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Serum- and glucocorticoid-regulated kinase (SGK) regulates meiotic resumption in ovarian starfish oocytes via intracellular pH-increase and cyclin B–Cdk1 activation

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Short summary

Tight regulation of intracellular pH (pH_i) is essential for biological processes. Fully-grown oocytes, having a large nucleus called the germinal vesicle, arrest at meiotic prophase-I. Upon hormonal stimulus, oocytes resume meiosis to become fertilizable. At this time, the pH_i increases via Na^+/H^+ exchanger activity, although the regulation and function of this change remain obscure. Here, we show that in starfish oocytes, serum- and glucocorticoid-regulated kinase (SGK) is activated via PI3K/TORC2/PDK1 signaling after hormonal stimulus and that SGK is required for this pH_i increase and cyclin B–Cdk1 activation. When we clamped the pH_i at 6.7, corresponding to the pH_i of unstimulated ovarian oocytes, hormonal stimulation induced cyclin B–Cdk1 activation; thereafter, oocytes failed in actin-dependent chromosome transport and spindle assembly after germinal vesicle breakdown. Thus, this SGK-dependent pH_i increase is likely a prerequisite for these events in ovarian oocytes. We propose a model that SGK drives meiotic resumption via concomitant regulation of the pH_i and cell cycle machinery.