere Vol. 32, No. 1, pp. 31-44.

Muntean, N., Jermini, M., Small, I., Falzon, D., Peter Fuerst, P., Migliorati, G., Scortichini,G., Forti, A. F., Anklam, E., von Holst, C., Niyazmatov, B., Bahkridinov, S., Aertgeerts, R., Bertollini, R., Tirado, C., Kolb, A. 2003: Assessment of Dietary Exposure to Some Persistent Organic Pollutants in the Republic of Karakalpakstan of Uzbekistan. Vol. 111, No 10, August 2003, Environmental Health Perspectives, 1306-1311.

Petrlik, J. 2005: Hazardous waste incinerator in Lysa nad Labem and POPs waste stockpile in Milovice. International POPs Elimination Project (IPEP) Hot Spot Report. Arnika, Prague 2005.

Pirard, C., Focant, J.-F., Massart, A.-C., De Pauw, E., 2004: Assessment of the impact of an old MSWI. Part 1: Level of PCDD/Fs and PCBs in surrounding soils and eggs. Organohalogen Compounds 66: 2085-2090.

Pless-Mulloli, T., Edwards, R., Schilling, B., Paepke, O. 2001b: Executive Summary. PCCD/PCDF and Heavy Metals in Soil and Egg Samples from Newcastle Allotments: Assessment of the role of ash from the Byker incinerator. (Includes comments from Food Standards Agency, Environment Agency). 12 February 2001. University of Newcastle.

Pless-Mulloli, T., Air, V., Schilling, B., Paepke, O., Foster, K. 2003b: Follow-up Assessment of PCDD/F in Eggs from Newcastle Allotments. University of Newcastle, Ergo, Newcastle City Council, July 2003.

Pratt, I., Tlustos, Ch., Moylan, R., Neilan, R., White, S., Fernandes, A., Rose, M. 2004: Investigation into levels of dioxins, furans and PCBs in battery, free range, barn and organic eggs. Organohalogen Compounds – Volume 66 (2004) 1925-31.

Pussemier, L., Mohimont, L., Huyghebaert, A., Goeyens, L., 2004. Enhanced levels of dioxins in eggs from free range hens: a fast evaluation approach. Talenta 63: 1273-1276.

SAFO (Sustaining Animal Health and Food Safety in Organic Farming) 2004: Onderzoek naar dioxine in eieren van leghennen met vrije uitloop. SAFO, September 2004. Published at: http://www.agriholland.nl/nieuws/home.html. 12/10/2004.

SCOOP Task 2000: Assessment of dietary intake of dioxins and related PCBs by the population of EU Member States. Reports on tasks for scientific cooperation Report of experts participating in Task 3.2.5 (7 June 2000) and Annexes to Report SCOOP Task 3.2.5 (Dioxins). Final Report, 7 June, 2000. European Commission, Health & Consumer Protection Directorate-General, Brussels 2000.

SVA CR (State Veterinary Administration of the Czech Republic) 2004: Chart with results of regular monitoring in Middle Bohemian region. Document reached by Arnika upon request for information.

Traag, W., Portier, L., Bovee, T., van der Weg, G., Onstenk, C., Elghouch, N., Coors, R., v.d. Kraats, C., Hoogenboom, R. 2002: Residues of Dioxins and Coplanar PCBs in Eggs of Free Range Chickens. Organohalogen Compounds Vol. 57 (2002). 245-248.