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Multiple Cdk1 Inhibitory Kinases Regulate the Cell Cycle during Development

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Abstract

The Wee kinases block entry into mitosis by phosphorylating and inhibiting the activity of the mitotic cyclin-dependent kinase, Cdk1. We have found that the various *Xenopus* Wee kinases have unique temporal and spatial patterns of expression during development. In addition, we have isolated and characterized a new Wee1-like kinase, *Xenopus* Wee2. By both *in vivo* and *in vitro* tests, *Xenopus* Wee2 functions as a Wee1-like kinase. The previously isolated Wee1-like kinase, *Xenopus* Wee1, is expressed only as maternal gene product. In contrast, *Xenopus* Wee2 is predominantly a zygotic gene product, while the third Wee kinase, *Xenopus* Myt1, is both a maternal and zygotic gene product. Concurrent with the changing levels of these Cdk inhibitory kinases, the pattern of embryonic cell division becomes asynchronous and spatially restricted in the *Xenopus* embryo. Interestingly, once zygotic transcription begins, *Xenopus* Wee2 is expressed in regions of the embryo that are devoid of mitotic cells, such as the involuting mesoderm. In contrast, *Xenopus* Myt1 is expressed in regions of the embryo that have high levels of proliferation, such as the developing neural tissues. The existence of multiple Wee kinases may help explain how distinct patterns of cell division arise and are regulated during development.

Keywords

Wee1; Myt1; Wee2; Cdc2; gastrulation; cell cycle; *Xenopus*; cell division; morphogenesis; embryogenesis

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