Change of growth pattern and bone mineral density in ovariectomized female rats according to estrogen dosage

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OBJECTIVES

To know the optimal dosage of estrogen to promote pubertal growth spurt without significant decrease of bone mineral density or epiphyseal plate thickness

METHODS

Subject

Fifteen 4-week-old female wild-type *Sprague Dawley rats* (SD rat) were ovariectomized

Three groups were randomly divided according to injected dosage of estrogen

1. **Group 1 as a control** (N=5)
   sesame oil
2. **Group 2 as a high dose** (N=5)
   100㎍/kg/week of estradiol depo
3. **Group 3 as a super-high dose** (N=5)
   200㎍/kg/week of estradiol depo

For 10 weeks (week 10 - 19)
Subcutaneous injection on posterior neck area

Experiment

1. **Anthropometric check**
   Crown-rump length, body weight check weekly

2. **Laboratory check**
   serum GH level, serum estradiol level using ELISA

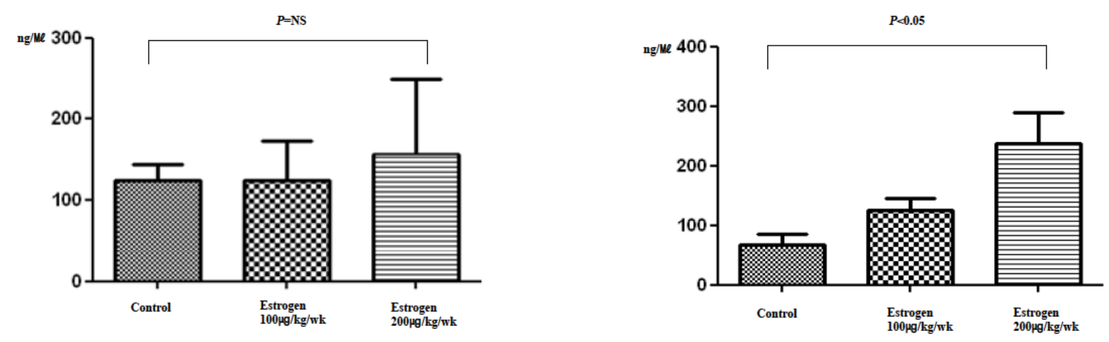
3. **Bone mineral densities were evaluated with DXA**
   (lunar PIXmus2 densitometer)

4. **Pituitary RNA extraction**
   Quantitative RT-PCR for *Gh1*

Oligonucleotide name	Primer sequence		Fragment size (bp)	Temperature (℃)
	Sense primer (forward, 5'-3')	Antisense primer (reverse, 3'-5')		
Gh1	ctt cgc ttc tcg ctg ct	gat gcc ctc ttc cag gtc	135	53.5
gapdh	cta ctg gcg tct tca cca c	gtt cac acc cat cac aaa ca	116	52

5. **Dissection of proximal tibia**
   HE staining
   Thickness of epiphyseal plate including proliferative zone and hypertrophic zone were checked (20 equally divided site)

Fig.2 Comparison of serum GH levels before and after injections



There were no significant differences in serum estradiol levels among three groups before treatment (The data was not shown here)

Fig.3 Comparison of total BMD before and after injections

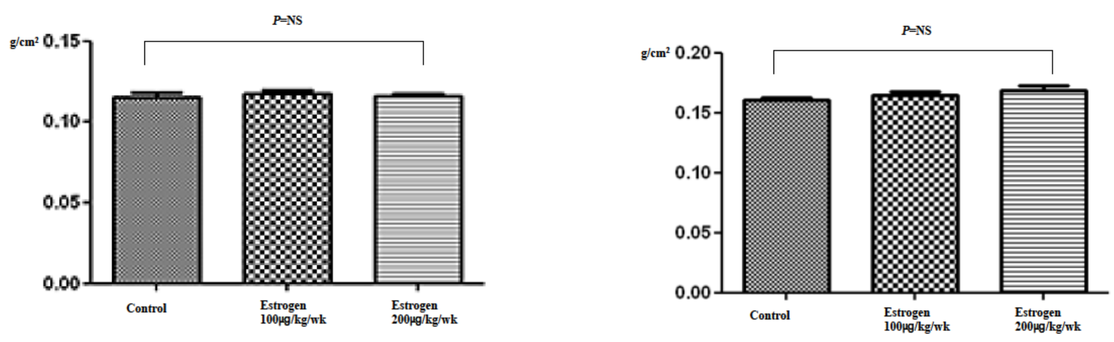


Fig.4 Comparison of pituitary *Gh1* expression level after injections

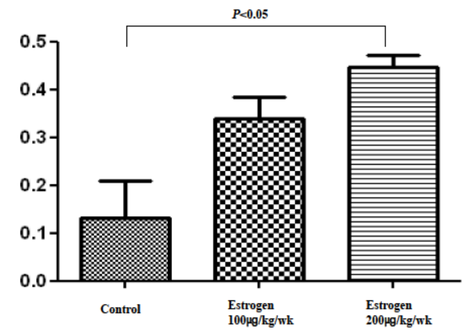
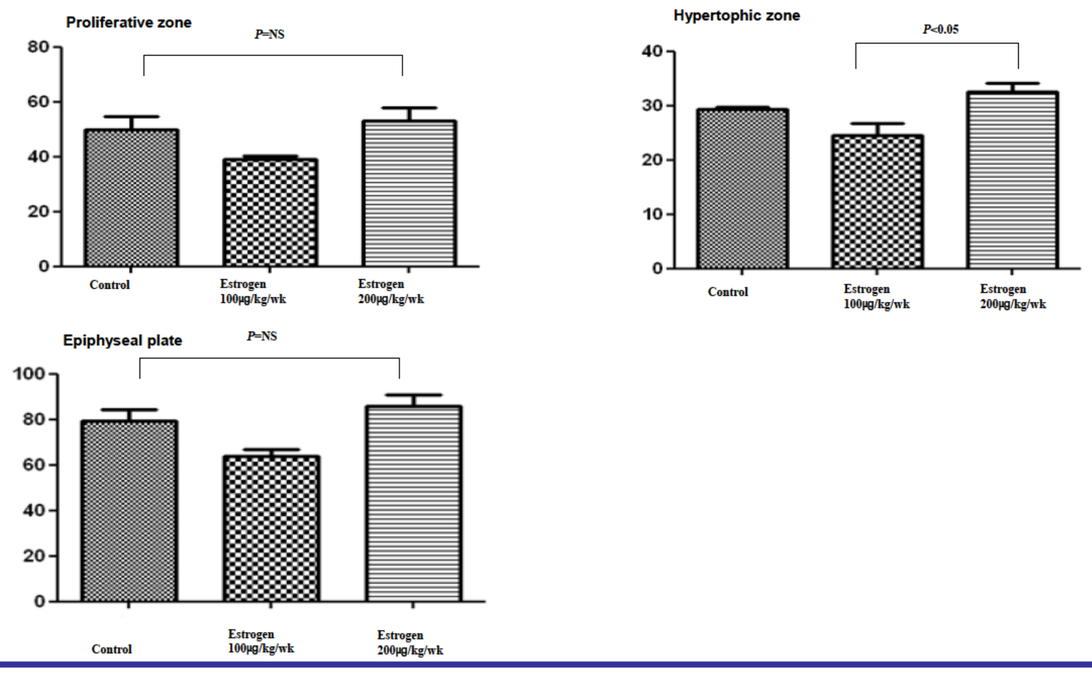
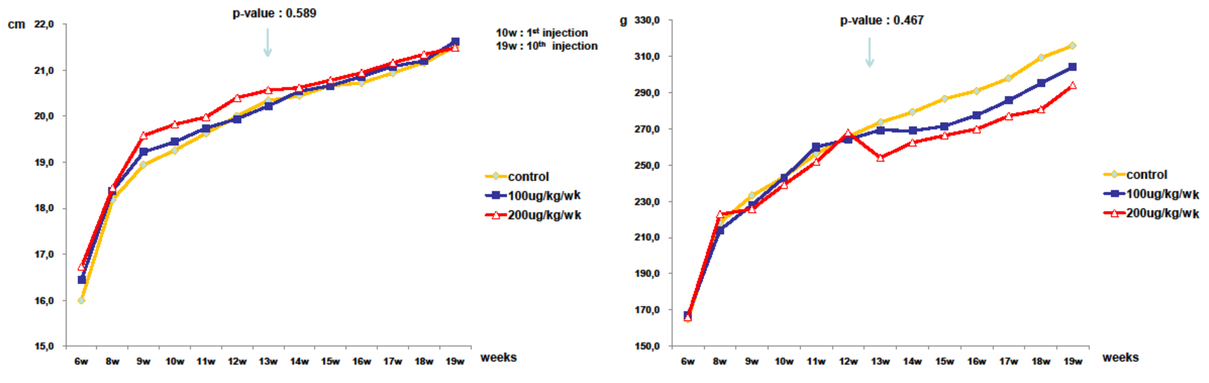


Fig.5 Comparison of the thickness of epiphyseal plate after injections



RESULTS

Fig.1 Comparison of changes of body length and body weight before and after injections



CONCLUSIONS

GH secretion and Gh1 gene expression were increased after super-high dose estrogen treatment.

There were tendencies that body weight had negative and bone mineral density had positive relation with estrogen dosage, but with no significant differences.

The thickness of hypertrophic zone in epiphyseal plate was relatively increased after super-high-dose estrogen treatment.

The effects of estrogen on epiphyseal plate in rodents may be different with human

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