



Presentation at BVA Congress

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Belfast, North of Ireland

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A blue background image showing a sunset or sunrise over a body of water. The sun is low on the horizon, creating a bright glow and reflecting on the water's surface. The sky is a deep blue with some light clouds.

Dioxins Levels in Milk
1991-2005

Jim O'Donovan

University College Dublin.

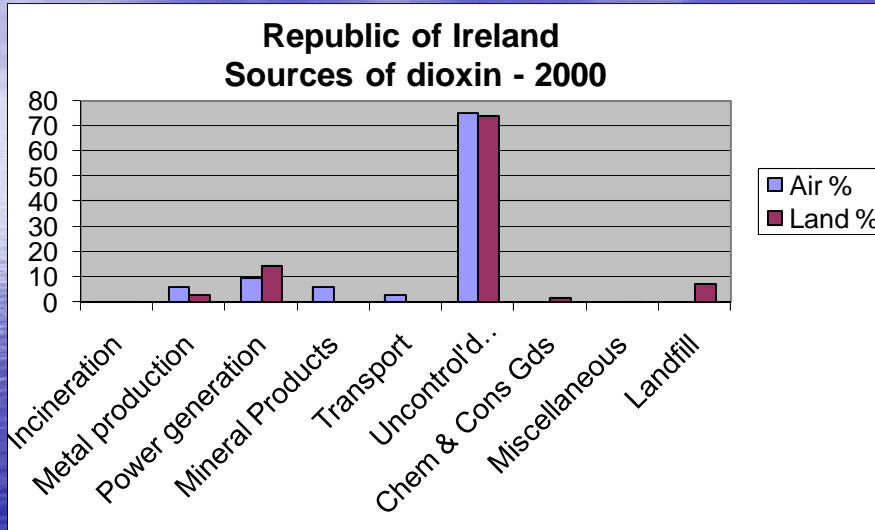
Dioxins

- A group of 29 chemicals that share a common receptor affinity
- Exert action in living cells via the aryl hydrocarbon receptor
- 2,3,7,8 tetrachlorodibenzo-*para*-dioxin
- Includes 7 PCD-dioxins, 10 PCD-furans and a subset of PCBs (the 12 DL-PCBS).
- Hydrophobic & lipophilic
- Persistent organic pollutants (POPs). Ubiquitous in our environment.

Dioxins

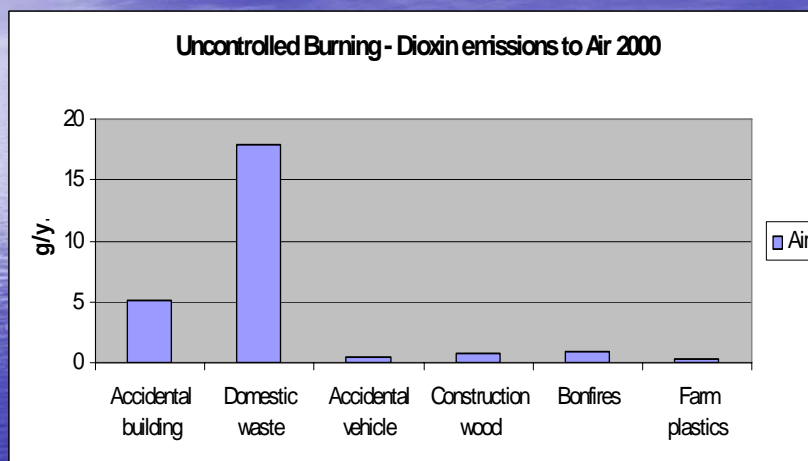
- These molecules vary in their relative toxicity and are present in the environment as mixtures.
- WHO in 1998 developed a TEQ system for quantifying toxicity of dioxin mixtures.
- 2,3,7,8 tetrachloro-p-dioxin has a TEF of 1
- Other dioxins have lower TEFs.

Sources of dioxins and furans.



Source: Hayes & Marnane, 2002.

Uncontrolled combustion



Source: Hayes & Marnane, 2002

Dioxins in Humans

Non-occupational exposure:

- 10% approx by inhalation & other routes
- 90% approx dietary
 - Fat containing foods
 - Dairy contributes ~40% of dioxin/furan intake
- Dairy, meat and eggs significant pathways for human dioxin intake in recent feed contamination incidents.

Sources: Eduljee & Gair 1996; Theelan et al 1993;
Schmid et al. 2002; Larebeke et al. 2001

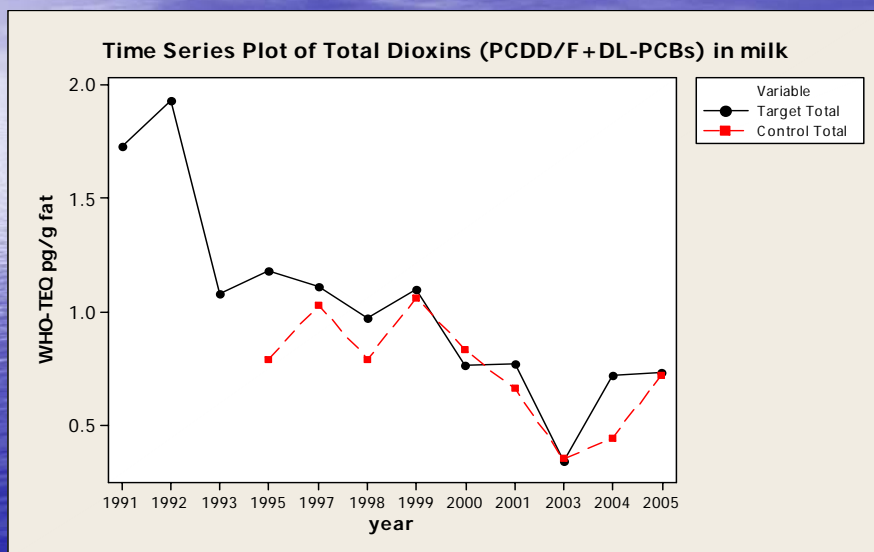
Quantifying dioxin mixtures

- Measure the concentration of each dioxin-like chemical present in the sample.
- Multiply each [congener] by it's TEF to get the congener's TEQ
- Sum all the congener TEQs to arrive at the total WHO-TEQ for the sample.

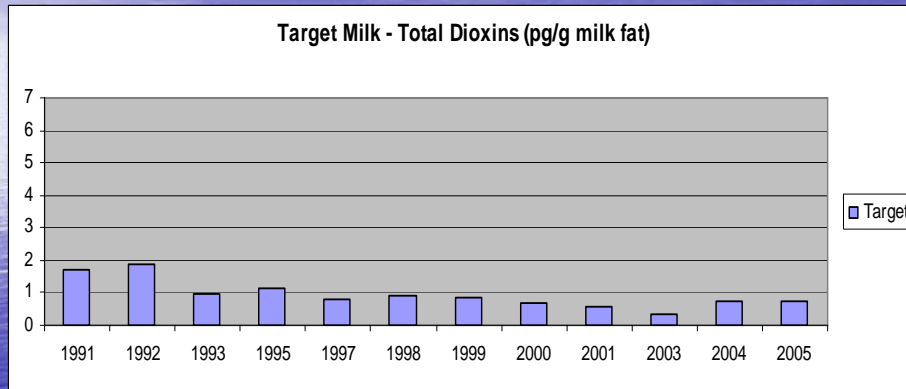
In the AHMS

- Milk samples collected from individual herds and then pooled (Target or Control)
- Target pools from 1991 to 2005
- Control pools from 1995 to 2005
- Tested by two accredited laboratories
- ERGO (1991-2001 samples)
- Eurofins (2003-2005 samples)
- Dioxin testing paid for by the FSAI.
- All results are LOQ or actual result.

Results



Legal limits!



EU limit for dioxins and furans = 3pg/g WHO-TEQ milk fat

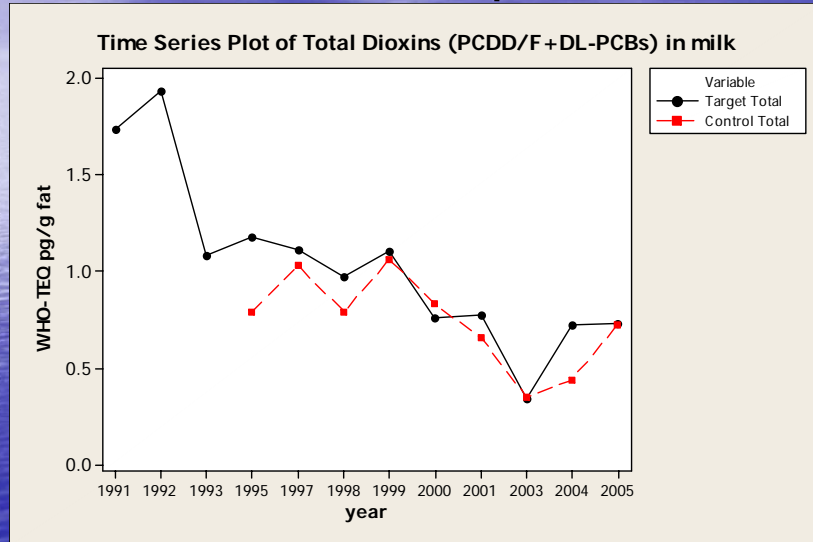
EU limit for dioxins furans and DL-PCBs = 6pg/g WHO-TEQ milk fat

EC 2375/2001& EC 199/2006

Results

- Total dioxin levels in target cow milk have more than halved between 1991 and 2000-2005
- Target cow milk [dioxin] is not significantly higher than control cow milk [dioxin] in this study.
- The [dioxin] is less than the EU maximum tolerable limit of 6pg/g fat for marketable milk in all the samples tested.
- So why has milk dioxin concentration fallen?
- How do these results compare to other studies?

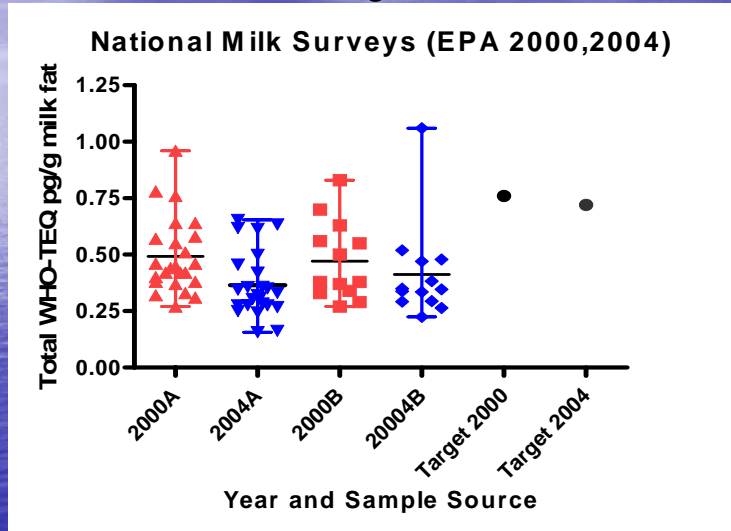
So how do we compare?



Nationally: Milk Surveys

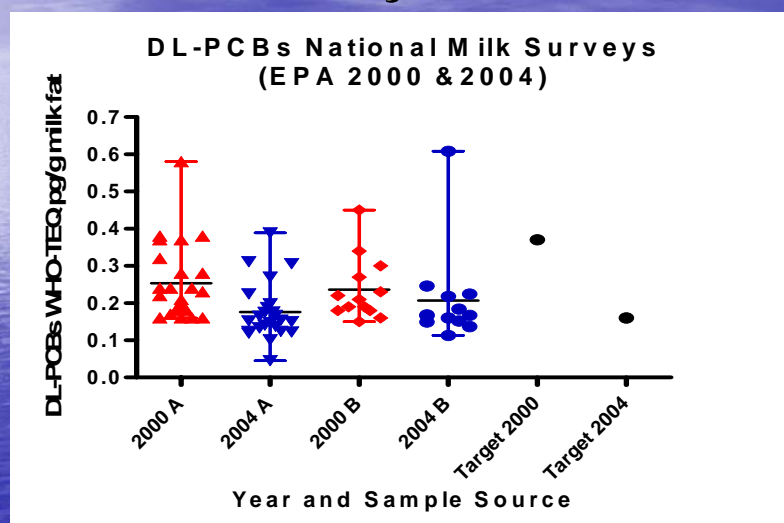
- EPA conducted surveys in 1995, 2000 & 2004.
- Included milk from "background" (n=24) and "potential impact" (n=13) areas.
- Mean [Dioxin and furan] fell 33% between 1995 and 2004
- Mean [Total dioxin] fell ~22% between 2000 and 2004.

Irish milk surveys: Total dioxin



Source: EPA 2001 & EPA 2005

Irish milk surveys: DL-PCBs

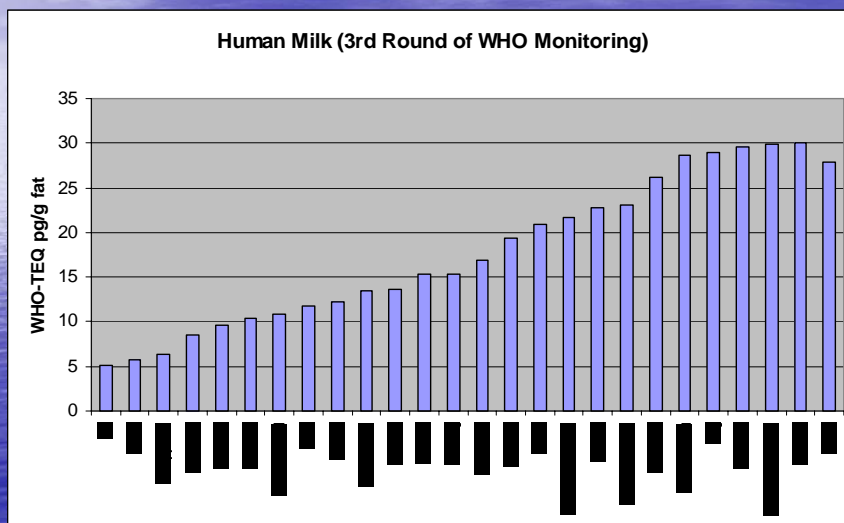


Source: EPA 2001 & EPA 2005

Internationally

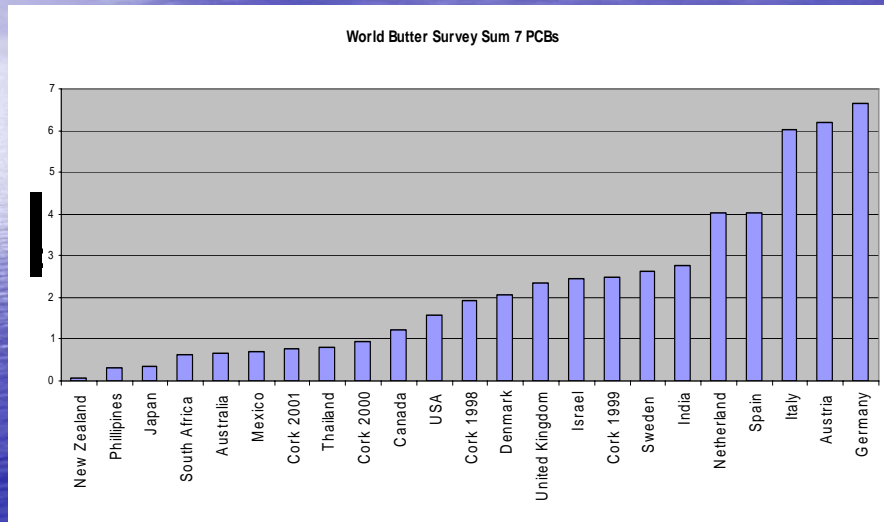
- [Dioxin] and [PCB] falling over last three decades in
 - Sediments
 - Human milk
 - Dairy milk and products (Misc refs).
- EU survey 1997-2003 (152 samples, 17 countries) (Gallani et al. 2004).
 - Average [PCDD/F]= 0.77 pg/g fat WHO-TEQ
 - Average [Total Dioxins] = 2.42pg/g fat
 - (Gallani et al. 2004).
- (EPA – average Irish milk concentrations)
 - 2004 = 0.33ng/kg WHO-TEQ
 - 2000 = 0.49 ng/kg WHO-TEQ)

Dioxin exposure (human milk)



Source: van Leeuwen & Malisch, Organohalogen Compounds 56, 311-306

Global PCB survey: Butter.



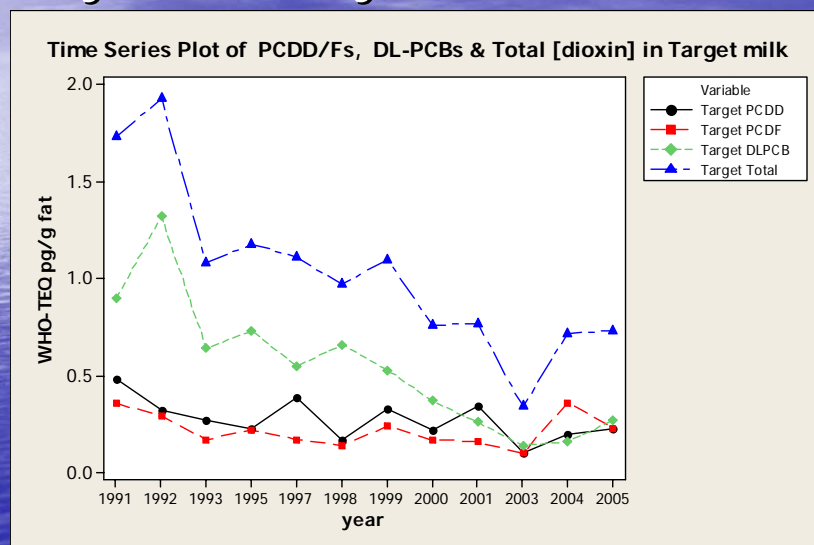
So.....

- Target milk [dioxin] is within the range for background samples in Ireland.
- The higher background results in Ireland are found at East Coast and sites around Cork City.
- Is this industrialization or urbanisation?
- The decline in target milk [dioxin] parallels national and international trends.
- By comparison, Irish milk has relatively low concentrations of dioxin and PCBs.

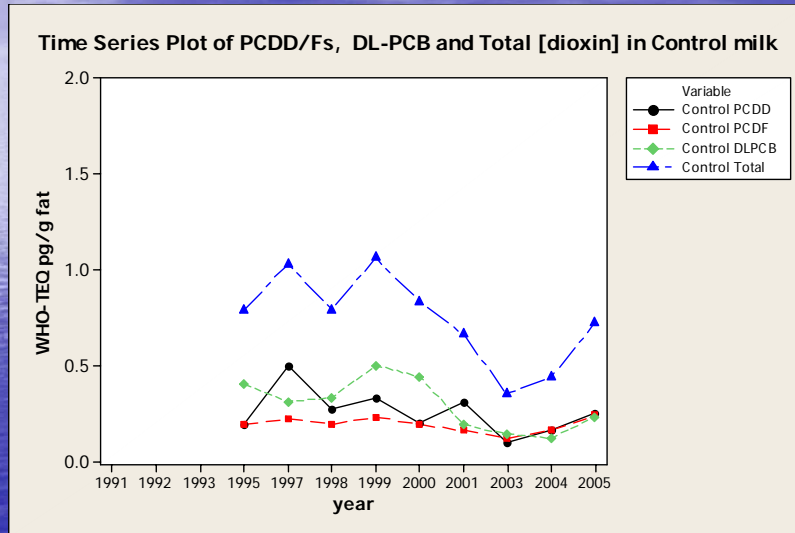
Why has [dioxin] fallen in Target milk?

- Answer?
- Need to look at the components that make up the milk [dioxin]
- PCD Dioxins
- PCD Furans
- DL-PCBs

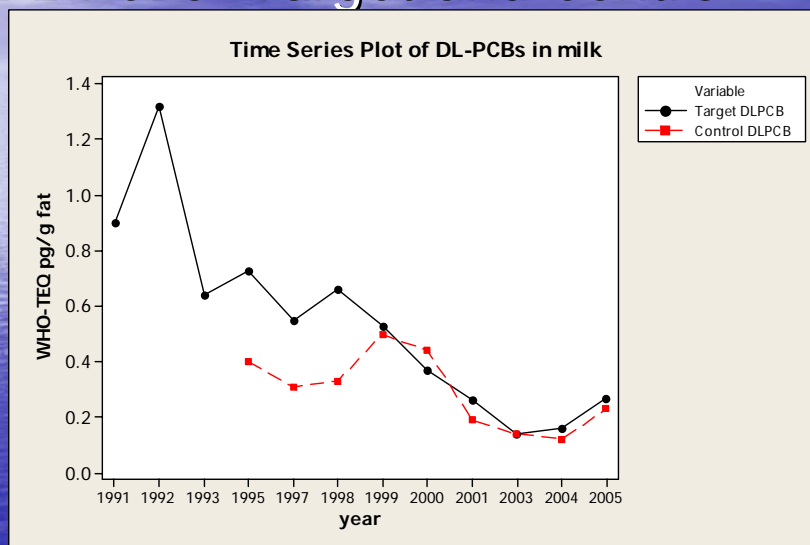
Why have they fallen?



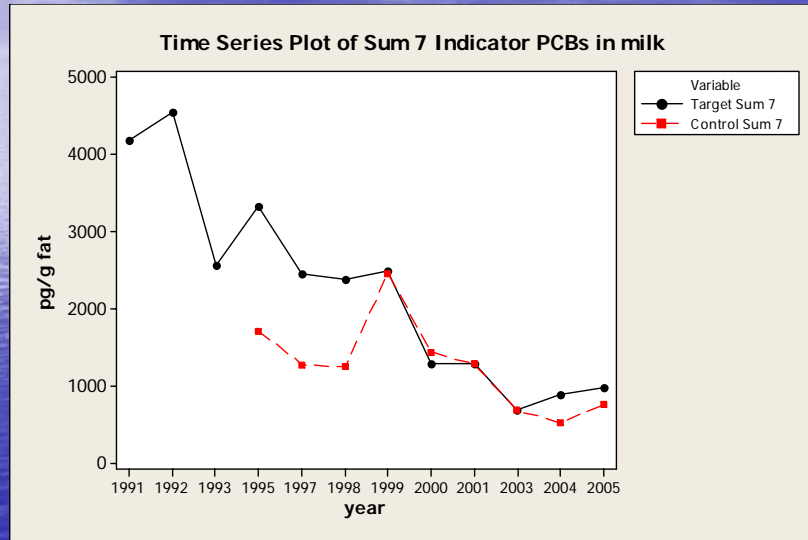
What about Control milk?



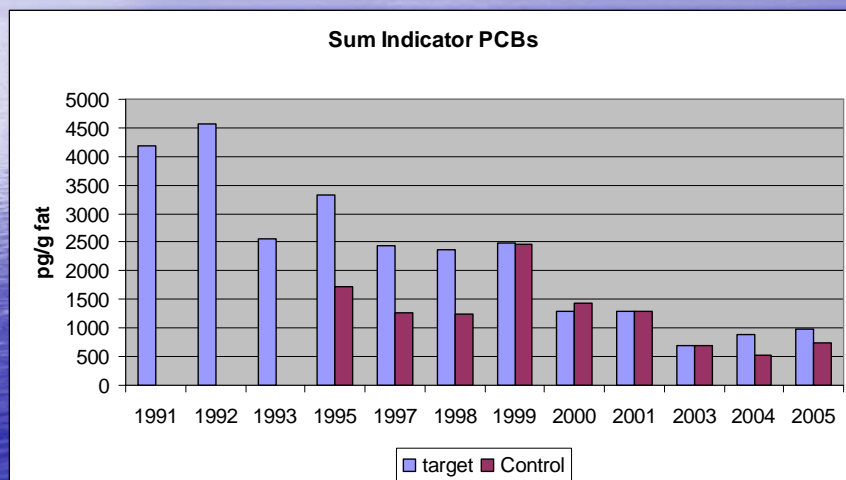
DL-PCBs: Target and Control



Indicator PCBs in milk

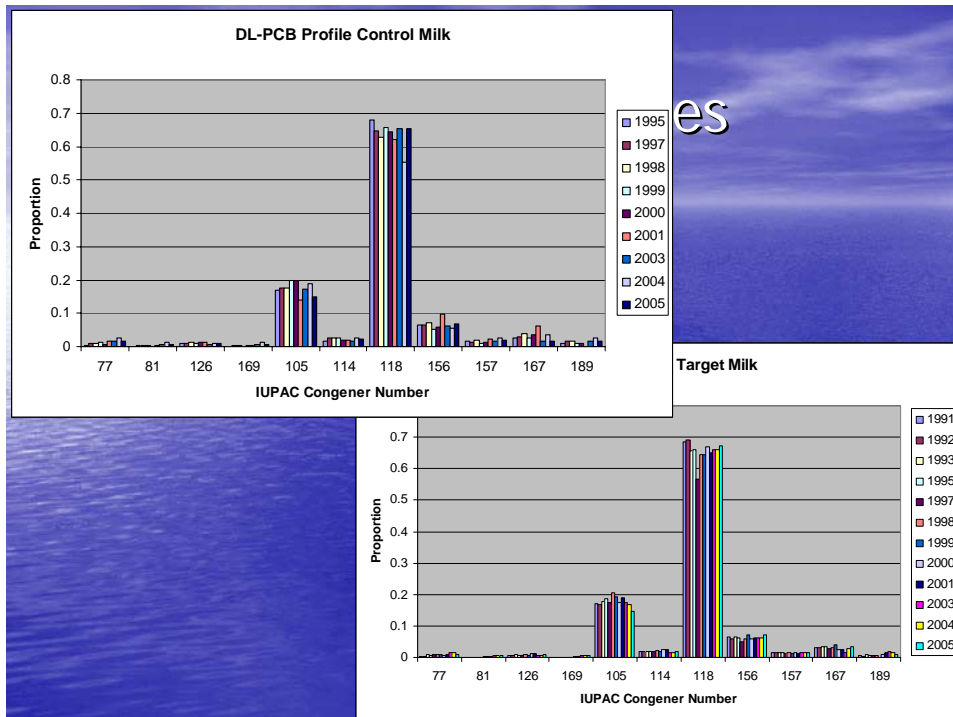


Indicator PCBs: Target and Control



Why have [dioxin TEQs] fallen?

- Mainly due to decrease in DL-PCB concentration
- This parallels the fall in [indicator 7 PCB]
- [Indicator 7 PCB] in 2003-2005 is <25% of 1991-1992 result.
- Although some PCBs are formed in combustion, most originate from non-combustive sources.
- Common Source(s)?



Conclusions

- [Dioxin] in target milk samples has fallen by approx. 50% since the early 1990s.
- All the samples (spanning 16 years) were less than 1/3 of the MTL set by EU for dioxins, furans and DL-PCBs (most <1/6).
- Target milk [dioxin] is within the range seen for Irish 'background' milk [dioxin] .
- [Dioxin] and [PCB] in Irish dairy and human milk are relatively low by comparison with international studies.
- Target milk results are consistent with those seen in milk from farms near densely populated areas of Ireland.

Acknowledgements

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- FSAI who funded the testing of samples