

## Cadmium mimics the in vivo effects of estrogen in the uterus and mammary gland

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### 서론

난소에서 생성되는 estradiol은 자궁내막세포를 증식시키고 비대하게 만든다. 또한 유선조직의 성장, 발달을 촉진시킨다. 다이옥신, Bisphenol A 등의 화학물질은 대표적인 환경호르몬(endocrine disruptor)으로서 생식내분비계에 영향을 미친다고 알려져 있다. 하지만 최근 카드뮴 등의 중금속들도 저농도에서 배분비계를 교란시킨다는 보고들이 있었으며, 이 연구에서는 카드뮴이 estradiol의 표적기관이 자궁과 유선조직에 어떠한 영향을 주는가를 살펴보았다.

### 연구방법

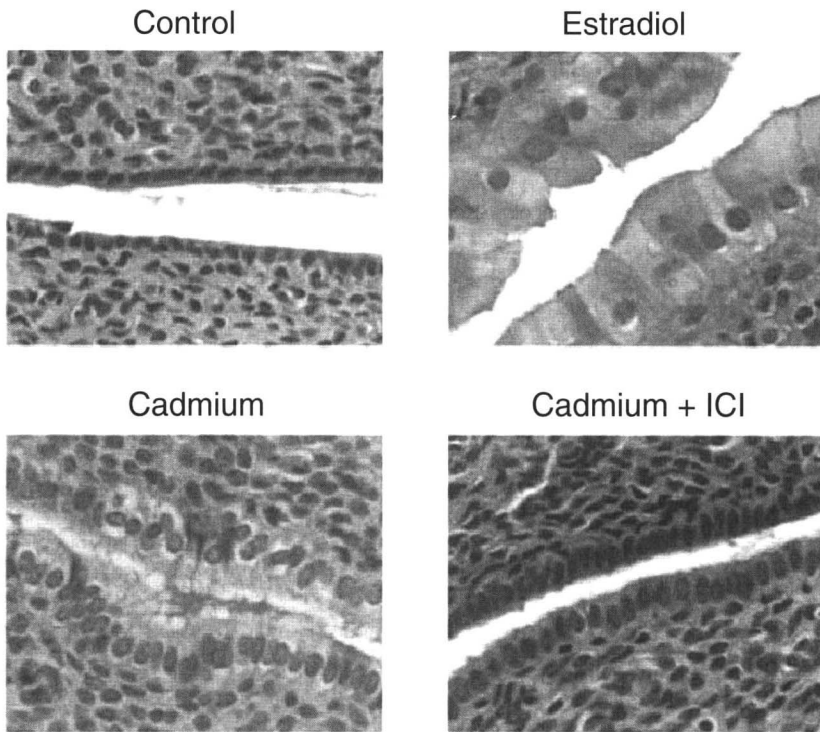
쥐의 복강에 cadmium을 일회 5  $\mu\text{g}/\text{kg}/\text{body weight}$  주사한 후 4일, 14일에 자궁조직과 유선조직의 변화를 살펴보았다. 그리고 에스트로겐의 효과를 차단하는 물질인 ICI-182, 780을 복강으로 500  $\mu\text{g}/\text{kg}/\text{d}$ 로 주사하여 에스트로겐에 의한 반응이 차단되는가를 살펴보았다. 대조군은 estradiol을 60  $\mu\text{g}/\text{kg}/\text{d}$ 로 방출하는 펠렛을 단독으로 투여하였다.

### 결론 및 고찰

estradiol과 카드뮴을 각각 투여한 후에 자궁조직과 유선조직이 증식하였다. 하지만 ICI를 함께 투여했을 때에는 둘 다에서 효과가 나타나지 않았다.

### 결과

동물 실험에서 독성, 발암성을 나타내는 용량은 1-5 mg/kg(5-25  $\mu\text{mol}/\text{kg}$ )이다. 하지만 이 연구에서는 위의 1/1000 용량을 사용하였고 이는 WHO-recommended Provisional Tolerable Intake(7  $\mu\text{g}/\text{kg}/\text{week}$ )와 비슷한 용량이다. 따라서 카드뮴은 저농도 노출에서 내분기 교란 물질로 작용할 수 있을 것이라 예상된다.



**Table 1** Effects of cadmium on uterine wet weight and mammary gland density in ovariectomized animals

	Uterine weight (day 4)		Mammary gland density		Body weight Grams
	Grams	Fold increase	Day 4	Day 14	
Control	0.075 ( $\pm 0.0069$ ; $n = 17$ )	—	54.3 ( $\pm 2.5$ ; $n = 17$ )	75.4 ( $\pm 1.9$ ; $n = 9$ )	187 ( $n = 9$ )
Cadmium	0.14* ( $\pm 0.0111$ ; $n = 21$ )	1.9	82.8*** ( $\pm 4.0$ ; $n = 20$ )	99.8*** ( $\pm 2.9$ ; $n = 14$ )	189 ( $n = 12$ )
ICI-182,780	0.048 ( $\pm 0.0027$ ; $n = 13$ )	0.64	69.7 ( $\pm 3.7$ ; $n = 8$ )	72.7 ( $\pm 2.2$ ; $n = 8$ )	182 ( $n = 10$ )
Cadmium + ICI-182,780	0.046 ( $\pm 0.0035$ ; $n = 11$ )	0.61	69.0 ( $\pm 5.4$ ; $n = 8$ )	72.2 ( $\pm 2.8$ ; $n = 8$ )	182 ( $n = 8$ )
Estradiol	0.284** ( $\pm 0.0168$ ; $n = 22$ )	3.8	84.1*** ( $\pm 3.2$ ; $n = 20$ )	112.6*** ( $\pm 6.9$ ; $n = 11$ )	172 ( $n = 10$ )

Uterine wet weight and mammary gland density in ovariectomized rats treated with cadmium, estradiol or ICI-182,780. Uterine wet weights and epithelial density (arbitrary units) are shown as mean  $\pm$  s.e.m. \*,  $P = 0.0001$  compared with control; \*\*,  $P < 0.0001$  compared with control. Epithelial density data were analyzed by one-way ANOVA ( $F_{(4,58)} = 12.41$ ,  $P < 0.001$  for day 4;  $F_{(4,46)} = 20.73$ ,  $P < 0.001$  for day 14). \*\*\*,  $P < 0.05$  (significantly different from controls).

## 목록

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