

# Food safety in the food chain

Teramo, 31 January 2018



IZSAM G. CAPOREALE  
TERAMO

## The role of the National Reference Laboratory for Dioxins and PCBs in food and feed



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# Food and Feed Chemical Safety

- Dioxins and PCB
- Heavy metals
- Toxic elements
- Mycotoxins
- POPs

Environmental  
contaminants

Food  
Authenticity  
and  
Traceability

Veterinary  
Drug Residues



- «Food fingerprintings» as a support tool for authentication of products

- Residues veterinary drugs
- Residues of anabolic substances

Food and Feed  
Composition  
and Additives

Residues of  
Pesticides

- Food and feed composition for evaluating their nutritive value
- Preservatives
- Color additives

- Pesticides
- Fungicides
- Herbicides
- Pyrethroids



# Bromatology, Residues in foods for human and animal consumption



national and international activities:

- **development** and **validation** of new analytical methods, in particular for dealing with emerging problems of contamination of foodstuffs
- **research projects** financed by the Ministry of Health in the field of food safety
- **technical assistance projects** for the benefit of candidate countries for EU membership



# LOW CONTAMINATION LEVELS

Most contaminants are expressed as:

- **ppm** parts per million
- **ppb** parts per billion
- **ppt** parts per trillion



# LOW CONTAMINATION LEVELS



What is ppm and what does it mean?

**One ppm is 1 part in 1 million**

four drops of ink in about 200 liters of water and mixing it thoroughly

**Levels in toxicology**

mg/kg

mg/l

µg/g



# LOW CONTAMINATION LEVELS



What is ppb and what does it mean?

**One ppb is 1 part in 1 billion**

One ppb is like one pinch of salt in 10 tons of potato chips.

**Pesticides in food**

**Veterinary drugs in feed**

$\mu\text{g}/\text{kg}$

$\text{ng}/\text{g}$

$\mu\text{g}/\text{l}$



# LOW LEVELS OF CONTAMINANTS



What is ppt and what does it mean?

**One ppt is 1 part in 1 trillion**

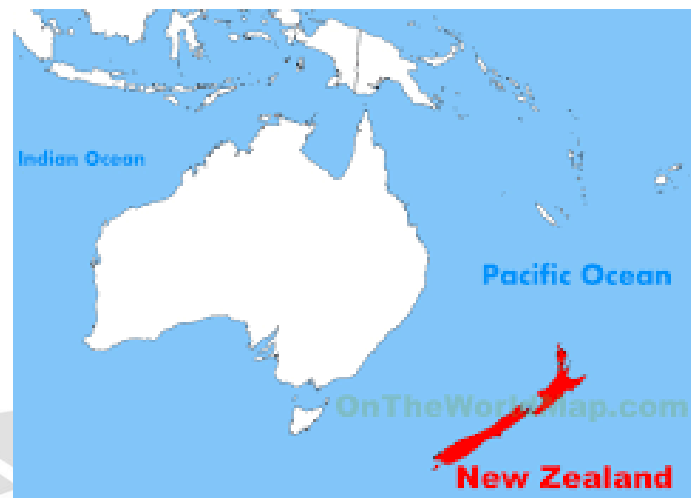
The size of a newspaper compared to the whole of New Zealand.

**Dioxins and PCBs in food**

ng/kg

µg/g

ng/l





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PCDD/F e PCB

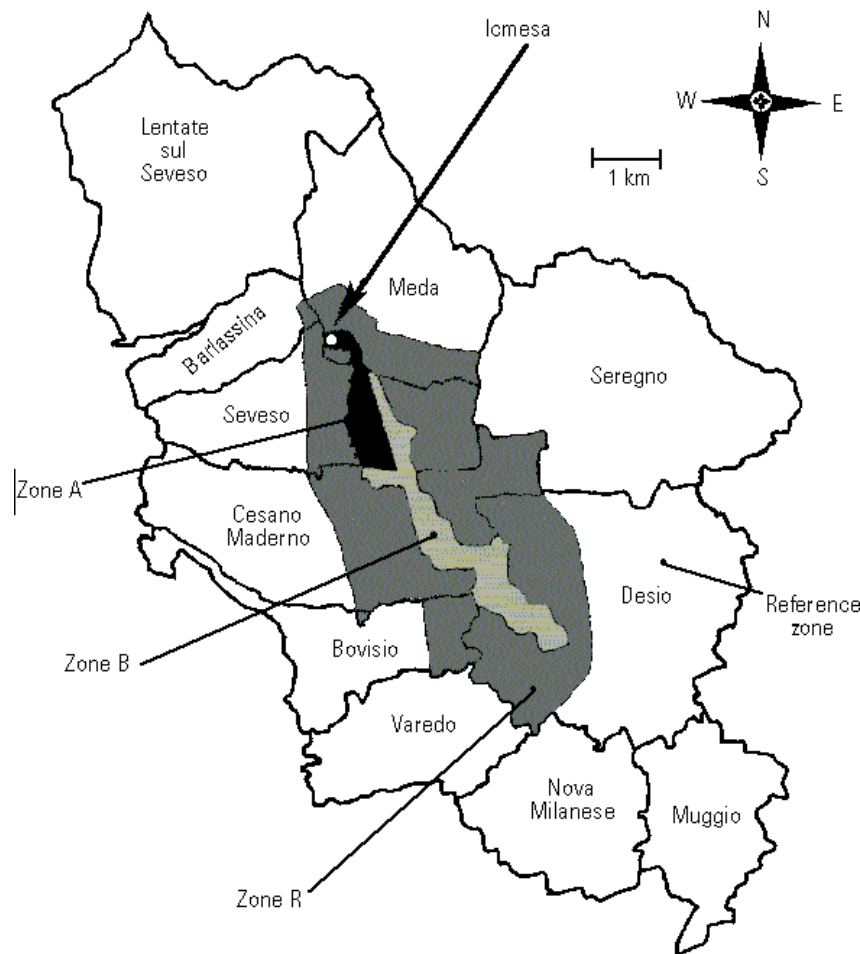
Laboratorio Nazionale di Riferimento

# Focus on NRL for Dioxins and PCBs in feed and food





The ICMESA chemical plant produced 2,4,5-trichlorophenol (TCP), a toxic unflammable compound used for the chemical synthesis of herbicides



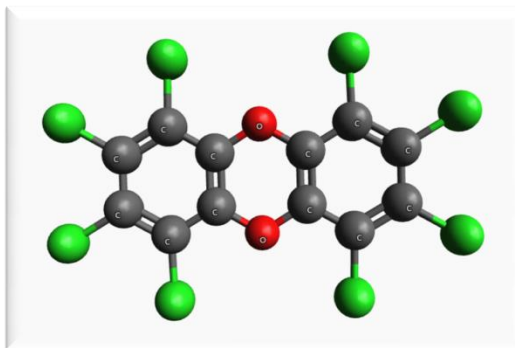
# Seveso

About 34 kg of dioxins was in the toxic cloud

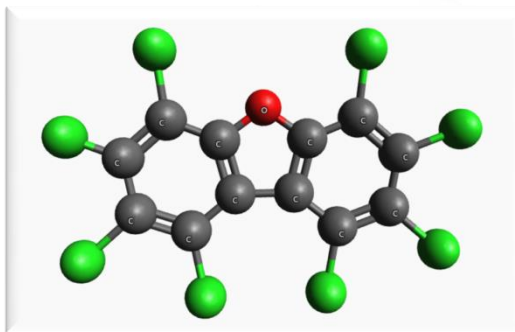


# Background

- 210 different congeners with 1 - 8 chlorine atoms
- No use nor technical and industrial production
- Formation as unwanted by-products during thermal and industrial processes
- Increase of environmental levels in parallel to the beginning of industrial chlorine chemistry



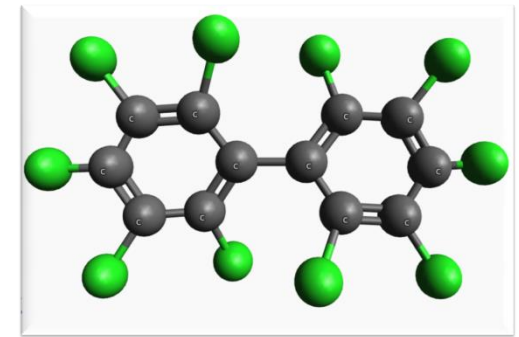
Polychlorinated dibenzo-*p*-dioxins  
(PCDDs)



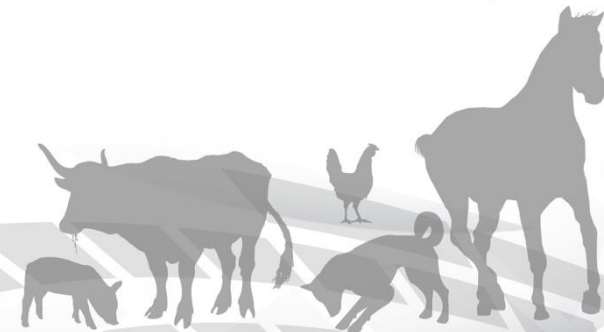
Polychlorinated dibenzofurans  
(PCDFs)

# Background

- 209 different congeners with 1 - 10 chlorine atoms
- Massive industrial production in the past (from 1930s to 1980s)
- Used for a wide variety of industrial applications such as electrical equipment

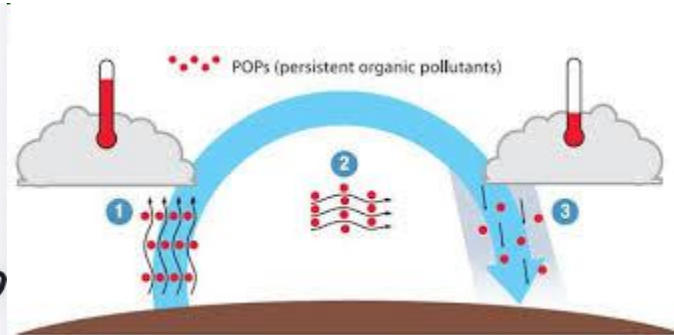
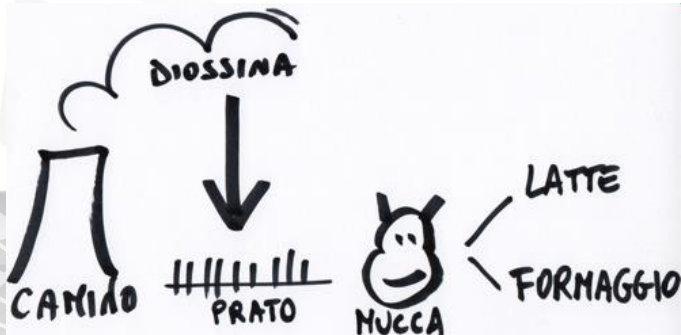


Polychlorinated biphenyls  
**(PCBs)**



## Why are dioxins and PCBs a problem?

- are only little water-, but highly lipid soluble (lipophilic)
- show global distribution
- are accumulated in the food chain
- possess very long biological half-lives (highly persistent)
- are toxic in animal experiments



# Dioxin laboratory milestones


- 
- Created after the “Belgium dioxin crisis” (1999)
  - First participation at DIOXIN meeting in Venice (1999)
  - Analysis of all the samples for PCDD/Fs in the framework of National Residues Surveillance Plan (2000 – 2004)
  - Start with DL-PCBs analysis (2005)
  - Designation as National Reference Laboratory by the Ministry of Health (2007)
  - First participation at EURL-NRLs workshops in Freiburg (July 2007)
- 
- 

# European workshops

- NRL participates at two annual workshops organized by EU-RL




# Core Working Groups

- 
- Technical aspects in analytical analysis (e.g. MU, LOQ, ...)
  - Congeners pattern
  - Harmonization of analytical methods for new contaminants (e.g. BFRs, CPs)

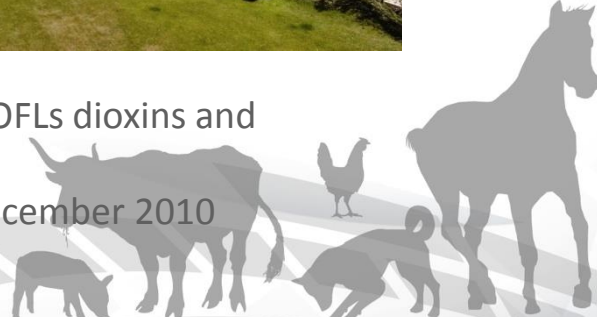





# National workshops



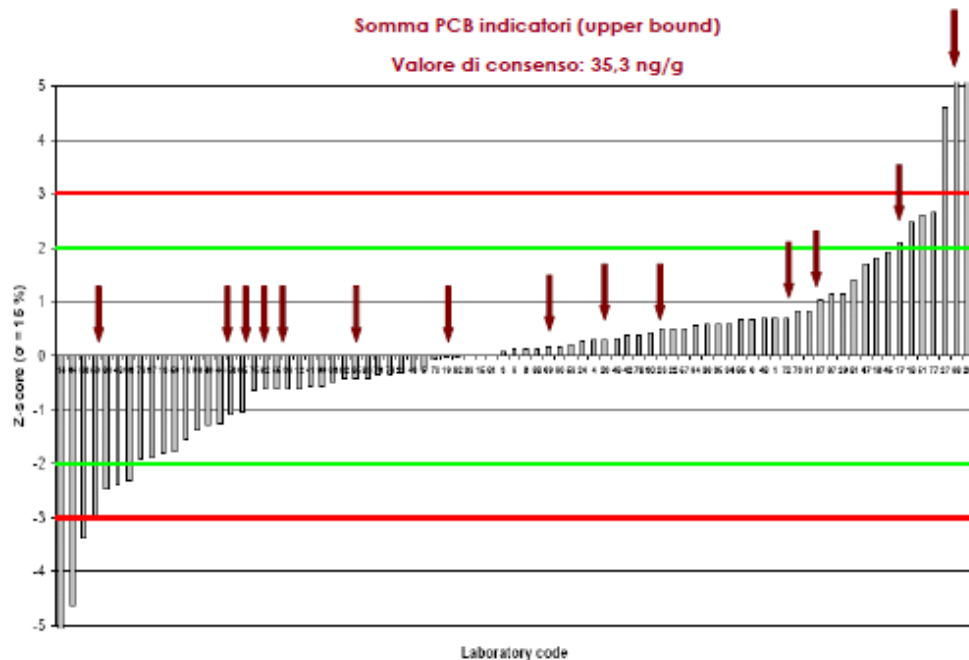
NRL organizes an annual workshop with OFLs and Ministry of Health representatives, to disseminate information acquired from COM/EURL/NRLs network



Workshop NRL-OFLs dioxins and PCBs.  
Teramo, 9-10 December 2010

NRL encourages OFLs to participate in EURL PTs, ensuring follow-up actions and publishing an annual report

Figura 9. Grafico degli z-score della somma dei PCB indicatori (upper bound) nella matrice salmone (le frecce indicano i laboratori italiani)



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Laboratorio Nazionale di Riferimento per le Diossine e i PCB  
in mangimi e alimenti destinati al consumo umano

PROVE INTERLABORATORIO 2011  
IN ALIMENTI E MANGIMI

26 MARZO 2012

# Food and Feed



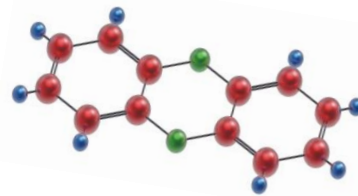
## Feed and Food samples



# Research projects



## Research projects



# THANK YOU

