

Sistema Socio Sanitario



Regione  
Lombardia

ATS Brescia

# Il melanoma nei siti contaminati italiani

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*Brescia*

*12 dicembre 2016*

## Contaminated sites and health

Report of two WHO workshops:  
Syracuse, Italy, 18 November 2011  
Catania, Italy, 21–22 June 2012



***WHO Collaborating  
Centre for  
Environmental Health  
in Contaminated Sites***

**“Areas hosting or having hosted human activities which have produced or might produce environmental contamination of soil, surface or groundwater, air, food-chain, resulting or being able to result in human health impacts”**

**WHO 2013**

## Industrially Contaminated Sites and Health

Guest Editors: Marco Martuzzi, Roberto Pasetto, and Piedad Martin-Olmedo



**Industrially Contaminated Sites and Health**, Marco Martuzzi, Roberto Pasetto, and Piedad Martin-Olmedo  
Volume 2014, Article ID 198574, 2 pages

**Environment and Health in Contaminated Sites: The Case of Taranto, Italy**, Roberta Pirastu, Pietro Comba, Ivano Iavarone, Amerigo Zona, Susanna Conti, Giada Minelli, Valerio Manno, Antonia Mincuzzi, Sante Minerba, Francesco Forastiere, Francesca Mataloni, and Annibale Biggeri  
Volume 2013, Article ID 753719, 20 pages

**Lung Cancer Risk and Past Exposure to Emissions from a Large Steel Plant**, Oscar Breugelmans, Caroline Ameling, Marten Marra, Paul Fischer, Jan van de Kasstelee, Johannes Lijzen, Arie Oosterlee, Rinske Keuken, Otto Visser, Danny Houthuijs, and Carla van Wiechen  
Volume 2013, Article ID 684035, 8 pages

**Comparative Assessment of Particulate Air Pollution Exposure from Municipal Solid Waste Incinerator Emissions**, Danielle C. Ashworth, Gary W. Fuller, Mireille B. Toledano, Anna Font, Paul Elliott, Anna L. Hansell, and Kees de Hoogh  
Volume 2013, Article ID 560342, 13 pages

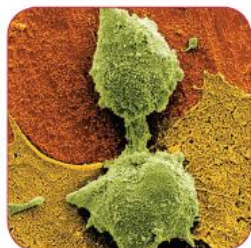
**Ecological Study on Hospitalizations for Cancer, Cardiovascular, and Respiratory Diseases in the Industrial Area of Etang-de-Berre in the South of France**, Laurence Pascal, Mathilde Pascal, Morgane Stempfelet, Sarah Gorla, and Christophe Declercq  
Volume 2013, Article ID 328737, 13 pages

**The Health Profile of Populations Living in Contaminated Sites: Sentieri Approach**, Roberta Pirastu, Roberto Pasetto, Amerigo Zona, Carla Ancona, Ivano Iavarone, Marco Martuzzi, and Pietro Comba  
Volume 2013, Article ID 939267, 13 pages

**Contaminated Sites in Europe: Review of the Current Situation Based on Data Collected through a European Network**, Panos Panagos, Marc Van Liedekerke, Yusuf Yigini, and Luca Montanarella  
Volume 2013, Article ID 158764, 11 pages

**A Review of Exposure Assessment Methods in Epidemiological Studies on Incinerators**, Michele Cordioli, Andrea Ranzi, Giulio A. De Leo, and Paolo Lauriola  
Volume 2013, Article ID 129470, 12 pages

**A Review of the Epidemiological Methods Used to Investigate the Health Impacts of Air Pollution around Major Industrial Areas**, Mathilde Pascal, Laurence Pascal, Marie-Laure Bidondo, Amandine Cochet, Hélène Sarter, Morgane Stempfelet, and Vèrène Wagner  
Volume 2013, Article ID 737926, 17 pages



# ANNALI

dell'Istituto Superiore di Sanità

Early Release  
Vol. 52, No. 4 2016

Free online at [www.iss.it/anna/](http://www.iss.it/anna/)

## MONOGRAPHIC SECTION

# Contaminated sites: a global health issue

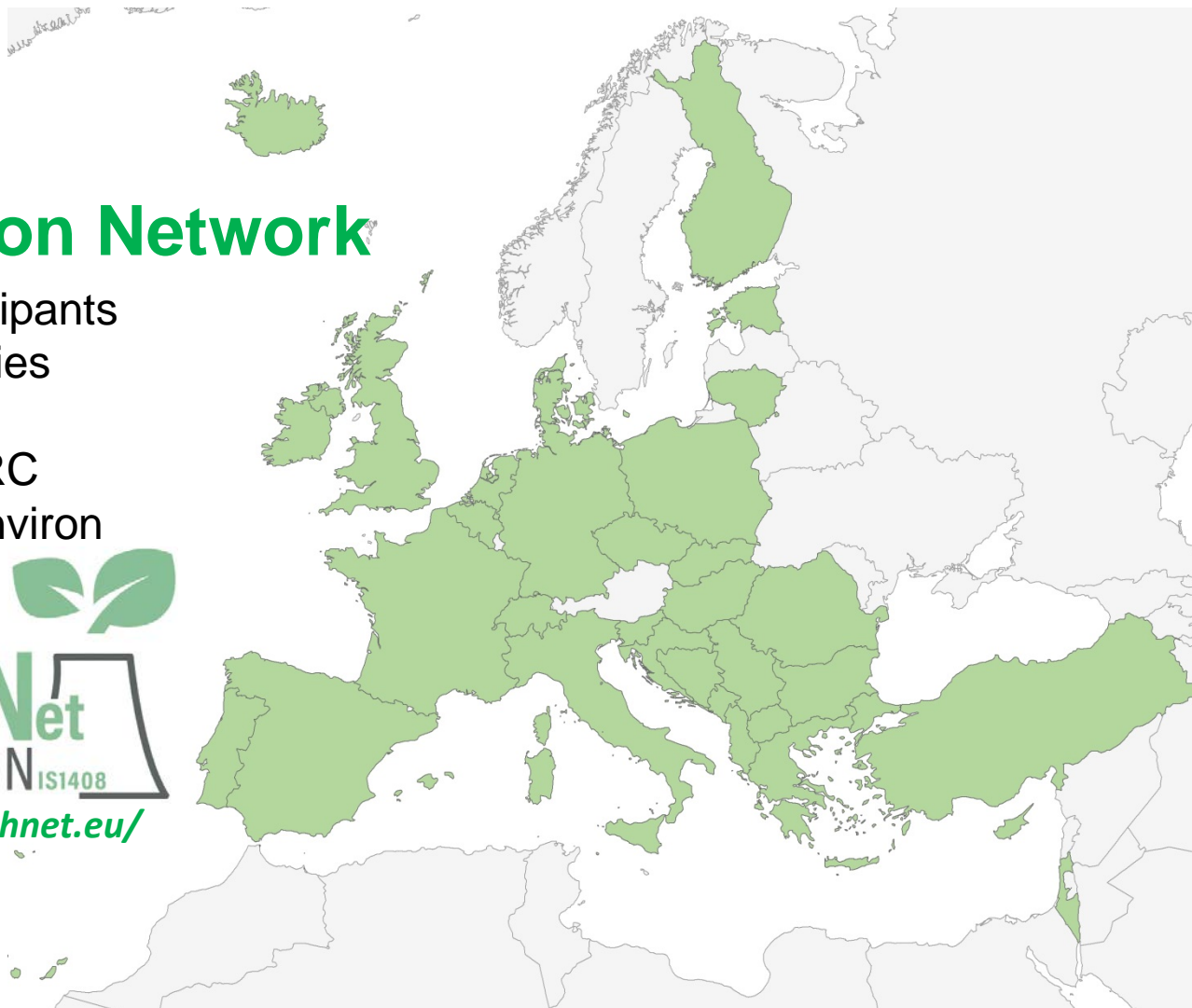
Edited by *Pietro Comba, Roberto Pasetto, Daniela Marsili and Paola De Castro*

- PREFACE  
*Pietro Comba, Ivano Iavarone and Roberta Pirastu*
- Exploring available options in characterising the health impact of industrially contaminated sites  
*Roberto Pasetto, Piedad Martin-Olmedo, Marco Martuzzi and Ivano Iavarone*
- Ethical aspects of epidemiological research in contaminated sites  
*Colin L. Soskolne*
- A survey on lifestyle and level of biomarkers of environmental exposure in residents in Civitavecchia (Italy)  
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- Environmental nickel exposure from oil refinery emissions: a case study in Ecuador  
*Raúl Harari, Florencia Harari and Francesco Forastiere*
- Agricultural areas in potentially contaminated sites: characterization, risk, management  
*Fabiana Vanni, Federica Scaini and Eleonora Beccaloni*
- The relevance of the food production chain with regard to the population exposure to chemical substances and its role in contaminated sites  
*Francesca Romana Mancini, Luca Busani, Sabrina Tait and Cinzia La Rocca*
- Fostering public health awareness on risks in contaminated sites. Capacity building and dissemination of scientific evidence  
*Paola De Castro, Roberto Pasetto, Daniela Marsili and Pietro Comba*
- A cross-disciplinary approach to global environmental health: the case of contaminated sites  
*Daniela Marsili*

# On-going related activities in Europe within the Industrially Contaminated Sites and Health Network (ICSHNet) COST Action

## The Action Network

- **130** Participants
- **32** Countries
- WHO
- EC DG JRC
- EC DG Environ



Albany  
Belgium  
Bosnia and Herzegovina  
Bulgaria  
Croatia  
Cyprus  
Czech Republic  
Denmark  
Estonia  
Finland  
France  
FYR Macedonia  
Germany  
Greece  
Hungary  
Iceland  
Ireland  
Israel  
Italy  
Lithuania  
Montenegro  
Netherlands  
Poland  
Portugal  
Romania  
Serbia  
Slovakia  
Slovenia  
Spain  
Switzerla  
Turkey  
United Ki

[http://www.cost.eu/COST\\_Actions/isch/IS1408](http://www.cost.eu/COST_Actions/isch/IS1408)



# SENTIERI is for surveillance of health status of residents in contaminated sites



S.E.N.T.I.E.R.I.

STUDIO EPIDEMIOLOGICO NAZIONALE TERRITORI E INSEDIAMENTI ESPOSTI A RISCHIO DA INQUINAMENTO

# **Aims of SENTIERI Project**

**To collect, store and interpret data on the health status of populations resident in National Priority Contaminated Sites (NPCS) recognized by the Ministry of Environment based on soil and groundwater contamination**



## CONTAMINATED SITES (44)



STEEL INDUSTRY



ASBESTOS/OTHER MINERAL FIBRES



LANDFILL/WASTE DUMP



OIL INDUSTRY



HARBOUR



ELECTRIC POWER PLANT



MINE/QUARRY



CHEMICAL PLANTS

**ESTIMATED NUMBER  
of CHILDREN and ADOLESCENTS  
1 million (0-19 years old)**



# Main features of SENTIERI Project

- **Multidisciplinary working group**
- **Area based study - municipality level**
- ***A priori* evaluation of scientific evidence in order to define specific etiological hypotheses**
- **Categorization of environmental exposures based on the sources of contaminant agents explicitly mentioned in the decrees of NPCS institution**

# SENTIERI



<http://www.epiprev.it/pubblicazione/epidemiol-prev-2010-34-5-6-suppl-3>



<http://www.epiprev.it/pubblicazione/epidemiol-prev-2011-35-5-6-suppl-4>



<http://www.epiprev.it/pubblicazione/epidemiol-prev-2014-38-2-suppl-1>



<https://bit.ly/sentieri4>  
epidemiol-prev-2016-40-5-suppl-1

# Cancer incidence in Italian contaminated sites

**Pietro Comba<sup>(a)</sup>, Paolo Ricci<sup>(b, c)</sup>, Ivano Iavarone<sup>(a)</sup>, Roberta Pirastu<sup>(d)</sup>, Carlotta Buzzoni<sup>(c, e)</sup>, Mario Fusco<sup>(c, f)</sup>, Stefano Ferretti<sup>(c, g)</sup>, Lucia Fazzo<sup>(a)</sup>, Roberto Pasetto<sup>(a)</sup>, Amerigo Zona<sup>(a)</sup>, Emanuele Crocetti<sup>(c, e)</sup>, for ISS-AIRTUM Working Group for the study of cancer incidence in contaminated sites\***

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*(b) Registro Tumori di Mantova, Mantua, Italy*

*(c) AIRTUM, Associazione Italiana dei Registri Tumori, Italy*

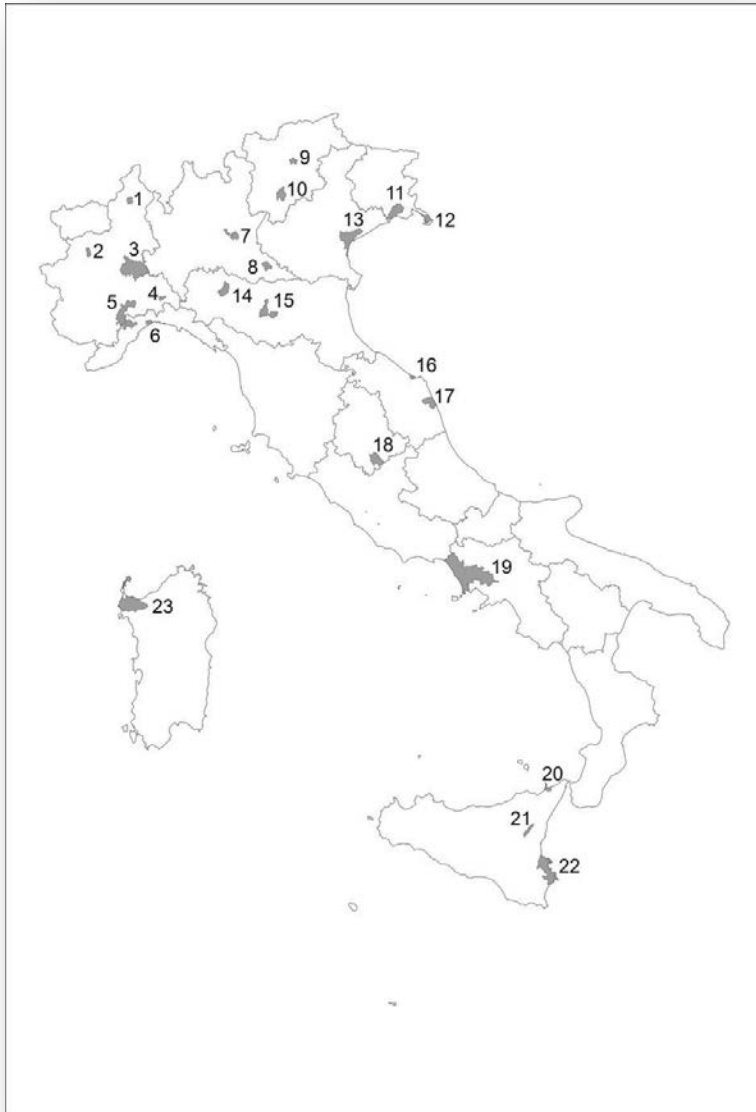
*(d) Dipartimento di Biologia e Biotecnologie "Charles Darwin", Sapienza Università di Roma, Rome, Italy*

*(e) Unità di Epidemiologia Clinica e Descrittiva, Istituto per lo Studio e la Prevenzione Oncologica, Florence, Italy*

*(f) Registro Tumori di Napoli (ASL Napoli 4), Naples, Italy*

*(g) Registro Tumori di Ferrara, Dipartimento di Chirurgia e Medicina Sperimentale, Università degli Studi di Ferrara, Ferrara, Italy*

*\* the Working Group members are cited before the References*



**Figure 1.**  
**Italian National Priority**  
**Contaminated Sites:**  
**Geographical distribution**

## Abstract

**Introduction.** The incidence of cancer among residents in sites contaminated by pollutants with a possible health impact is not adequately studied. In Italy, SENTIERI Project (Epidemiological study of residents in National Priority Contaminated Sites, NPCSS) was implemented to study major health outcomes for residents in 44 NPCSSs.

**Methods.** The Italian Association of Cancer Registries (AIRTUM) records cancer incidence in 23 NPCSSs. For each NPCSSs, the incidence of all malignant cancers combined and 35 cancer sites (coded according to ICD-10), was analysed (1996-2005). The observed cases were compared to the expected based on age (5-year period, 18 classes), gender, calendar period (1996-2000; 2001-2005), geographical area (North-Centre and Centre-South) and cancer sites specific rates. Standardized Incidence Ratios (SIR) with 90% Confidence Intervals were computed.

**Results.** In both genders an excess was observed for overall cancer incidence (9% in men and 7% in women) as well as for specific cancer sites (colon and rectum, liver, gallbladder, pancreas, lung, skin melanoma, bladder and Non Hodgkin lymphoma). Deficits were observed for gastric cancer in both genders, chronic lymphoid leukemia (men), malignant thyroid neoplasms, corpus uteri and connective and soft-tissue tumours and sarcomas (women).

**Discussion.** This report is, to our knowledge, the first one on cancer risk of residents in NPCSSs. The study, although not aiming to estimate the cancer burden attributable to the environment as compared to occupation or life-style, supports the credibility of an etiologic role of environmental exposures in contaminated sites. Ongoing analyses focus on the interpretation of risk factors for excesses of specific cancer types overall and in specific NPCSSs in relation to the presence of carcinogenic pollutants.

**Table 1**

Cancer incidence in National Priority Contaminated Sites (NPCSs) in Italy, 1996-2005

ICD X – cancer site	Men			Women		
	Observed	SIR, 90% CI		Observed	SIR, 90% CI	
C43 Skin melanoma	1280	1.24	1.18 1.29	1285	1.14	1.08 1.19
C50 Breast	117	0.98	0.84 1.14	14387	1.08	1.07 1.1
C82-85,96 Non-Hodgkin lymphoma	1926	1.06	1.02 1.1	1866	1.07	1.03 1.11

SIR: Standardized Incidence Ratio, 90% CI: 90% Confidence Interval.

# BREAST CANCER, MELANOMA AND NON-HODGKIN LYMPHOMA

## *Methods*

- The presence of PCBs was documented in 8 out of 18 NPCSSs, in different environmental matrices (air, soil, ground and surface water, biota). Human biomonitoring data and food monitoring data were also taken into consideration.
- Standardized Incidence Ratios (SIRs), together with their 90% confidence intervals, were computed for each NPCSS and cancer site with reference to the time window 1996-2005.
- Reference rates were provided by the pool of Cancer Registries from Northern-Central Italy or from Southern-Central Italy (depending on the localization of the study area).



# NPCSS' INFORMATION

NPCSS	PLANTS/POLLUTION SOURCES	PCBS AND OTHER AGENTS DETECTED IN ENVIRONMENTAL MATRICES	PCBS - OTHER AGENTS	
			BIOMONITORING	FOOD
<i>Brescia Caffaro</i>	Chemical plants, landfill	As, <b>PCBs</b> , PCDDs, chlorobenzene, other solvents	PCDDs/PCDFs (serum)	<b>PCBs</b> (food of animal and vegetable origin) PCDDs/PCDFs (cattle's meat and milk, forage)
<i>Fidenza</i>	Chemical plants, urban and hazardous waste landfills	AS, <b>PCBs</b> , PCDDs, benzene		
<i>Litorale Domizio Flegreo</i>	Urban waste landfills, illegal dumping sites, illegal burning of waste	As, PCDDs, <b>PCBs</b> , benzene, others solvents	PCDDs/PCDFs (breast milk)	PCDDs/PCDFs (cow and buffalo's milk)
<i>Laghi Mantova</i>	Metallurgic plants, paper plants, petrochemical plant, harbour area, industrial waste landfills, incinerator (hazardous waste)	As, Cd, PCDDs, ethylbenzene, other solvents		<b>PCBs</b> (fruit, vegetables)
<i>Priolo</i>	Chemical plants, petrochemical plant, refinery, harbour area, asbestos, hazardous waste landfills	<b>PCBs</b> , hexachlorobenzene	PCDDs, <b>PCBs</b> , HCB (breast milk and puerperae hair)	Cd, Pb, Hg, PCDDs, organochlorine compounds (fish and other seafood)
<i>Taranto</i>	Refinery, steel plant, harbour area, cement plant, landfills, illegal dumping sites	As, Cd, benzene, xilene, PCDDs, <b>PCBs</b>	As, Cd, PCDDs, <b>PCBs</b> (serum)	<b>PCBs</b> , HCB, PAHs (clams), PCDDs, <b>PCBs</b> (sheep and cow's meat and milk, clams)
<i>Terni-Papigno</i>	Steel plant, hazardous waste landfills	<b>PCBs</b>		
<i>Venezia (Porto Marghera)</i>	Chemical plants, petrochemical plant, refinery, harbour area, illegal dumping sites	As, Cd, <b>PCBs</b> , PCDDs, solvents		As, Cd, PCDDs, PCDFs (shellfish)

**NOTE: The agents listed in this table represent a fraction of all those detected or monitored in the NPCSS**



## Overall Standardized Incidence Ratios (SIRs) with 90% Confidence intervals (90% CI) between 1996-2005

NPCSs	Breast			Melanoma						NHL					
	females			males			females			males			females		
	N	SIR	CI (90%)	n	SIR	CI (90%)	n	SIR	CI (90%)	N	SIR	CI (90%)	N	SIR	CI (90%)
<i>Brescia Caffaro</i>	1187	125	120-132	98	127	106-150	100	119	100-140	136	114	99-132	151	125	109-143
<i>Fidenza</i>	403	102	94-111	28	86	61-118	30	86	62-116	45	80	61-102	64	122	98-150
<i>Litorale Domizio Flegreo</i>	1097	103	98-108	68	104	84-128	71	94	76-115	179	102	89-115	195	130	115-146
<i>Laghi Mantova</i>	472	113	105-122	37	111	83-146	37	102	76-134	62	119	95-147	56	104	83-130
<i>Priolo</i>	712	111	104-118	53	106	84-134	58	112	89-139	102	108	91-127	78	87	72-105
<i>Taranto</i>	497	145	134-156	55	225	178-282	46	152	117-195	58	142	113-176	40	98	74-128
<i>Terni-Papigno</i>	902	114	107-120	71	113	92-138	80	124	102-150	137	124	107-143	108	98	83-115
<i>Venezia (Porto Marghera)</i>	3045	110	107-114	283	125	113-138	263	111	100-123	343	95	87-104	373	105	96-114

Benedetti et al. ISEE 2016. *INCIDENCE OF BREAST, PROSTATE, TESTICULAR AND THYROID CANCER IN ITALIAN CONTAMINATED SITES WITH PRESENCE OF SUBSTANCES WITH ENDOCRINE DISTRUPTING PROPERTIES*

# MAIN FINDINGS

- A number of excesses in the incidence of neoplasms for which PCB exposure represents an ascertained (melanoma) or suspected (breast cancer, Non-Hodgkin Lymphomas) have been detected in several Contaminated Sites where the occurrence of PCB has been documented.

Significantly increased SIRs were observed for:

Breast cancer (F)	in 6 out of 8 NPCSSs
Melanoma (M)	in 3 out of 8 NPCSSs
Melanoma (F)	in 4 out of 8 NPCSSs
NHL (M)	in 2 out of 8 NPCSSs
NHL (F)	in 2 out of 8 NPCSSs

- Excesses in melanoma incidence in both genders have been observed in Brescia, Porto Marghera and Taranto.

# CONCLUDING REMARKS. 1

**In light of the well-known limitations of geographic epidemiological studies, these figures do not provide causal clues, but rather suggest second generation studies, based on analytical epidemiological approaches. These studies should address firstly the risk of melanoma and, where appropriate/feasible, the risk of Non Hodgkin Lymphoma and breast cancer.**

## **CONCLUDING REMARKS. 2**

**The role of contamination of the different environmental matrices should be better ascertained (where it has not yet been taken into account) through exposure and risk assessment studies.**

## **CONCLUDING REMARKS. 3**

**Both exposure assessment and analytic epidemiological approaches have been adopted in the context of Brescia.**

## **CONCLUDING REMARKS. 4**

**With specific reference to melanoma, for which there is sufficient evidence of a causal role of PCB exposure (IARC Monograph 107, 2016), the aim of these studies is not to re-assess the carcinogenic risk of PCBs to humans, but rather to estimate the health impact of PCB exposure in specific contexts, if feasible, taking into account issues such as latency time, statistical power and specific exposure pathways in the context at study.**

# **CONCLUDING REMARKS. 5**

**The public health priority in contaminated sites is to pursue environmental clean-up. In this frame, epidemiological surveillance can be a valid tool for documenting reduction of exposure levels over time and, possibly, reduction in the incidence of diseases causally associated to the contaminant agents that characterize the sites of study.**