

# 다이옥신의 보건학적 관리대책

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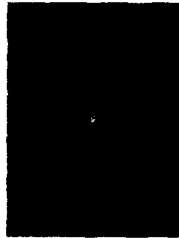
## 관리대책 방향설정의 근거

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- ◆ Toxicity
- ◆ Characteristics
- ◆ International Trend
- ◆ Impact
- ◆ Current exposure status
- ◆ Technique



100만 명의 1등 수료생!



Jae-Yeon Jang, Ajou University



## *Toxicity of dioxin*

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**According to WHO figures,  
a piece of dioxin the size of a small grain of rice,  
if distributed equally and directly to people,  
is equivalent to the “allowable” yearly dose for one million  
people**



## *Characteristics of Dioxin*

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- ◆ **No useful purpose**
- ◆ **Unwanted by-products**
- ◆ **Highly persistent**



# *The Dirty Dozen*

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- ◆ **Stockholm Convention on Persistent Organic Pollutants (POPs)**
- ◆ **A dozen notoriously toxic chemicals will be outlawed or restricted around the world under a landmark UN treaty**
  - 12 particularly virulent Persistent Organic Pollutants (POPs)
  - Pesticides aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex and toxaphene
  - Industrial chemicals polychlorinated biphenyls (PCBs) and hexachlorobenzene
  - Combustion byproducts dioxins and furans
- ◆ ***UN Environment Programme (UNEP)***
  - "This is a historic achievement, We have the chance of getting rid of some of the most toxic substances ever made by Man."



# *Impact*

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## ◆ **Belgian chickens**

- exposed to dioxin-contaminated feed in June 1999
- global import restrictions on Belgian egg and poultry products
- The cost to Belgium and EU has been estimated at US\$3 billion

## ◆ **EPA Superfund and RCRA**

- 12 sites where dioxin is one of the chemicals of concern
- Times Beaches, Missouri, Love Canal etc

## ◆ **죽염 ?**

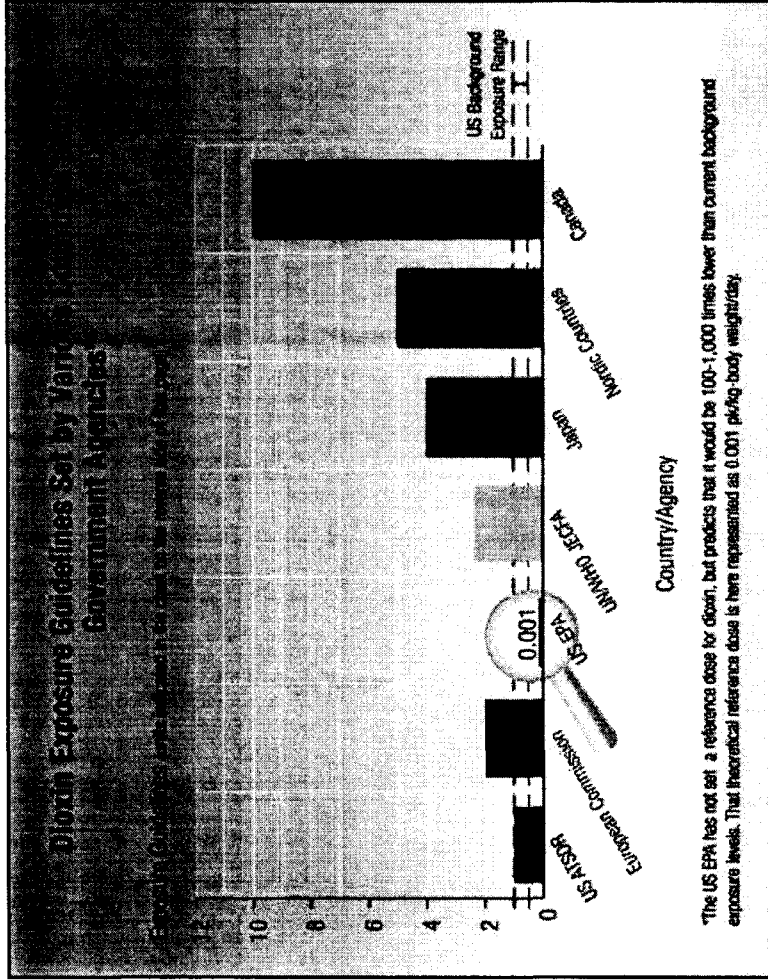
## ◆ **소각장 ?**





# “Maximum Allowable Dose” of dioxin

- ◆ 0.006 pg/kg/day
- ◆ 1 - 10 pg/kg/day



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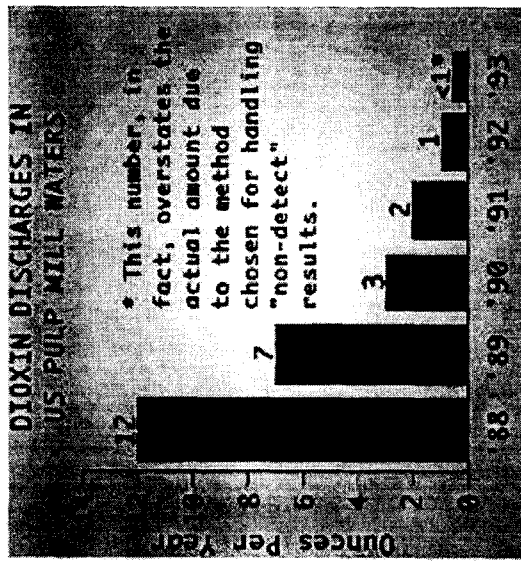
## *Daily exposure dose*

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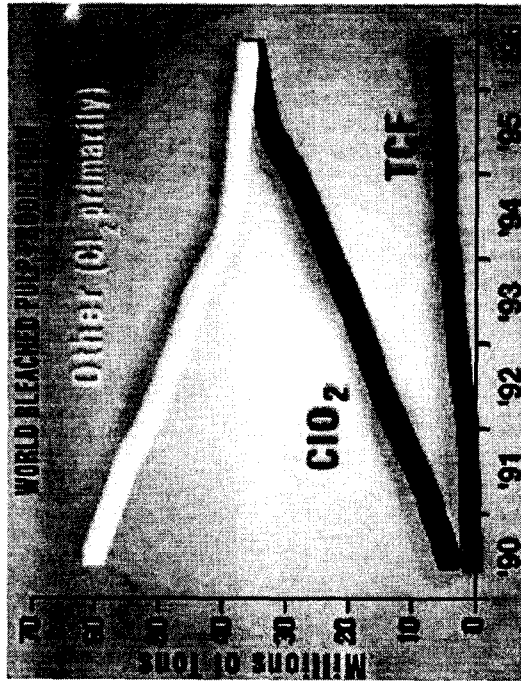
- ◆ **US EPA**
  - background exposure 0.5 -1.0 pg TEQ/kg/day (US EPA, 2000)
- ◆ **Joint UN FAO/WHO**
  - 2.3 pgTEQ/kg
- ◆ **일본 환경청**
  - 도시 주민 0.5-3.5, 어류섭취 선호 주민 3.6 pg/kg/day
- ◆ **식품의약품안전청 국립독성연 연구소(2001년 3월 16일)**
  - 한국인 15.65pg/day
- ◆ **국립환경연구원(2002년 8월 28일)**
  - 안산시 고잔동 농도를 바탕으로 하루 최대 가능 섭취량 추정
  - 2.58 pg-TEQ/kg/day (대기 호흡으로만?)



# Best Available Technology



Source: American Forest & Paper Association, individual companies, and state health authorities



Source: Alliance for Environmental Technology



## *Greenpeace*

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- ◆ **Dioxin releases must be eliminated, not simply reduced**
- ◆ **Zero is the only acceptable discharge of dioxin**
- ◆ **The current crisis demonstrates the failure of the "acceptable discharge" approach to persistent toxic substances.**
- ◆ **Given the current health threat, it would be wholly inappropriate for EPA to permit the continued release of any additional dioxin into the environment**



# European Dioxin Inventory

SNAP		1985	2005		Reduction/Increases %		Trend	90% reduction likely?
			upper estimate	min	max	min		
01	Power plants	666	50	67	-92		↓	YES
	Res. combustion: Boilers, stoves, fireplaces	989	523	869	-47		↓	NO
0202	Res. combustion: Boilers, stoves, fireplaces	900	82	337	-91		↓	NO
	Combustion in industry/boilers, gas turbines, stationary engines	238	39	78	-84		↓	NO
030301	Sinter plants	1650	383	467	-77		↓	NO
030308	Secondary zinc production	450	20	20	-96		↓	YES
030309	Secondary copper production	29	15	17	-49		↓	NO
030310	Secondary aluminium production	65	21	60	-68		↓	NO
30311	Cement	21	14	50	-32		↔	NO
030328	Other: metal reclamation from cables	750	40	50	-95		↓	YES
040207	Electric furnace steel plant	120	141	172			↑	NO
040308	Other: Non ferrous metal foundries	50	38	72	-25		↔	NO
	Other: sintering of special materials and dressing facilities	200	1	86	-100		↓	NO
060406	Preservation of wood	390	118	310	-70		↓	NO
0701	Road transport	282	41	60	-84		↓	NO
	Inc. of Dom. or municipal wastes	4000	178	232	-94		↓	YES
080201	Inc. of Dom. or municipal wastes	200	116	187	-42		↓	NO
090202	Inc. of Industrial wastes	300	16	45	-85		↓	NO
090207	Inc. of hospital wastes	2000	51	161	-87		↓	YES
090801	Cremation: Inc. of Corpees	28	13	22	-55		↓	NO
7201	Fires	382	60	371	-84		↓	NO
	Total of sources considered (g I-TEQ/year)	13690	1859	3834	-86		↓	NO
	Industrial sources	10539	1007	1577	-80		↓	NO
	non-industrial sources	3151	852	2257	-70		↓	NO

(g I-TEQ/year)

reduction indicators: >90%; 60-90%; 30-60%; 0-30%

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# 소각장 다이옥신 배출기준치

(단위 : ng-TEQ/Nm<sup>3</sup>)

구분	신설시설	기존시설	
		2001. 1.1.~2005. 12.31.	2006. 1.1. 이후
시간당 처리능력 4톤 이상	0.1	20	1
시간당 처리능력 4톤 미만~2톤 이상	1	40	5
시간당 처리능력 2톤 미만~0.2톤 이상	5	40	10

- Too loose
  - Too late
  - "acceptable discharge" approach
- Control not Prevention could not solve the crisis**  
 소형 소각로 선호: 소형소각로 관리부실 문제의 지속



# *Recycling*

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## ◆ **Curitiba, Brazil**

- A highly successful recycling programme is running since 1989
- Ten thousand families participate in the "Garbage that is not Garbage" programme receiving two kilos of food for every four kilos of recyclable garbage collected and delivered to the mobile units.

## ◆ **An analysis of recycling potential**

- 72.8 percent of waste reclamation was possible. The financial costs of incineration (even with energy recovery) was calculated to be 6,000 pesetas/ton compared to 2,325 pesetas/ton

## ◆ **A study, by the Centre for the Biology of Natural Systems in New York**

- the costs and benefits of eliminating dioxin sources from all combustion processes in the Great Lakes region of North America.
- The study found that replacing all municipal waste incinerators in the region with intensive recycling programmes would result in approximately US\$530 million annual savings



## *Worldwatch Institute*

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- ◆ The number of jobs per one million ton of waste processed in New York City

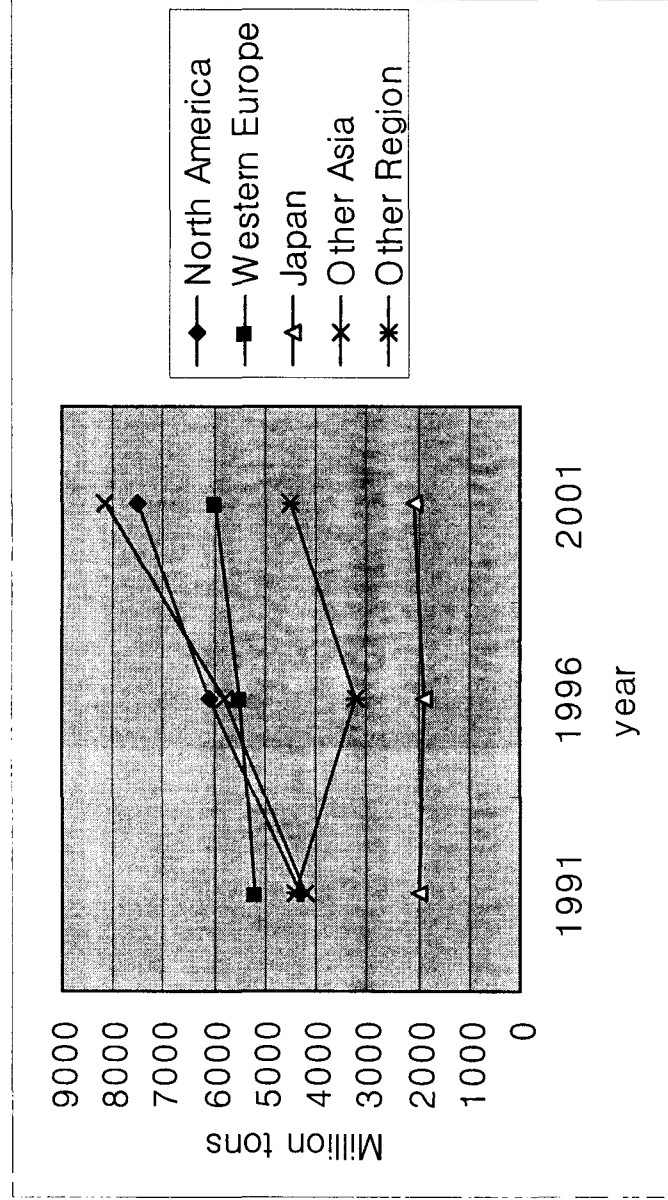
<b>Type of waste disposal</b>	<b>Number of jobs</b>
Landfill	40-60
Incinerators	100-290
Mixed waste composting	200-300
Recycling	400-590





# PVC

- ◆ Although it only accounts for approximately 0.5 percent of municipal waste by weight, PVC provides over 50 percent of available chlorine - the element essential to dioxin formation.
- ◆ Highest increase in Asia except Japan





## *Management and monitoring*

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- ◆ 매체이동관리
- ◆ 노출관리
- ◆ 말로만이 아닌 실질적인 수용체 관리
  
- ◆ Reference site
- ◆ Representative sampling
- ◆ Vulnerable population



## *Conclusion*

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- ◆ Elimination not reduce
- ◆ Prevention not control
- ◆ Recycling not incineration
- ◆ Maximum achievable control technology
- ◆ Strict regulation with the same guideline on incinerator
- ◆ Phase-out PVC
- ◆ Cross-Media and Receptor strategy
- ◆ **Vulnerable population, sentinel event**