

sera. It is concluded that PHAR is a simple and sensitive method for screening of auto-antibodies in human sera, and that presence of auto-antibodies is evidently confirmed in sera of infertile patients.

### 332. Analysis of the Blocking Effect of Antibodies to Zona Pellucida on Fertilization by Using Monoclonal Antibody

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It was elucidated that antibodies to zona pellucida (ZP) had a strong inhibitory effect on fertilization in vivo and in vitro. However, the inhibitory mechanism was not completely understood because of the heterogeneity of the conventional antibodies used for experiments. In the present study, monoclonal antibodies (Moabs) were produced to ZP antigens and their effect on fertilization was studied in vitro.

Five hybridomas which produced Moabs to pig ZP were established. Of these, 4 Moabs cross-reacted to ZP of hamster oocytes. In in vitro fertilization test in hamster, a conventional antiserum to pig ZP blocked the sperm binding to ZP with immunoprecipitin formation on the surface of ZP. However, no Moab could block the sperm penetration in hamster oocytes by each or a combination of Moab. When Moab-treated oocytes were further treated with anti-mouse  $\gamma$ -globulin serum, one of the interspecies cross-reactive Moab showed a strong inhibitory effect on sperm penetration with precipitin formation around the oocytes.

From these results, we concluded that the blocking effect on fertilization of antibodies to interspecies cross-reactive antigens of ZP was not due to antibody binding to the sperm receptors on ZP but due to steric hindrance on the sperm binding site by a cross-linked lattice formation around ZP.

### 333. Analysis of Energy Metabolism in the Human Endometrium

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Morphological changes occur in the endometrium by the effect of estrogen and progesterone during the menstrual cycle. We studied the biochemical properties of changes as the site of implantation analyzing thier energy metabolism.

Samples were obtained by endometrial curettage from 54 women with normal cycles. Activities (nmol/mg of protein/min) of four energy-yielding enzymes, hexokinase (KH), glucose 6-P dehydrogenase (G6PDH), malate dehydrogenase (MDH) and lactate dehydrogenase (LDH). Tissue contents (nmol/mg of protein) of glucose and glucose 6-P (G6P) were measured by fluorometry. Part of the samples were examined morphologically and the endometrial dating was done. Serum concentration of estradiol 17- $\beta$  (E) and progesterone (P) were determined by RIA.

Activity of HK increased from  $8.65 \pm 1.33$  at the early proliferative phase to  $18.2 \pm 1.21$  at the late secretory phase. The difference was significant ( $P < 0.01$ ) and the activity was correlated with P. Activity of G6PDH, key enzyme of pentose shunt, was correlated with E ( $P < 0.01$ ) and increased at the time of ovulation. Activities of MDH and LDH showed the similar pattern to that of HK. Glucose and G6P contents were  $8.48 \pm 0.89$ ,  $1.21 \pm 0.33$  respectively at the proliferative phase. They showed remarkable increase (3-fold for glucose and 10-fold for G6P) at the secretory phase. These results show that the energy metabolism in the endometrium is controlled by ovarian steroid hormones through the regulation of the substrate supply and the rate-limiting enzyme activities and is most activated around the time of implantation.

### 334. The Influence of LH-RH Analog on the Pregnant Myometrium

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While conducting studies on induction of ovulation with LH-RH analog, we found that the LH-RH analog was effective in inhibiting the gonadal function. So, we studied the possible use of the analog in the termination of early pregnancy. As trial agent, we