

Regulation of Oocyte Maturation

The Role of cAMP^a

NAVA DEKEL

*Department of Hormone Research
The Weizmann Institute of Science
Rehovot 76100, Israel*

INTRODUCTION

It is very well established that luteinizing hormone (LH) elicits ovarian functions by elevation of cAMP concentrations. However, the available data related to the possible involvement of cAMP in regulation of oocyte maturation are controversial, since they provide evidence for both inhibitory and stimulatory actions of the nucleotide. Tsafiriri *et al.*¹ have reported that injection of a cAMP derivative into isolated rat follicles could mimic the effect of LH and induce oocyte maturation. In a later study, however, the presence of the cyclic nucleotide phosphodiesterase inhibitor, theophylline, was found to antagonize LH action on follicle-enclosed oocytes.² Moreover, other studies demonstrated that either membrane-permeable derivatives of cAMP or cyclic nucleotide phosphodiesterase inhibitors completely block the spontaneous maturation *in vitro* of isolated oocytes³⁻⁵ as well as LH-induced maturation of follicle-enclosed oocytes.^{6,7} These later reports demonstrate, however, that it is only the continuous presence of cAMP modulators that blocks LH-induced oocyte maturation, while a transient exposure to elevated levels of the nucleotide will, by itself, induce meiosis resumption. Is cAMP an inducer or an inhibitor of oocyte maturation? Considering that *in vivo*, following the preovulatory LH surge, both oocyte maturation and cAMP elevation are concomitantly stimulated, this question becomes even more relevant.

cAMP AS A MEDIATOR OF LH ACTION

To study the possible role of cAMP as a mediator of LH in the induction of oocyte maturation, we exposed follicle-enclosed rat oocytes to forskolin, which interacts with the catalytic subunit of the adenylate cyclase to stimulate cAMP generation.⁸ In this study⁹ we found that forskolin is a potent inducer of oocyte maturation. Induction of oocyte maturation by forskolin was associated with elevation of cAMP concentrations in the follicle and was potentiated by a phosphodiesterase inhibitor.¹⁰ We sug-

^aThese studies were supported by a grant from the Israel Academy of Sciences and Humanities.

