

식품 중 다이옥신의 위해성평가 및 최근 관리동향

이 효 민 박사
(국립독성연구원 위해도평가과)

식품중 다이옥신 모니터링수행 (식품의약품안전청)

- 5개대도시/ composite sampling -

1999

6개 식품군

73 시료

쌀, 보리, 콩, 배추, 무부리, 소고기, 돼지고기, 닭고기, 고등어, 조기, 명태, 오징어, 계란, 우유, 치즈

2000

5개 식품군

71 시료

쌀, 콩, 소고기, 돼지고기, 닭고기, 계란, 갈치, 고등어, 조기, 홍합, 굴, 꼬막, 바지락

2001

11개 식품군

75 시료

쌀, 보리, 깨, 팥, 감자, 고구마, 무, 양파, 배추, 사과, 배, 꿀, 소고기, 닭고기, 돼지고기, 계란, 치즈, 우유, 고등어, 갈치, 오징어, 굴, 게

-식품의약품안전청-

식품 중 다이옥신 (PCDDs/Fs) 오염수준

| Commodity group | Sample No. | PCDDs/Fs Contamination | | | |
|---------------------------------|------------|------------------------|-------|-------|---------------|
| | | 1999 | 2000 | 2001 | mean |
| Rice | 13 | 0.0187 | 0.002 | 0.002 | 0.0076 |
| Grains (pg TEQ/g) | 8 | 0.0211 | - | 0.003 | 0.0121 |
| Bean | 12 | 0.0198 | 0.006 | - | 0.0129 |
| Red bean | 3 | - | - | 0.004 | 0.0040 |
| Potatoes (pg TEQ/g) | 3 | - | - | 0.001 | 0.0010 |
| Sweet potato | 3 | - | - | 0.001 | 0.0010 |
| Seeds (pg TEQ/g) | 3 | - | - | 0.019 | 0.0190 |
| Sesame | 3 | 0.0015 | - | 0.002 | 0.0018 |
| Radish | 3 | 0.0015 | - | 0.002 | 0.0018 |
| Vegetables (pg TEQ/g) | 5 | 0.0456 | - | - | 0.0456 |
| Korean Cabbage | 5 | 0.0456 | - | - | 0.0456 |
| Cabbage | 3 | - | - | 0.002 | 0.0020 |
| Onion | 3 | - | - | 0.001 | 0.0010 |
| Fruits (pg TEQ/g) | 3 | - | - | 0.003 | 0.0030 |
| Apple | 3 | - | - | 0.003 | 0.0030 |
| Citrus fruit | 3 | - | - | 0.005 | 0.0050 |
| Pear | 3 | - | - | 0.004 | 0.0040 |

식품 중 다이옥신 (PCDDs/Fs) 오염수준

| Commodity group | Sample No. | PCDDs/Fs Contamination | | | mean |
|------------------------------------|------------|------------------------|-------|-------|---------------|
| | | 1999 | 2000 | 2001 | |
| Meats (pg TEQ/g) | | | | | |
| Beef | 19 | 0.0182 | 0.132 | 0.052 | 0.0674 |
| Pork | 15 | 0.0144 | 0.042 | 0.007 | 0.0211 |
| Chicken | 13 | 0.0003 | 0.021 | 0.016 | 0.0124 |
| Eggs (pg TEQ/g) | 13 | 0.0124 | 0.024 | 0 | 0.0121 |
| Fishes (pg TEQ/g) | | | | | |
| Mackerel | 13 | 0.0698 | 0.858 | 0.099 | 0.3423 |
| Hair tail | 8 | - | 1.452 | 0.036 | 0.7440 |
| Croaker | 10 | 0.0297 | 0.043 | - | 0.0364 |
| Pollack | 5 | 0.0109 | - | - | 0.0109 |
| Squid | 8 | 0.0386 | - | 0.007 | 0.0228 |
| Oyster | 8 | - | 0.147 | 0.133 | 0.1400 |
| Clam | 15 | - | 0.137 | - | 0.1370 |
| Crab | 3 | - | - | 0.12 | 0.1200 |
| Dairy Product (pg TEQ/g) | | | | | |
| Milk | 5 | 0.023 | - | 0.008 | 0.0155 |
| Cheese | 7 | 0.0179 | - | 0.011 | 0.0142 |

다이옥신 인체노출량 산출

$$\sum_{i=1}^n \text{concentration of food } i \times \text{ingestion rate } i \times \text{body weight} \quad (\text{pg TEQ/kg/day})$$

- Daily Dietary Exposure -

- concentration of food i : average TEQ (PCDDs/Fs) levels in the food i to which individuals are exposed
 - ingestion rate : adult mean in 20~64 years supported by National Health and Nutrition Survey (1999)
 - body weight : adult mean as 60 kg by Korea Research Institute of Standards and Sciences (1998)
- *Estimating dietary exposure were intended to be representative of the general adult.*

국내 식품소비량 자료 (성인평균)

| Food | 20 ~ 29yrs | 30 ~ 49yrs | 50 ~ 64yrs | Average |
|-----------|------------|------------|------------|---------|
| Rice | 242.2 | 269.2 | 280.5 | 264.0 |
| Barley | 2.9 | 4.0 | 6.0 | 4.3 |
| Soybean | 2.5 | 3.2 | 5.0 | 3.6 |
| • | • | • | • | • |
| • | • | • | • | • |
| Pollack | 6.2 | 8.6 | 8.9 | 7.9 |
| Mackerel | 9.4 | 7.7 | 6.8 | 8.0 |
| Croaker | 2.3 | 5.7 | 5.7 | 4.6 |
| Hair tail | 2.0 | 3.4 | 2.8 | 2.7 |
| Squid | 7.6 | 9.8 | 5.1 | 7.5 |
| Oyster | 0.6 | 1.6 | 1.3 | 1.2 |
| Clam | 4.9 | 4.3 | 3.3 | 4.2 |

National Health and Nutrition Survey (MHW, 1999)

국내 성인 체중자료

Unit : kg

| Age | Man | | Woman | | Average |
|--------------|-------------|------------|-------------|------------|-------------|
| | Average | S.D. | Average | S.D. | |
| | 20~21 | 63.7 | 7.3 | 52.2 | |
| 22~24 | 65.6 | 7.2 | 51.7 | 7.2 | 58.7 |
| 25~29 | 68.0 | 8.6 | 52.2 | 8.6 | 60.1 |
| 30~34 | 67.9 | 7.9 | 54.8 | 7.9 | 61.4 |
| 35~39 | 68.4 | 7.9 | 54.9 | 7.9 | 61.7 |
| 40~49 | 69.0 | 8.3 | 57.1 | 8.3 | 63.1 |
| 50~59 | 67.5 | 7.9 | 57.2 | 7.9 | 62.4 |
| 60 | 60.4 | 7.8 | 55.7 | 7.8 | 58.1 |
| 20~60 | 66.3 | 7.9 | 54.5 | 7.9 | 60.4 |

(KRISS, 1998)

식품을 통한 다이옥신 (PCDDs/Fs) 인체 노출량

| Commodity group | Ingestion rate (g/day) | Exposure level (pg-TEQ/kg.day) |
|---------------------------------|---------------------------|-----------------------------------|
| Rice | 263.97 | 0.0333 |
| Grains (pg TEQ/g) | | |
| Barely | 4.30 | 0.0009 |
| Bean | 3.57 | 0.0008 |
| Red bean | 0.90 | 0.0001 |
| Potatoes (pg TEQ/g) | | |
| Potato | 16.93 | 0.0003 |
| Sweet potato | 16.17 | 0.0003 |
| Seeds (pg TEQ/g) | | |
| Sesame | 0.77 | 0.0002 |
| Vegetables (pg TEQ/g) | | |
| Radish | 48.27 | 0.0014 |
| Korean Cabbage | 14.87 | 0.0113 |
| Cabbage | 3.67 | 0.0001 |
| Onion | 15.70 | 0.0003 |
| Fruits (pg TEQ/g) | | |
| Apple | 43.70 | 0.0022 |
| Citrus fruit | 71.20 | 0.0059 |
| Pear | 26.20 | 0.0018 |

식품을 통한 다이옥신 (PCDDs/Fs) 인체노출량

| Commodity group | Ingestion rate (g/day) | Exposure level (pg-TEQ/kg.day) |
|------------------------------------|---------------------------|-----------------------------------|
| Meats (pg TEQ/g) | | |
| Beef | 29.40 | 0.0330 |
| Pork | 30.03 | 0.0106 |
| Chicken | 8.93 | 0.0019 |
| Eggs (pg TEQ/g) | 20.23 | 0.0041 |
| Fishes (pg TEQ/g) | | |
| Mackerel | 7.97 | 0.0455 |
| Hair tail | 2.73 | 0.0339 |
| Croaker | 4.57 | 0.0028 |
| Pollack | 7.90 | 0.0014 |
| Squid | 7.50 | 0.0029 |
| Oyster | 1.17 | 0.0027 |
| Clam | 4.17 | 0.0095 |
| Crab | 4.03 | 0.0081 |
| Dairy Product (pg TEQ/g) | | |
| Milk | 42.40 | 0.0110 |
| Cheese | 0.53 | 0.0001 |
| | | 0.1067 |

국내 다이옥신 TDI 설정 배경 (식품의약품안전청)

- 1999. 7 벨기에 다이옥신 사건과 국민적 필요성 증대에 따라 잠정적인 dioxins TDI를 4pg/kg/day로 제안
- 1999. 7 분석, 식품, 위해성평가 등 각분야 전문가로 구성된 내부 및 외부 자문위원회 개최
- 1999. 7 자문위원회의 결정에 따라 다이옥신 TDI 설정을 위한
~ 국내 식품 중 다이옥신 monitoring 계획 수립
- 2000. 6 국내 식품 중 다이옥신 monitoring 및 위해성평가 실시
- 2000. 6 국내 식품 중 다이옥신 monitoring 결과를 근거로 자문위원회를 통해 국내 다이옥신 TDI 4pg/kg/day 확정

다이용신 TDI 1~4 pg/kg/day 근거 (May 1998)

Toxicological Data Used in TCDD-TDI

| Study | Response Endpoint | Animal species | Maternal Body burden (ng/kg BW) | Related Human EDI* (pg/kg BW/day) |
|--|--|----------------|---------------------------------|-----------------------------------|
| Gray et al., 1997 | Decreased sperm count in offspring | Rat | 28 | 14 |
| Gehrs et al., 1997 Gehr & Smalowicz, 1998 | Immune suppression in offspring | Rat | 50 | 25 |
| Gray et al., 1997 | Increased genital malformations in offspring | Rat | 73 | 37 |
| Schants and Bowman, 1989 | Neurobehavioural (object learning) effects offspring | Monkey | 42 | 21 |
| Rier et al., 1993 | Endometriosis | Monkey | 42 | 21 |

* Estimated Daily Intake(EDI) =
$$\frac{\text{Animal body burden} \times (\ln 2 / \text{half-life})}{\text{Absorption rate}} \leftarrow \begin{matrix} 7.5\text{years} \\ 50\% \end{matrix}$$

* Composite Uncertainty Factor: 10 (human variability, LOAEL instead of NOAEL and half-lives differences of dioxin-like compounds)

국내 다이옥신 TDI 4 pg/kg/day 설정 근거 (KFDA)

Gray et al, 1997
 Reproductive/
 Developmental Toxicity
 (Increased genital
 malformations
 in offspring)

Animal Body Burden
 73 ng/kg

Estimated Daily Intake (EDI) :
 Body Burden(ng/kg) × ln 2/half-life
 (7.5yrs) × absorption rate 0.5

Estimated Human
 Daily Intake
 37 pg/kg/day

*Composite
 Uncertainty Factor*
 10

Tolerable Daily Intake
4 pg/kg/day
 (식품의약품안전청)

June, 2000

다매체노출을 고려한 다이옥신 인체노출량

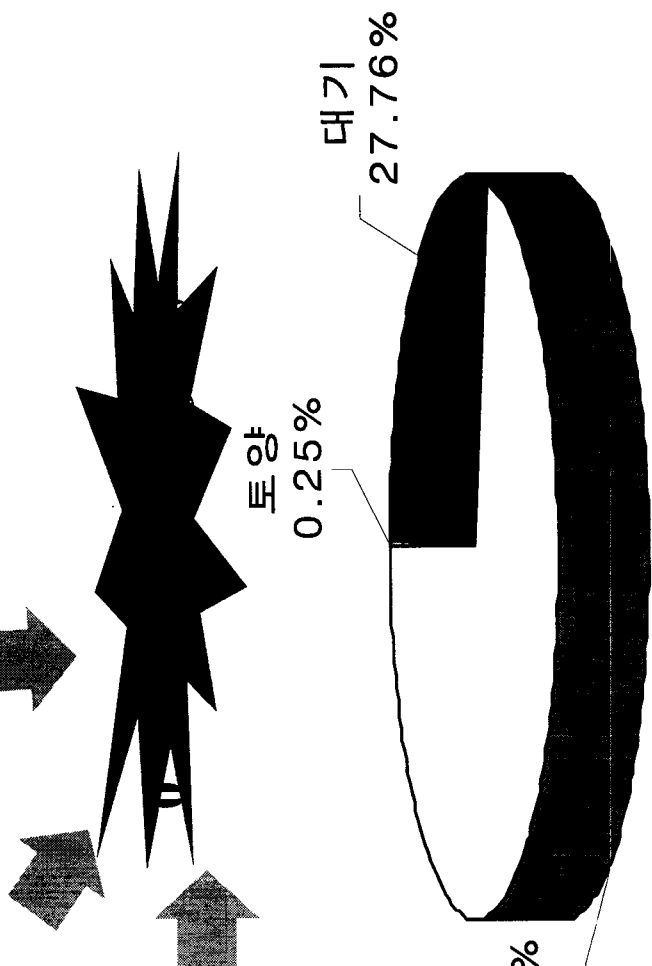
토양을 통한 인체노출량
 (50mg/day, 1999~2000, 환경부)
0.0008 pg TEQ/kg/day

대기를 통한 인체노출량
 (13.3m³/day, 1999~2000, 환경부)
0.087 pg TEQ/kg/day

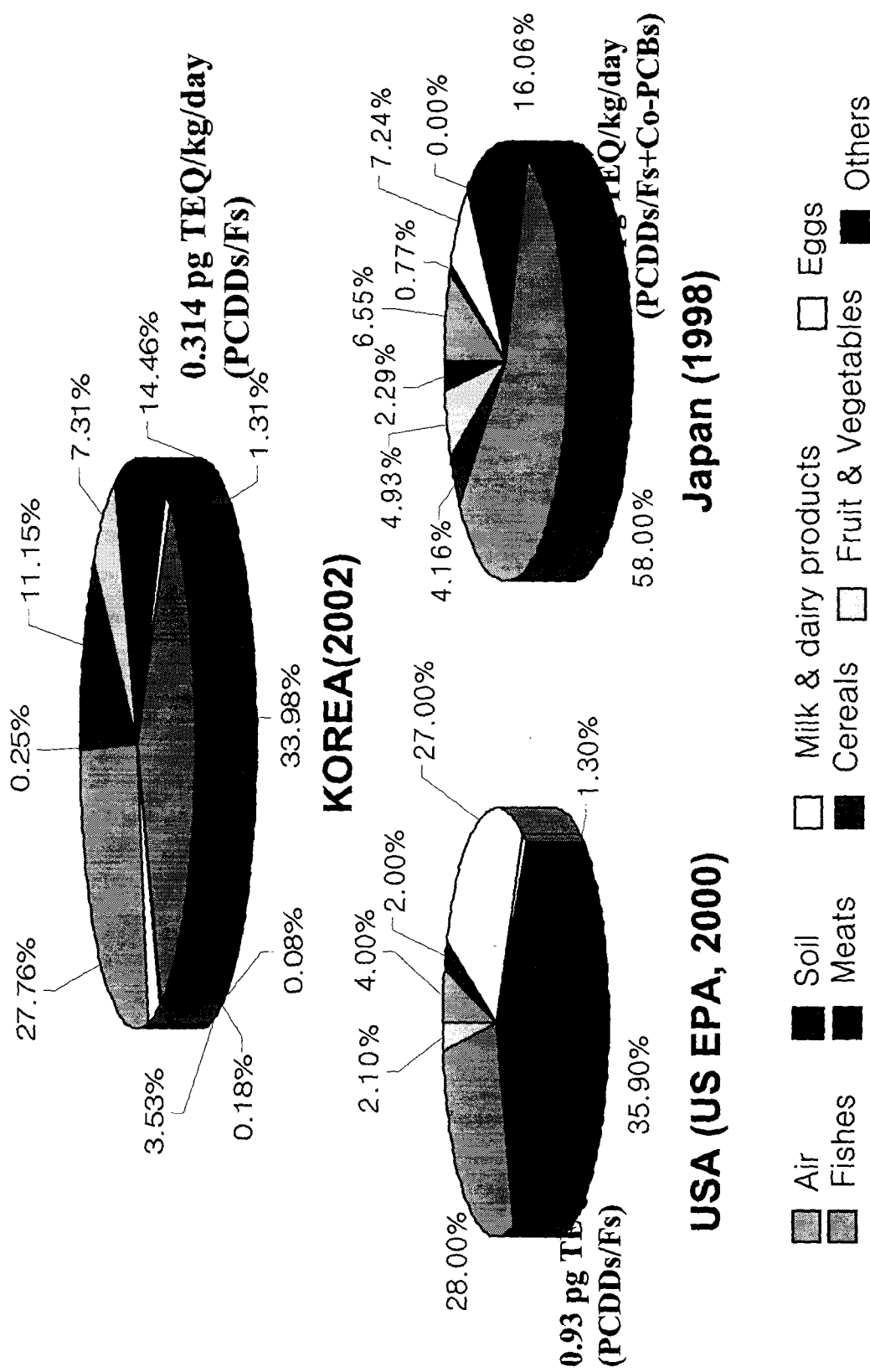
식품섭취를 통한 인체노출량
 (1999~2001, 식품의약품안전청)
0.226 pg TEQ/kg/day

현노출수준에서의 위험지수
 식품 71.98%

$$\frac{0.314 \text{ pg TEQ/kg/day}}{4 \text{ pg TEQ/kg/day}} = 0.0785$$



다이옥신 인체 노출패턴 차이



식품중 다이옥신 관리동향

EC(European Commission), Scientific Committee for food

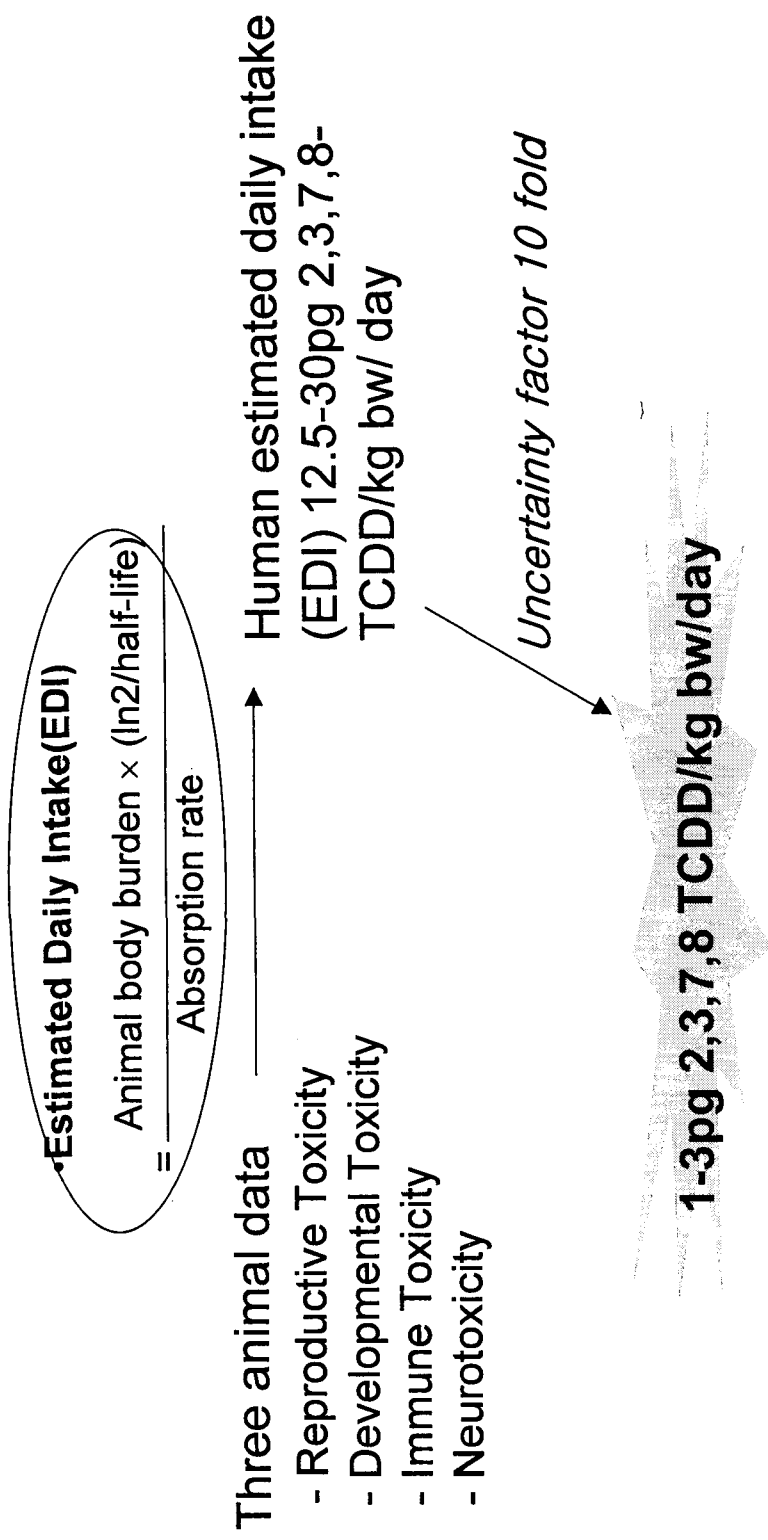
; 식품중 dioxins and dioxin-like PCBs 의 위해성평가에 대한 결과 및 의견을 채택 (November,2000, SCF)

t-TWI (Temporary tolerable weekly intake) 7 WHO-TEQ~~bw~~ bw 제시

관련독성자료

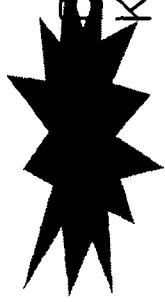
- ① Subtle effect on cognitive recognition in the offspring of rhesus monkey fed a diet containing 2,3,7,8-TCDD for up to three years.
- ② Development of endometriosis in the rhesus monkey dams from the same studies fed the diet for 42months
- ③ Effects on the reproductive function and the immune system of the male offspring of rats administered a single gavages dose of 2,3,7,8-TCDD during gestation

t - TWI 7 WHO-TEQ/kg bw 산출 근거



- single value를 선별하기 위한 과학적자료 부족
- 범위의 lower end 값 1pg TEQ/kg/day를 temporary tolerable intake 값으로 고려

다양한 TWI 제한을 위한 Scientific Cooperation Working



Belgium, Finland, Germany, Netherlands, United Kingdom, Denmark, France, Italy, Norway, Sweden

Specific task ; to provide the EC with information on dietary exposure to PCDDs/Fs and dioxin-like PCBs in participating countries.



- Eggs, fats, oils, meat(products), milk(products)
- 1-2~3 pg I-TEQ/g fat
- Fish ; 0.25~10-20 I-TEQ/g product
- Vegetables, cereals ; low, close to the detection limit

There were large differences in the amount, detail and quality of the data from the participating countries

TWI 제한을 위한 모니터링 (EC)

National Average Concentrations of Dioxins and Related PCBs (pg TEQ/g fat) in Representative food samples

| Food group | TEQ PCDD/F | | | TEG PCB | | |
|----------------------|------------|-----------|-----------|---------|-----------|-----------|
| | <1990 | 1990-1994 | 1995-1999 | <1990 | 1990-1994 | 1995-1999 |
| beef | | | | | | |
| DE | | 0.71 | 0.66 | | | |
| DK | 2.60 | | | | | |
| FI | | 0.02 | | | | |
| IT | | | 0.70 | | | |
| NL | | 1.77 | 0.72 | | | |
| NO | | 0.33 | | | 1.35 | |
| SV | | | 0.98 | | | 1.08 |
| liver chicken | | | | | | |
| NL | | 3.30 | / | | | |
| liver cow | | | | | | |
| DE | | | 2.60 | | | |
| FR | | | 3.29 | | | |
| IT | | | 2.30 | | | |
| NL | | 5.70 | | | | |
| SV | | | 0.95 | | | 1.65 |
| liver pig | | | | | | |
| DE | | | 3.00 | | | |
| NL | | 15.4 | | | | |
| NO | | 5.10 | | | | |

TWI 제한을 위한 모니터링 (EC)

National Average Concentrations of Dioxins and Related PCBs (pg TEQ/g fat) in Representative food samples

| Food group | TEQ PCDD/F | | | TEG PCB | |
|--------------------|------------|-----------|-----------|---------|---------------------|
| | <1990 | 1990-1994 | 1995-1999 | <1990 | 1990-1994 1995-1999 |
| Pork | | | | | |
| DE | 0.39 | 0.35 | 0.29 | | |
| FI | | 0.29 | | | |
| IT | | | 1.39 | | |
| NL | | 0.43 | 0.23 | | |
| NO | | 0.20 | | | |
| SV | | | 0.98 | | 0.81 |
| poultry | | | | | |
| DE | | 0.62 | 0.58 | | |
| IT | | | 0.92 | | |
| NL | | 1.63 | 0.89 | | |
| SV | | | 0.77 | | 0.70 |
| UK | 5.40 | 1.68 | | 2.42 | 0.93 |
| lamb/mutton | | | | | |
| DE | 1.83 | 0.52 | | | |
| NL | | 1.80 | | | |
| NO | | 0.31 | | | |
| SV | | | 1.01 | | 0.86 |

TWI 제안을 위한 모니터링 (EC)

National Average Concentrations of Dioxins and Related PCBs (pg TEQ/g fat) in Representative food samples

| Food group Country | TEQ PCDD/F | | | TEG PCB | | |
|-----------------------------|------------|-----------|-----------|---------|-----------|-----------|
| | <1990 | 1990-1994 | 1995-1999 | <1990 | 1990-1994 | 1995-1999 |
| eggs | | | | | | |
| DE | | 1.08 | 1.16 | | | |
| FI | | 1.55 | | | | |
| FR | | | 0.46 | | | |
| IT | | | 2.67 | | | |
| NL | | 2.00 | 1.08 | | | |
| NO | | 1.97 | | | 8.91 | 1.45 |
| SV | | | | | | |
| UK | 8.25 | 1.77 | 1.03 | 2.36 | 0.97 | |
| fats and oils | | | | | | |
| NL | | 1.51 | | | | |
| SV | | | 0.77 | | | 0.42 |
| UK | 1.26 | 0.26 | | 1.29 | 0.35 | |
| milk / milk products | | | | | | |
| BE | | 2.60 | 2.06 | | | |
| DE | 1.92 | 0.86 | 0.57 | | | |
| DK | 2.26 | | 0.49 | | | |
| FI | | 0.99 | 0.34 | | | 0.23 |
| FR | | | 0.67 | | | |
| IT | | | 0.57 | | | |
| NL | | 1.56 | 0.94 | | | |
| NO | | 0.32 | | | 1.28 | |
| SV | 2.02 | 0.92 | 0.75 | | | 0.43 |
| UK | 3.98 | 1.41 | 1.01 | 2.22 | 0.91 | 1.80 |

TWI 제안을 위한 모니터링 (EC)

National Average Concentrations of Dioxins and Related PCBs (pg TEQ/g fat) in Representative food samples

| Food group | TEQ PCDD/F | | | TEG PCB | | |
|-------------------------|------------|-----------|-----------|---------|-----------|-----------|
| | <1990 | 1990-1994 | 1995-1999 | <1990 | 1990-1994 | 1995-1999 |
| cereals/cereal products | | | | | | |
| FI | | | 0.02 | | | 0.00 |
| FR | | | 0.02 | | | |
| NL | | 0.01 | | | | |
| SV | | | 0.17 | | | 0.11 |
| UK | 0.08 | 0.11 | | 0.08 | 0.02 | |
| fruit and vegetables | | | | | | |
| DE | 0.01 | 0.01 | | | | |
| FI | | 0.02 | | | | |
| FR | | 0.06 | | | | 0.01 |

TWI 제안을 위한 모니터링 (EC)

Dietary intake of dioxins (pg TEQ/kg/day*) according to recent surveys

| Country | Survey | Period | Age | Body weight kg | Region | Occurrence date | Pg TEQ/kg/day | |
|-----------------------------------|---------------------|---------|--------|-------------------|-----------------|--------------------|---------------|-----------|
| | | | | | | | (PCDD/F) | PCB total |
| <i>Adults or total population</i> | | | | | | | | |
| Finland | Finsurvey | 1997 | 25-64 | 60.0 | 5 major regions | 1991-99 | 1.01 | 0.84 1.85 |
| France | Dietary survey | 1998-99 | 18-75 | 67.1 | all France | 1998-99 | 1.45 | na - |
| Germany | Report of Nutrition | 1985-89 | 25-50 | 70 | all Germany | 1991-95 | 1.47 | na - |
| Germany | Report of Nutrition | 1985-89 | adults | 70 | all Germany | 1993-96 | 0.88 | na - |
| Germany | Duplicate diets | 1994 | - | - | Saxony-Anhalt | 1994 | 0.85 | na - |
| Germany | Duplicate diets | 1994-95 | 24-64 | - | NR Westphalia | 1994-95 | 0.72 | na - |
| Germany | Report of Nutrition | 1985-89 | adults | 70 | all Germany | 1995 | 1.0 | na - |
| Germany | Report of Nutrition | 1985-89 | adults | 70 | all Germany | 1995-98 | 0.53 | na - |
| Germany | Report of Nutrition | 1985-89 | 25-50 | 70 | all Germany | 1995-98 | 0.73 | na - |
| Italy | INN-CA 1995 | 1994-96 | 1-92 | 61.1 | all Italy | - | 0.74 | na - |
| Netherlands | DNFCS 1992 | 1992 | 1-85 | 63.1 | all Netherlands | 1994-96 | 0.59 | na - |
| Norway | NORKOST 1997 | 1997 | 16-79 | 73.5 | All Norway | 1989-96 | 0.39 | 1.50 1.89 |
| Sweden | Riksmaten 1997-98 | 1997-98 | 18-74 | 73.7 | all Sweden | 1998-99 | 1.06 | 0.85 1.91 |
| Sweden | Market Basket | 1999 | - | 73.7 | 4 major towns | 1999 | 1.07 | 0.79 1.87 |
| United Kingdom | British Adult Study | 1986/87 | 16-64 | 70.1 | all UK | 1992 | 1.26 | 0.81 2.07 |

*TEF factors used, unless otherwise stated: NATO/CCMS (1998); PCB = Ahlborg et. Al. (1994); na = not assessed.

TWI 제안을 위한 모니터링 (EC)

Average percent contribution of dioxins (I-TEQ) from major food groups. Adults total population

| country | Food consumption data | Occurrence date | Total intake Pg/d | %contribution from | | | | |
|--------------|-------------------------|-----------------|-------------------|--------------------|--------------|-------------|-------------|--------------|
| | | | | Dairy products | Meat,poultry | Eggs | Fish | Other Foods* |
| FI | Finsurvey 1997 | 1991-99 | 61 | 16 | 6 | 4 | 63 | 11 |
| FR | National survey 1998-99 | 1998-99 | 97 | 33 | 13 | 2 | 26 | 26 |
| DE | 1985-89 | 1995-98 | 51 | 39 | 30 | 11 | 11 | 9 |
| IT | INN-CA 1995 | | 45 | 26 | 32 | 7 | 35 | - |
| NL | National survey 1987-88 | 1990-91 | 82 | 39 | 20 | 4 | 2 | 35 |
| NO | NORKOST 1997 | 1989-96 | 29 | 22 | 14 | 12 | 46 | 6 |
| SE | Riksmaten 1997-98 | 1996-99 | 68 | 19 | 31 | 2 | 34 | 14 |
| UK | Adult survey 1986-87 | 1992 | 88 | 25 | 20 | 4 | 6 | 45 |
| Range | | 1989-99 | 29-97 | 16-39 | 6-32 | 2-12 | 2-63 | 6-45 |

*Other foods = cereals and cereal products, vegetables, fruit, vegetable fats and oils

TWI 제한을 위한 모니터링



Dietary Intake Estimation

- Average Daily intake of PCDDs/Fs ; 0.53~1.47 pg TEQ/kg/day
 - Dairy Products 16 ~ 39%
 - Meat 6 ~ 32 %
 - Fish 2 ~ 63 %
 - Vegetables, Fruits, Cereals, Vegetable fats 6~45%
- High intake (95 percentile intake) can be 2~3 fold higher than the average, depending on the degree of contamination of various foods.
- Average Daily Intake of PCDDs/Fs and dioxin-like PCBs ; 1.2~3.0 pg TEQ/kg/day

TWI 제안을 위한 모니터링 (요약)

November 2000

Scientific Committee for Food
EC

- The Committee concluded that the t-TWI for 2,3,7,8-TCDD could be extended to include all PCDDs/Fs and the dioxin-like PCBs
- Risk Assessment have identified groups of the population that may experience higher than average exposure through high consumption of heavily contaminated food, human milk (breast fed infants), or occupational exposure.

- The committee discussed setting of ~~maximum levels~~, ~~action thresholds~~ and ~~target values~~ using information on current levels in foods

EC TWI (4 pg TEQ/kg bw / week) 제정

(July, 2001)

- TWI (PCDDs/Fs와 dioxin-like PCBs)
- 2004년 12월까지 식품별 target level을 설정키로 함

| Products | Maximum levels for dioxins (PCDDs/Fs) (pg WHO-TEQ/g fat or product) |
|--|---|
| Meat and meat products originating from <ul style="list-style-type: none"> - Ruminants (bovine animals, sheep) - Poultry and farmed game - Pigs | 3 2 1 6 |
| Liver and derived products | 4 |
| Muscle meat of fish and fishery products and products thereof | 3 |
| Milk and milk products, including butter fat | 3 |
| Hen eggs and egg products | 3 |
| Oils and fats <ul style="list-style-type: none"> - Animal fat from ruminants from poultry and farmed game from pigs mixed animal fat | 3 2 1 2 0.75 2 |
| - Vegetable oil | |
| - fish oil intended for human consumption | |

- 지방성분이 1%이하인 식품에는 적용치 않기로 함.

다이옥신 관리현황

Guideline and maximum levels for concentrations of PCDDs/Fs and PCBs in foods in various European countries

| COUNTRY | FOODSTUFFS OF ANIMAL ORIGIN | |
|---------|--|---|
| | PCDDs and PCDFs | PCBs |
| Austria | Provisional limits : Pork 2, milk 3, poultry and eggs 5 and beef 6 Pg WHO-TEQ(PCDD/F)/g fat | |
| Belgium | Milk, bovine, poultry, animal fats and oils, eggs and derived products, if >2% fat : 5 pg WHO-TEQ (PCDD/F)/g fat. Pork and derived products, if > 2% fat : 3 pg WHO-TEQ(PCDD/PCDF)/g fat | For the sum of PCBs 28, 52, 101, 118, 138, 153 and 180 : Milk and derived products, if > 2% fat: 100 ng/g fat Bovine, pork , poultry, animal fats and oils, eggs And derived products, if > 2% fat: 200 ng/g fat |
| Denmark | No national limits | No national limits |
| Finland | No national limits | No national limits |
| France | Milk and dairy products : 5 pg/g fat | No national limits |
| Germany | Recommendations for milk and dairy products In pg 1-TEQ/g milk fat : < 0.9 (desirable target) >3.0 (identification of sources: measures to reduce input, recommendations for land use; recommendation To stop direct supply of milk products to consumers) > 5.0 (ban on trade of contaminated milk products) | Congener specific limits for PCBs 28, 52, 101, 138, 153 and 180 in foods of animal origin: 0.008-0.6 mg/kg fat or whole weight basis |
| Greece | No national limits | No national limits |
| Ireland | International norms | International norms |

다이옥신 관리현황

Guideline and maximum levels for concentrations of PCDDs/Fs and PCBs in foods in various European countries

| COUNTRY | FOODSTUFFS OF ANIMAL ORIGIN | |
|-----------------|---|---|
| | PCDDs and PCDFs | PCBs |
| Italy | No national limits | Action level for the sum of tri-to octachlorobiphenyls in various foods of animal origin (excluding freshwater and marine fish and derived products):100 ng/g fat |
| Luxembourg | Recommended : Pork 2, beef 6 poultry 5, milk 3 and eggs 5 pg/g fat | No national limits |
| Norway | No national limits | No national limits |
| Portugal | No national limits | No national limits |
| Spain | Levels > 5 pg/g fat are considered as non-acceptable in dairy products | , |
| Sweden | No national limits | PCB 153 : Meat products > 10%fat: 0.1, milk and milk products > 2%fat: 0.02 and eggs:0.1 mg/kg/fat. Meat products <10% fat: 0.01, milk and milk products < 2% fat: 0.001 and fish: 0.1 mg/kg wet weight |
| The Netherlands | Dairy products and foods with milk or dairy product as ingredients: 6pg TEQ/g fat | Congener specific limits for PCBs 28, 52, 101, 118, 138, 153 and 180 in foods of animal origin: 0.02 – 2 mg/kg fat (for fist mg/kg wet weight) |
| United Kingdom | Guideline for cows milk : 0.06 ng WHO-TEG/kg whole milk (16.6ng WHO-TEG/kg fat) (IMPORTANT NOTE: WHO-TEG for dioxins and PCBs together) | |

제 언

- 다이옥신의 식품모니터링 방법이 매우 다양하여 결과 비교시 세심한 주의가 요구됨
- 연속된 모니터링 수행으로 대표성 있는 자료의 확보가 요구됨
- 국제적 변화에 상응하는 식품규격 등 관리방안 및 다이옥신 인체노출패턴 차이 등을 고려한 위해성평가 관리 기술개발이 요구됨