In-vivo bovine model to examine the long-lasting effects of acute DEHP exposure on ovarian function

R. Hadas[1], Y. Maor[2] and D. Kalo[1,2] Z. Roth[1,2]

[1]Department of Animal Science, Robert H. Smith Faculty of Agriculture, Food and Environment, The Hebrew University of Jerusalem; [2]Center of Excellence in Agriculture and Environmental Health, Rehovot 76100, Israel

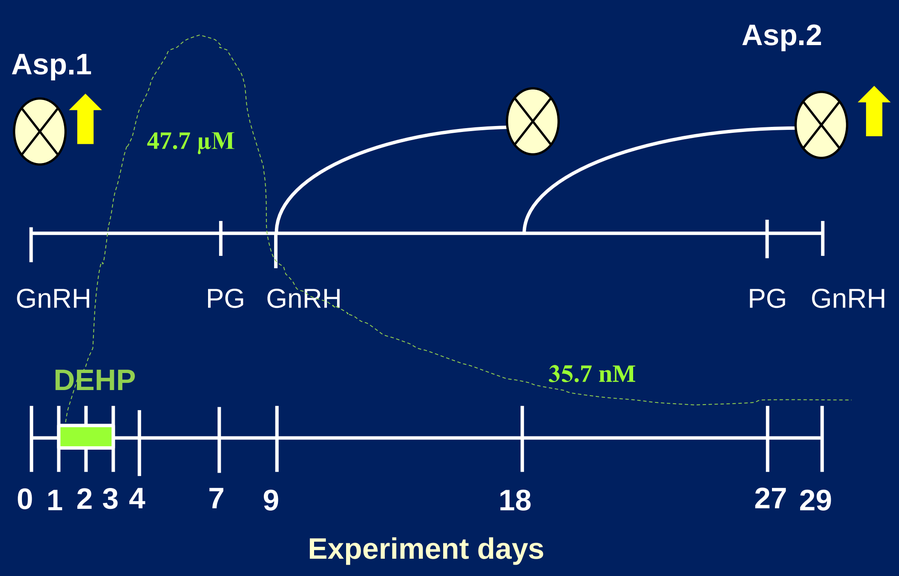
Background

- Di(2-ethylhexyl) phthalate (DEHP) is a commonly used plasticizer that is widely dispersed throughout agricultural environments. Thus, domestic animals are at potentially constant risk of exposure.
- DEHP and its metabolites have been shown to have adverse effects on ovarian function in laboratory animals. However, their effects on domestic animals are less known.

Objective

- To examine the effect of DEHP on ovarian function: follicular, and corpus luteum (CL) dynamics and steroidogenesis, in lactating cows.

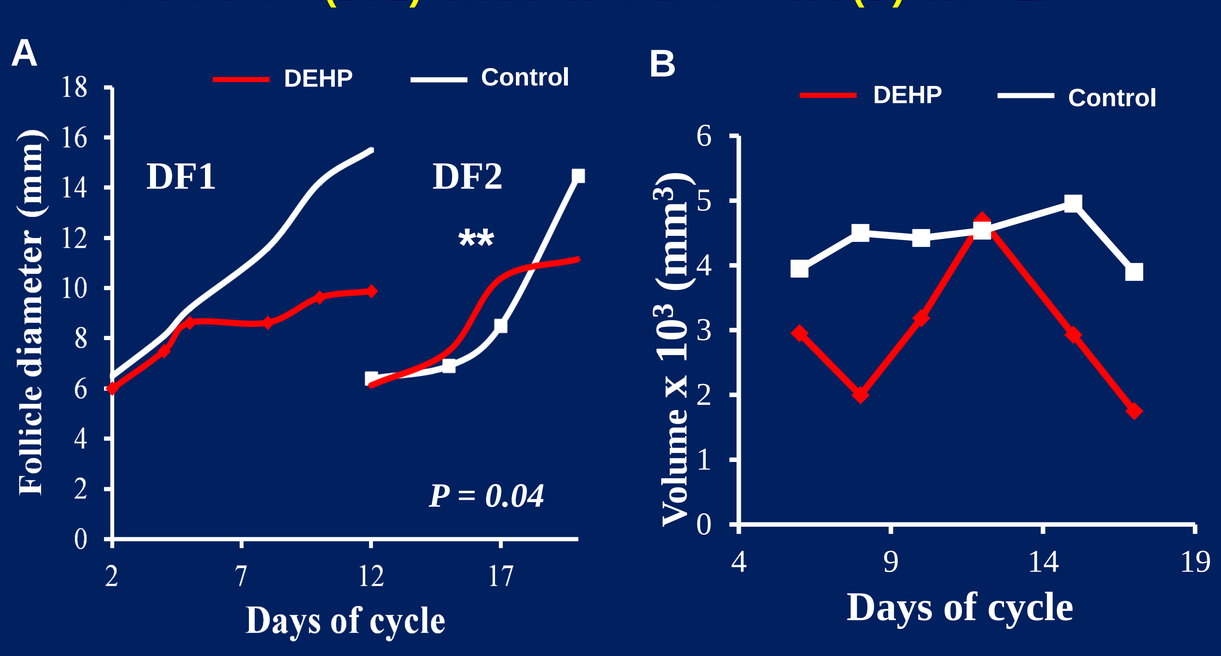
Experimental design



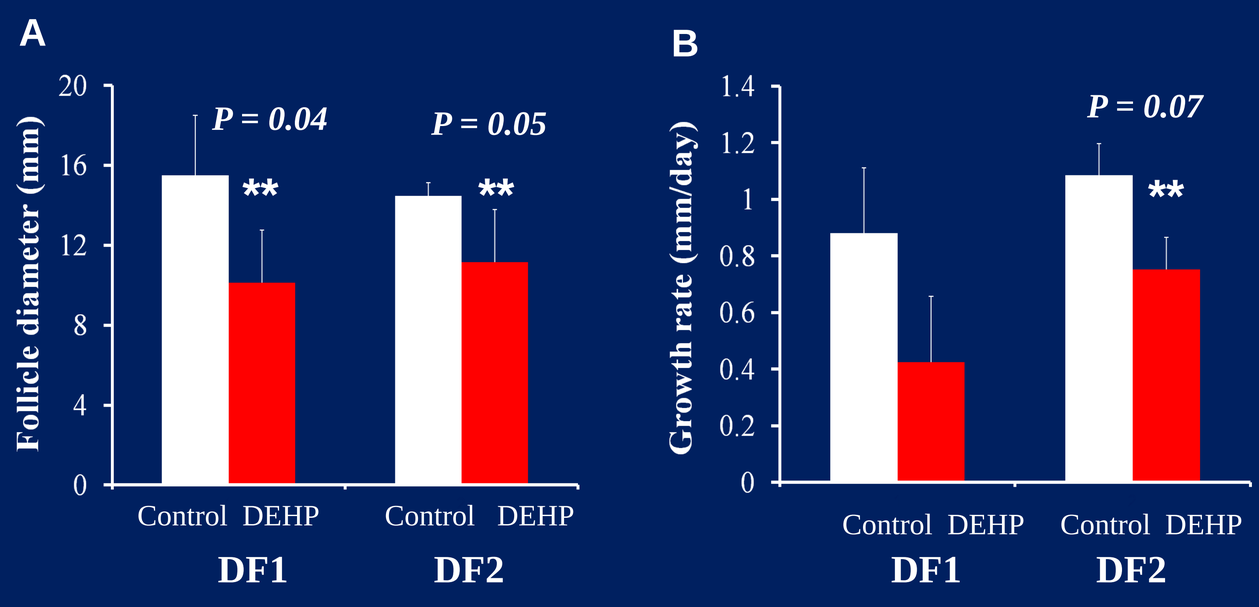
- Holstein cows were synchronized and tube-fed with DEHP (100 mg/kg per day; n=4) or water (n=5) for 3 days.
- Urine and plasma samples were collected before (day 0), during (days 2, 4) and after (days 11, 19, 24) treatment.
- Samples were pooled and analyzed to determine DEHP metabolite concentrations (data not shown).
- Cows were resynchronized and monitored by ultrasonography scanner (Aloka SSD-900, 7.5 MHz).
- Follicular fluids of the preovulatory follicles were aspirated with an ultrasonic scanner connected to a vaginal sector transducer (PieMedical, 7.5 MHz)..
- Follicular fluid estradiol concentration was determined by RIA kit (DSL-4800, Diagnostic Systems Laboratories Inc., Webster, TX, USA).
- Statistical variance was tested by one-way ANOVA. The level of significance was set to $P < 0.05$.

Results

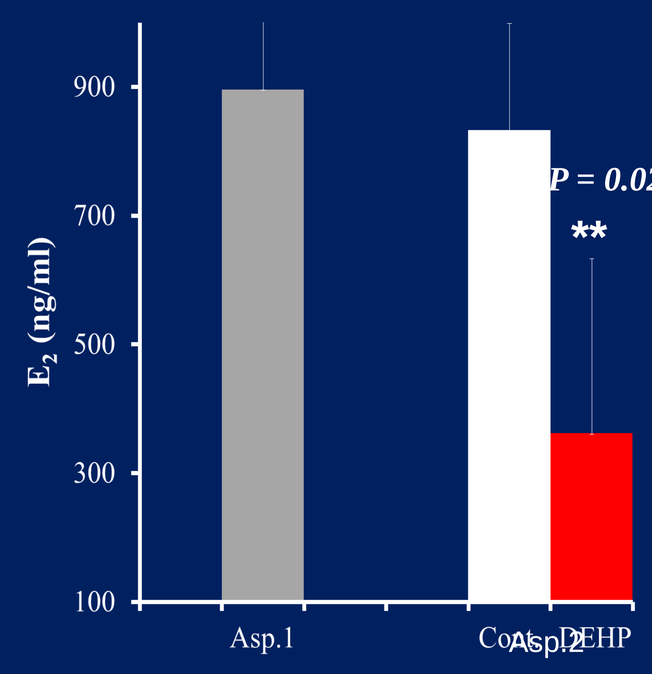
- **DEHP impairs developmental dynamics of (A) first-wave (DF1) and second-wave (DF2) dominant follicles and (B) the CL.**



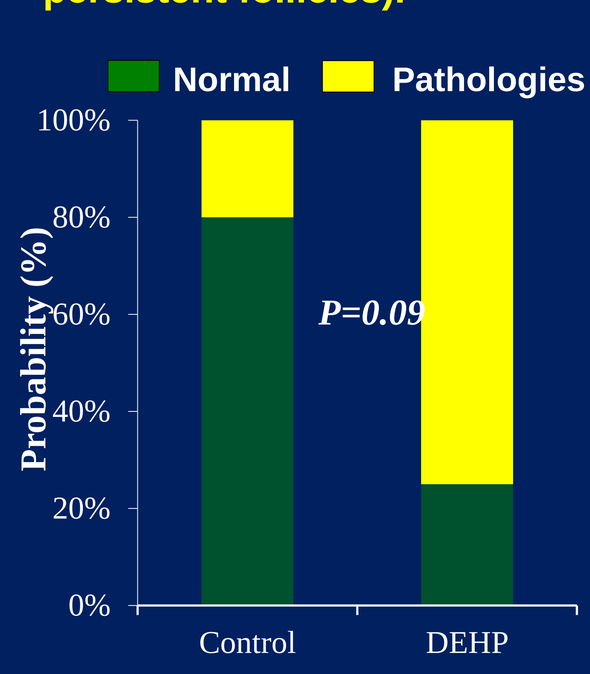
- **DEHP decreases (A) diameter and (B) growth rate of first-wave (DF1) and second-wave (DF2) dominant follicles.**



- **DEHP decreases estradiol (E_2) concentration in preovulatory follicular fluid.**



- **DEHP tends to increase the formation of ovarian pathologies (i.e. cysts, persistent follicles).**



Summary

- **The findings demonstrate the potential risk associated with exposure to DEHP via feeding.**
- **DEHP impaired developmental dynamics of the dominant and preovulatory follicles, as well as the CL.**
- **Such alterations might explain, in part, formation of ovarian pathologies and reduced fertility in dairy cows.**