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Searching for a link between the cell cycle machinery and cell polarity during *in vitro* zygotic embryogenesis of wheat (*Triticum aestivum*, l)

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During development, cell division cycle, differentiation and morphogenesis must be finely balanced. Altering cell cycle progression appears to have dramatic effects on morphogenesis in unicellular organisms and early embryos and in developing organs with predefined patterns. The possibility that the cell cycle may exert a control on morphogenesis during early embryogenesis in plants is suggested by three lines of evidence: (1) organ size and shape is severely affected in many tobacco seedlings expressing cdc2aN147 and the mutants produce only a few viable seeds; (2) in Arabidopsis plants expressing cdc2aN147 under the control of the constitutive CaMV 35S promoter, embryo development appears to be particularly affected and (3) when cdc2aN147 is expressed under the control of the seed storage albumin promoter which drives specific expression during late embryo development, either germination is abolished or cotyledons and root development are absent or completely abnormal.

However, little is known on the interactions between cell cycle and morphogenesis during early embryogenesis, because in land plants, most cell cycle mutants are not viable and zygotes are not amenable to direct manipulation. Zygotes of angiosperm species are well suited to study the relationships between the cell cycle and morphogenesis, as cellular differentiation and cell division are closely linked because precise spatial and temporal control of cell is required for the normal cell cleavage of the zygote. Recent discoveries have revealed that all eukaryotic organisms share a common mechanism for the regulation of cell division. A central component of this regulatory mechanism is a 34-kD protein encoded by the cell division cycle gene cdc2. The p34cdc2 protein is a serine/threonine protein kinase that, in association with other proteins, mediates cell division and DNA replication. Through the phosphorylation of specific substrates, p34cdc2 kinase mediates events such as chromosome condensation, nuclear envelope breakdown, and spindle formation.

Based on our experimental result that specifically inhibiting CDKs with purine derivatives, such as olomoucine, prevented the early expression of normal morphogenesis in wheat zygotes we report on a putative link between the cell cycle control and the establishment of polarity in wheat zygotes. Our hypothesis is corroborated by our finding that the p34cdc2 protein seemed to localize with the preprophase band (PPB) hinting at the involvement of p34cdc2 in the imprinting of the plane of cell division. In order to maintain the apical-basal polarity in the angiosperm egg/zygote that is oriented relative to maternal structures suggesting that maternal information could play an important role in zygotic embryogenesis, we employed a "re-implantation" technique elaborated in our laboratory that allowed for in situ development of the fusion products thus facilitating the contact of the developing zygote with the maternal tissue. Further, recent findings on the issue of egg cell activation of isolated and in vitro fertilised wheat egg cells will be presented.

Biography

Zsolt Pónya has completed his PhD at the age of 32 years from the Eötvös Lóránd University of Arts and Sciences, Budapest, Hungary and following obtaining his degree, he has launched his postdoctoral studies at the University of Siena, Italy, followed by a postdoc research fellowship at the Ben-Gurion University of the Negev, Israel. He is currently a senior scientist at the University of Kaposvár, Hungary. He has published a number of papers in reputed international journals and is a member of the editorial board of several prestigious scientific journals.

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