

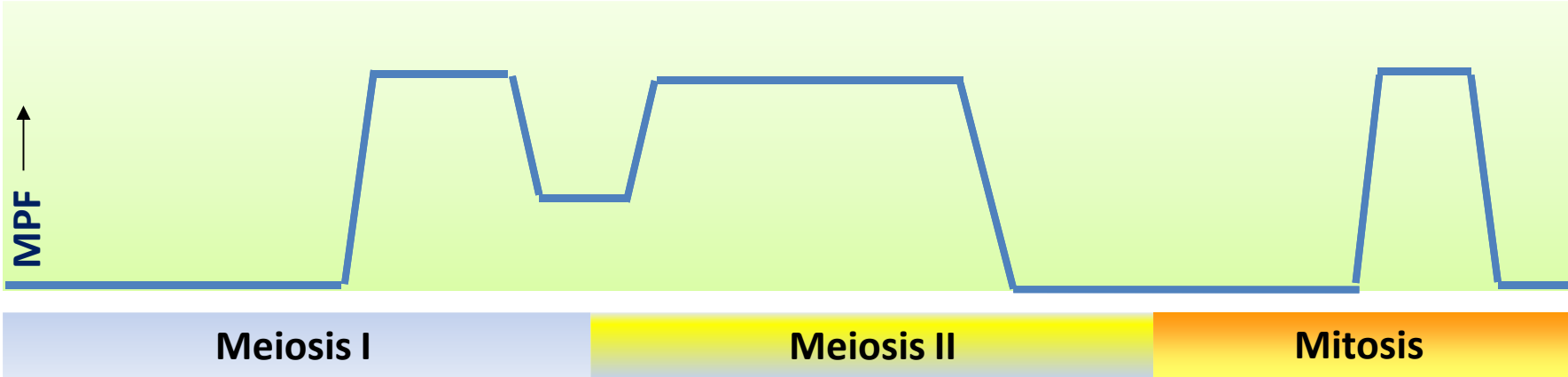
New insight into the regulation of cell cycle in mouse oocytes

한국발생생물학회

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오정수

Control of cell cycle in mouse oocytes

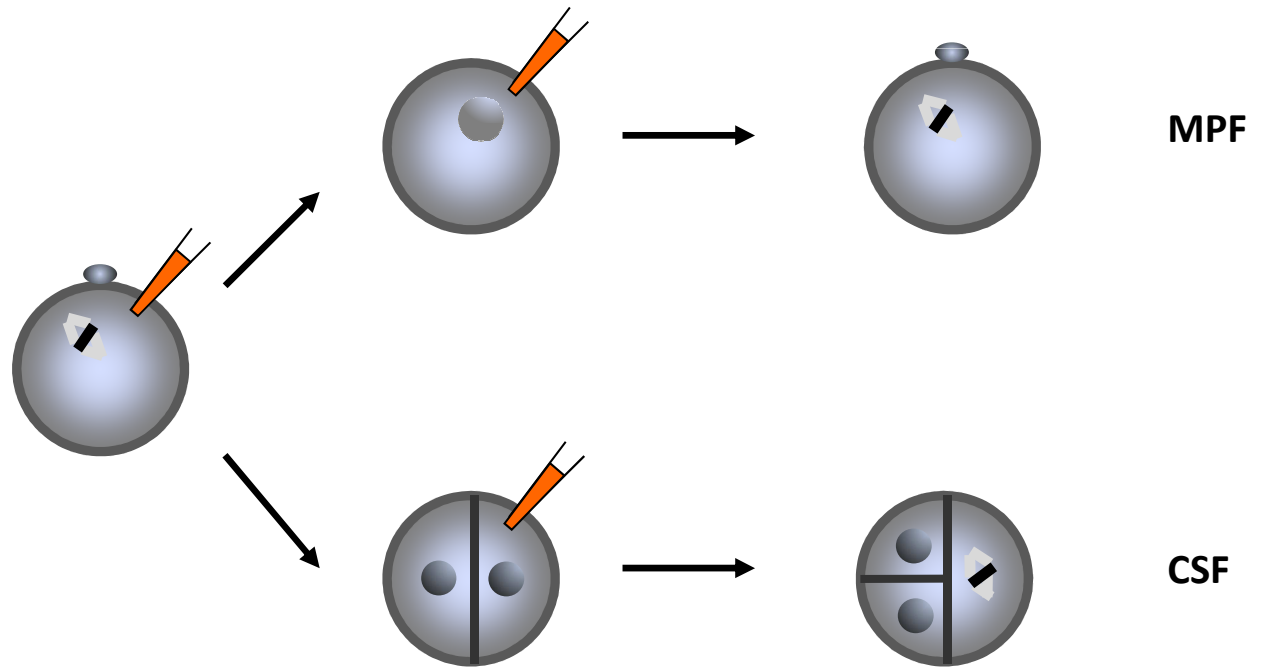
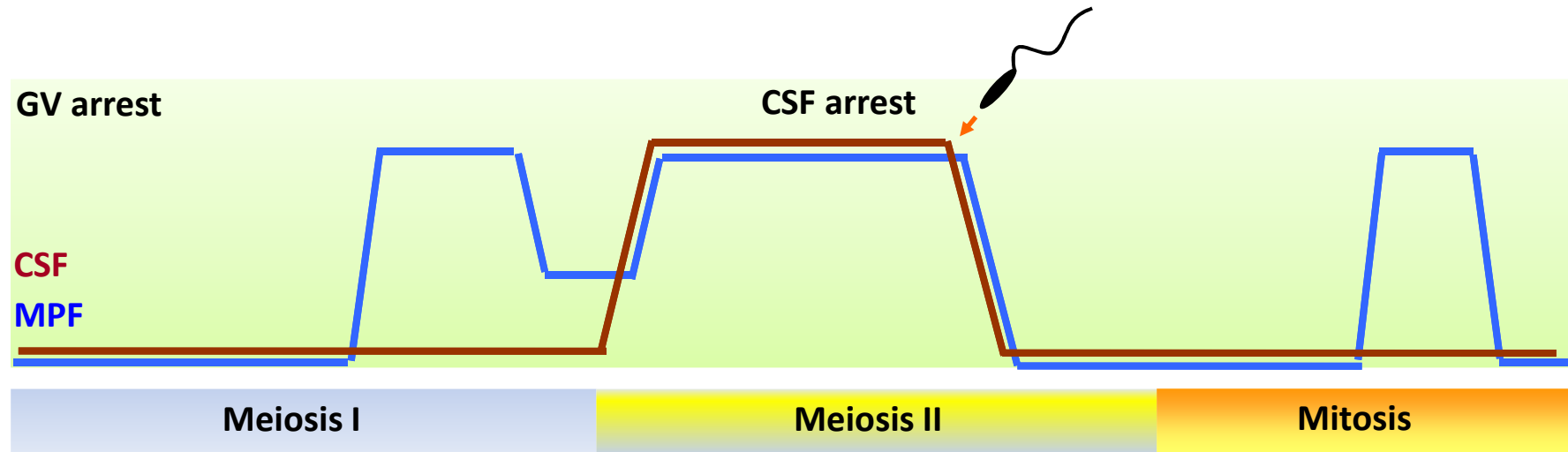


Prophase I

Metaphase II



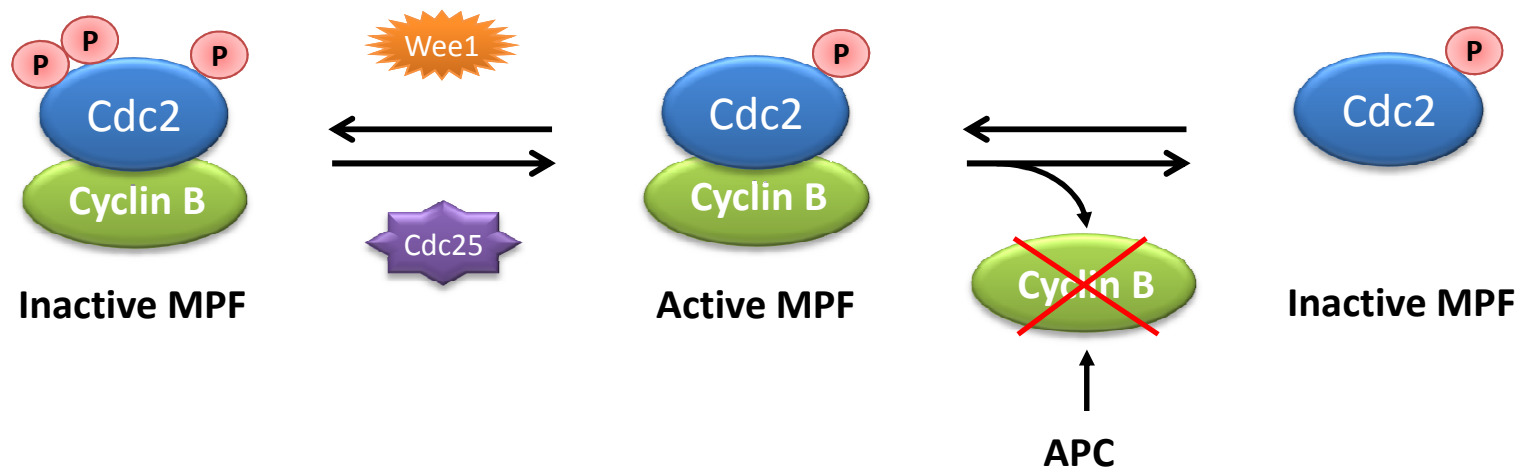
MPF (maturation-promoting factor) and CSF (cytostatic factor)



<Masui and Markert, 1971>

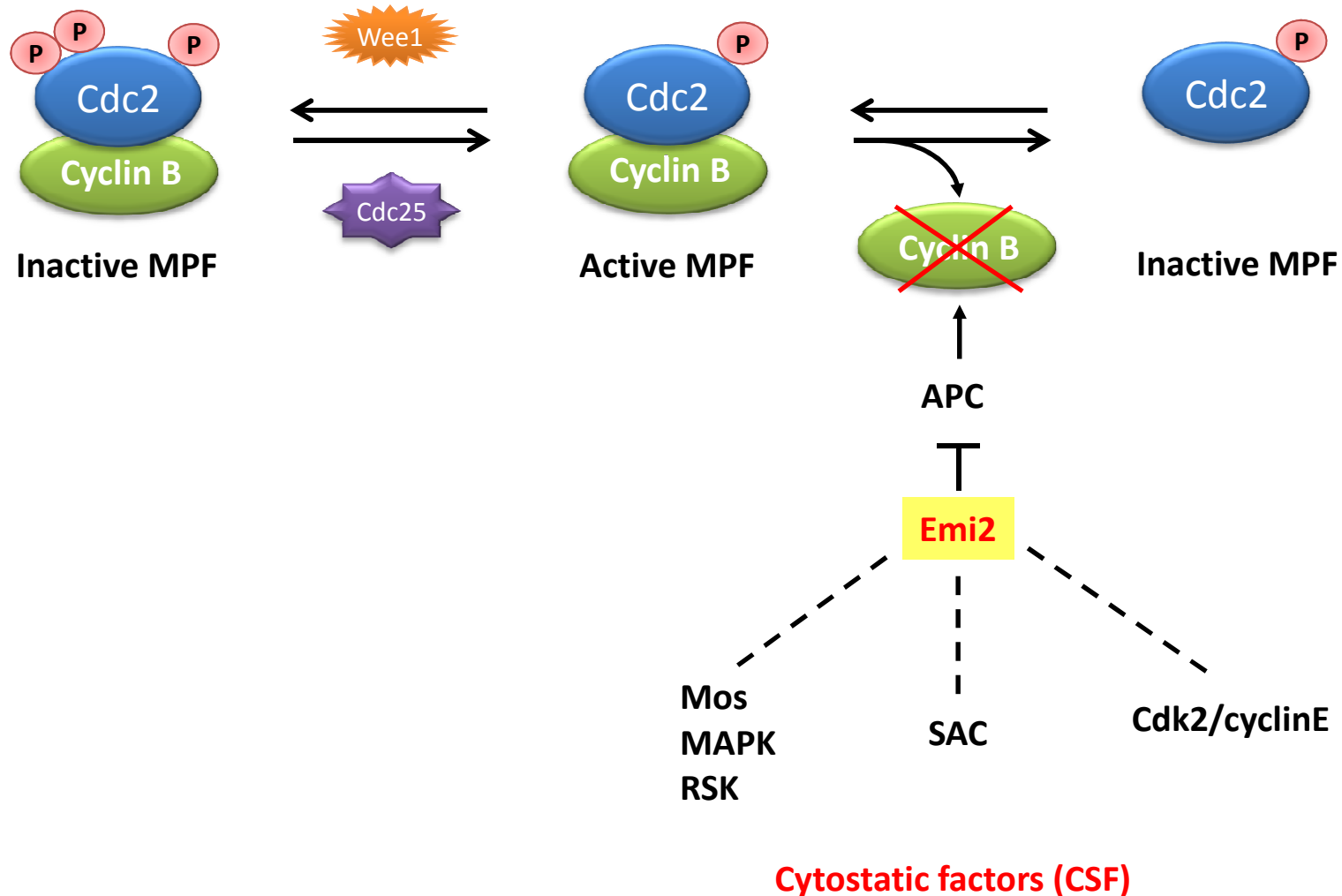
Control of cell cycle : Regulation of MPF and CSF activity

- MPF is a heterodimer of Cdc2 and cyclin B.
- Regulation of MPF activity
 1. The activity of MPF is mainly regulated by **phosphorylation of Cdc2**, which is mediated by Wee1 kinases and Cdc25 phosphatases.
 2. The activity of MPF is dependent on **cyclin B degradation** through APC activation.

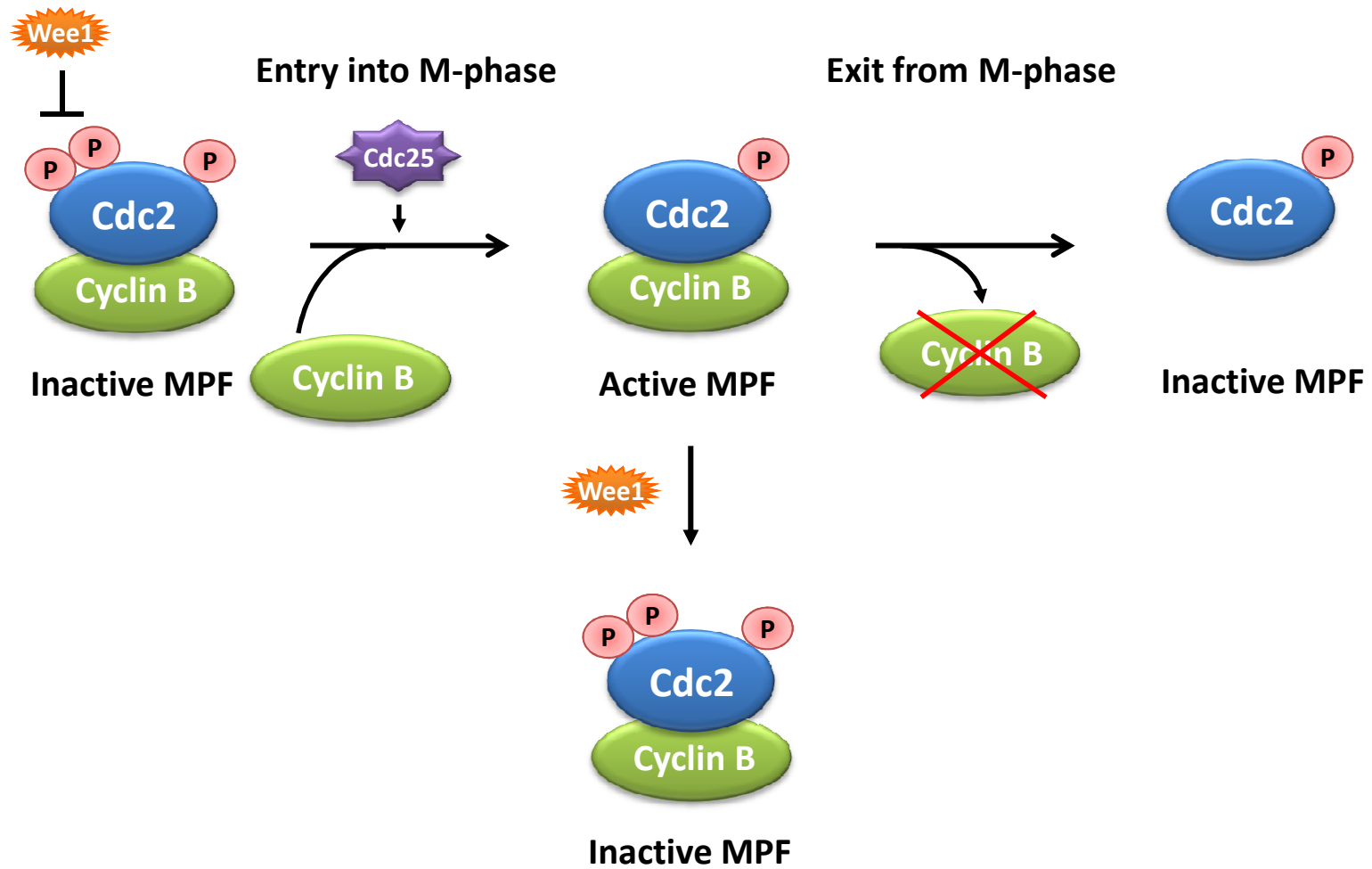


Control of cell cycle : Regulation of MPF and CSF activity

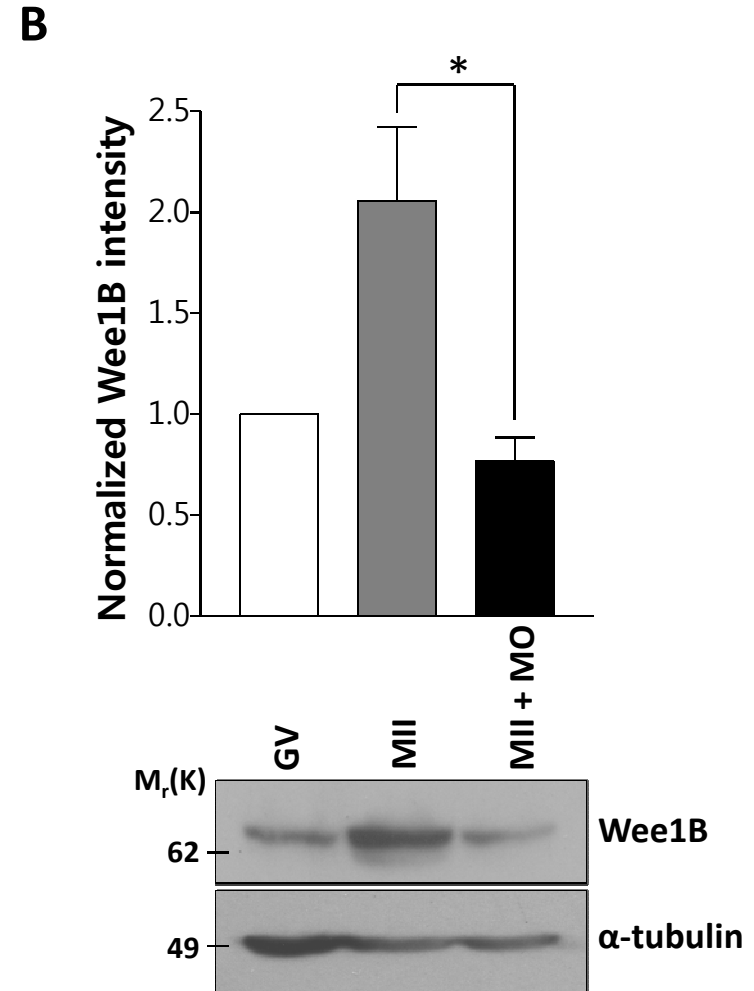
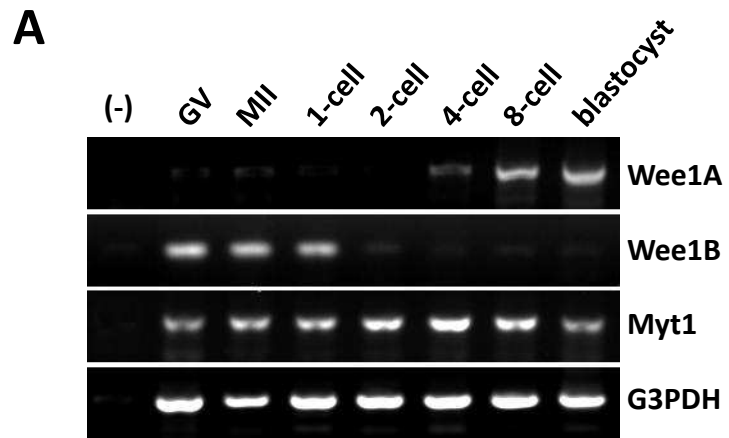
- CSF is less defined : Mos, Spindle assembly checkpoint (SAC) proteins, Cdk2/cyclin E or **Emi2**.



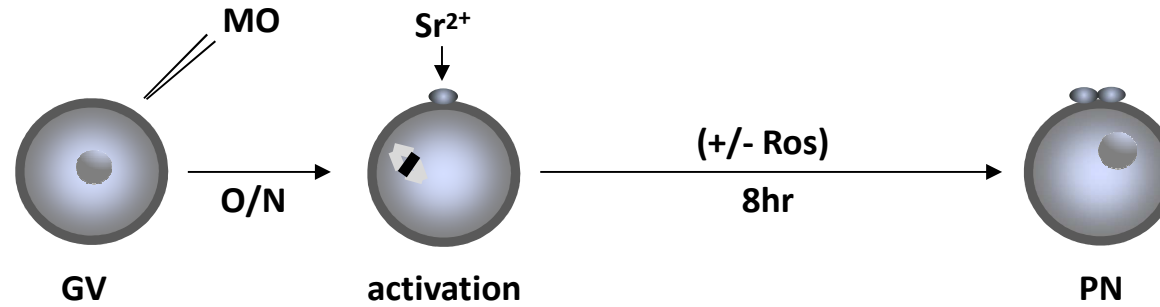
Current model for regulation of MPF activity



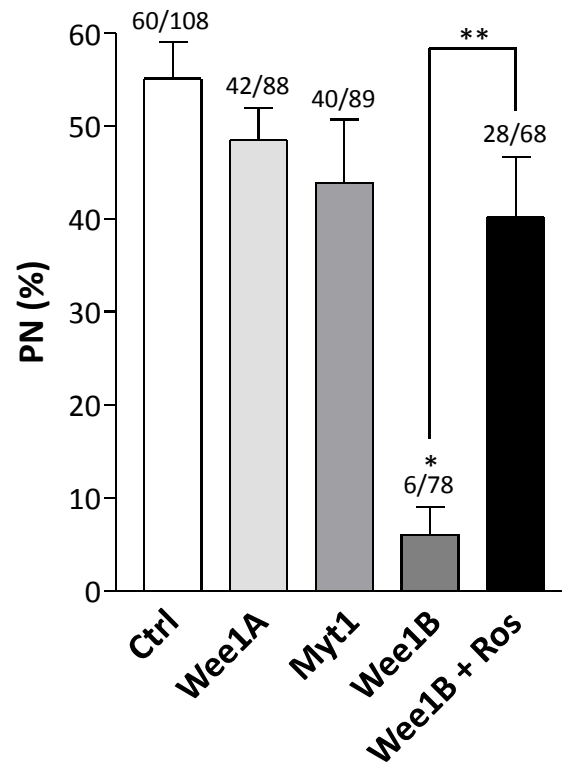
Expression of Wee1B during oocytes development



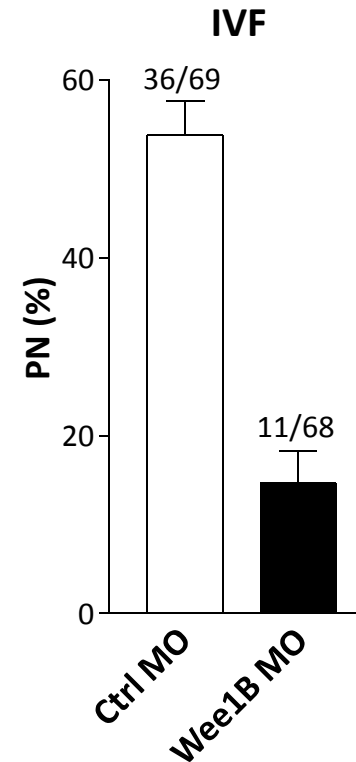
Wee1B knockdown prevents pronuclear formation during egg activation



A

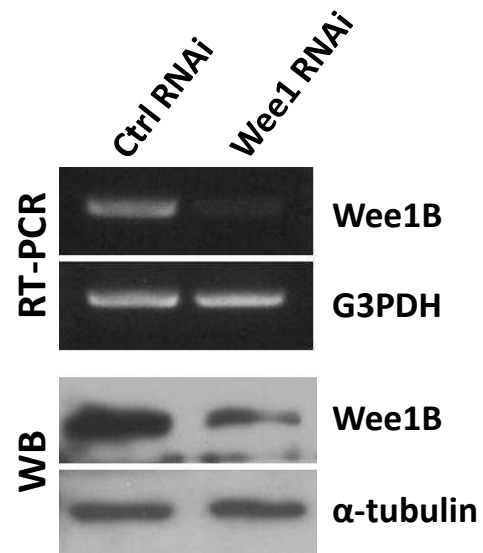


B

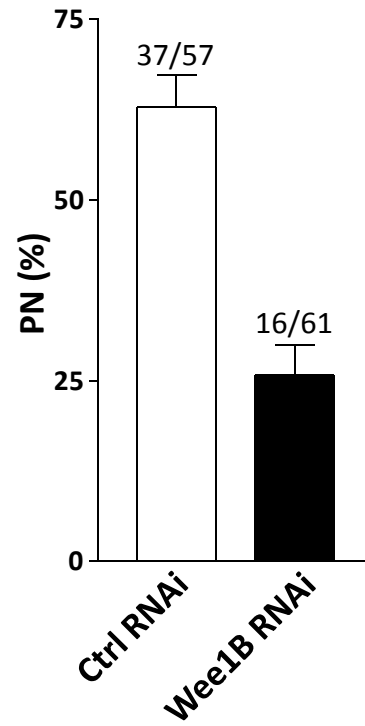


Wee1B knockdown prevents pronuclear formation during egg activation

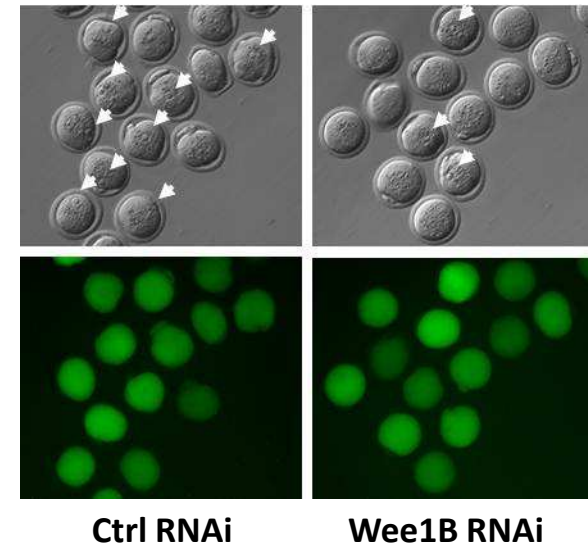
A



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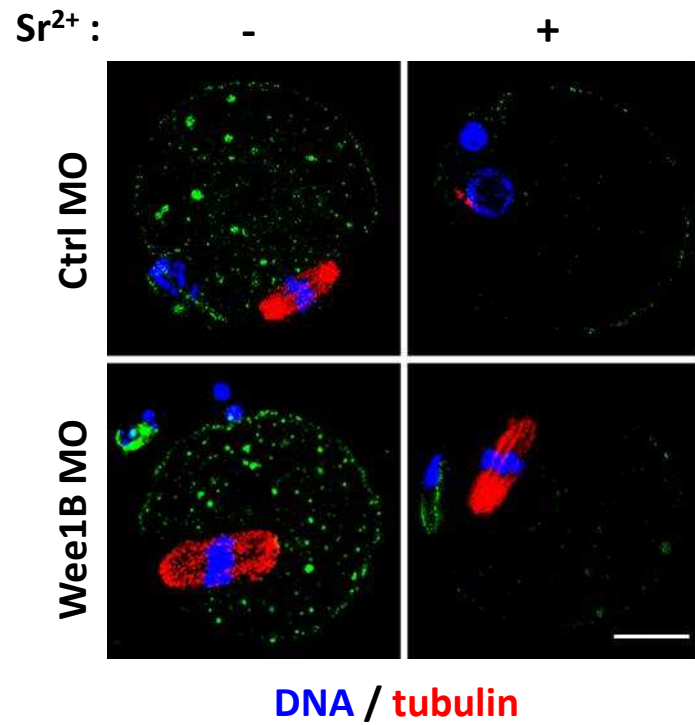


C

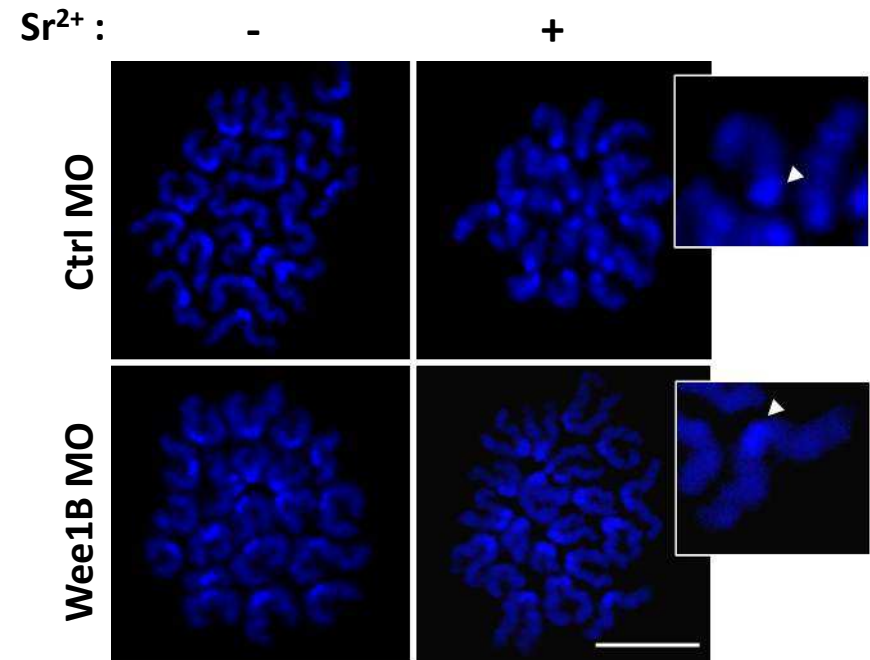


Wee1B knockdown eggs arrest in MII

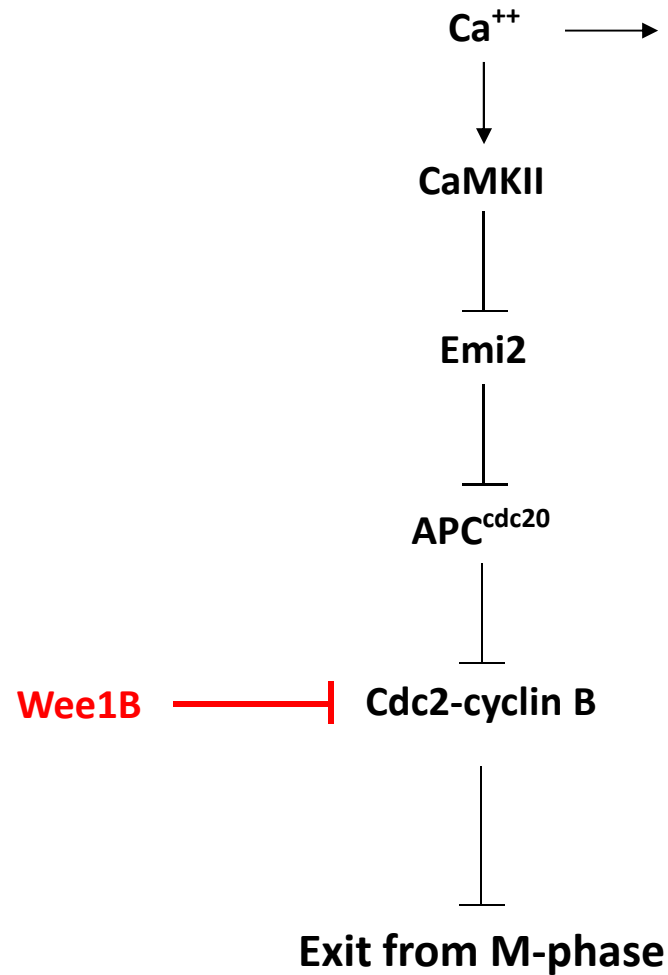
A



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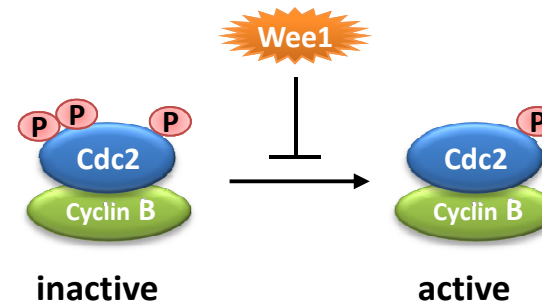


Molecular mechanism of Wee1B knockdown oocytes



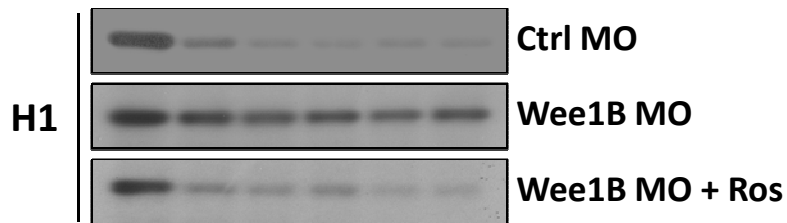
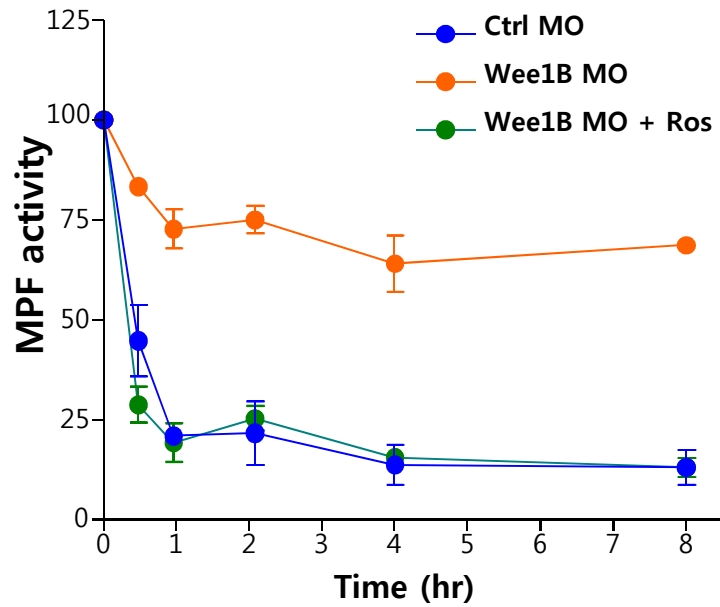
1. Overexpression of Cdc20 does not overcome MII arrest.

→ suggesting that MPF inactivation is not solely dependent on cyclin B degradation. Instead, it might be triggered by other mechanism.

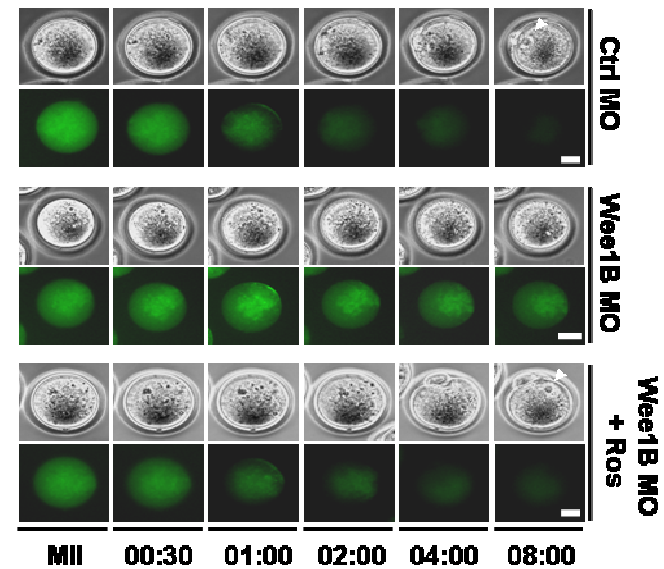
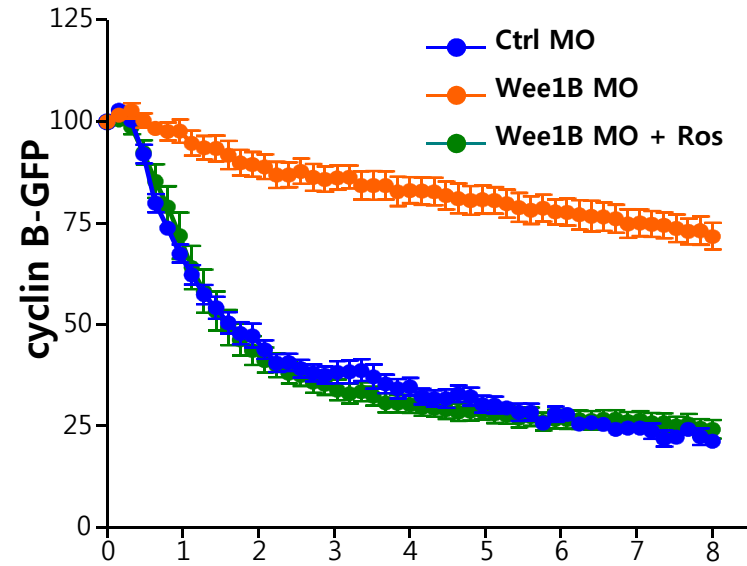


MPF inactivation ahead of cyclin B degradation

A

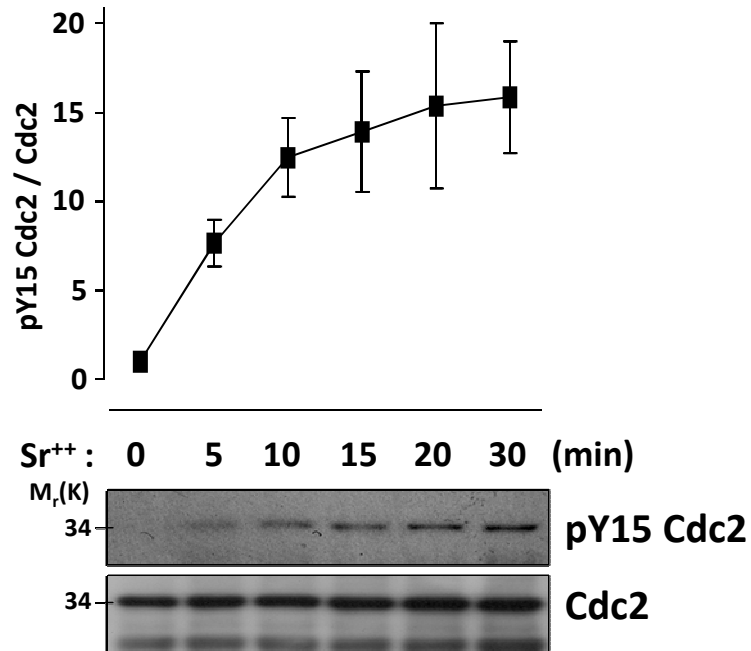


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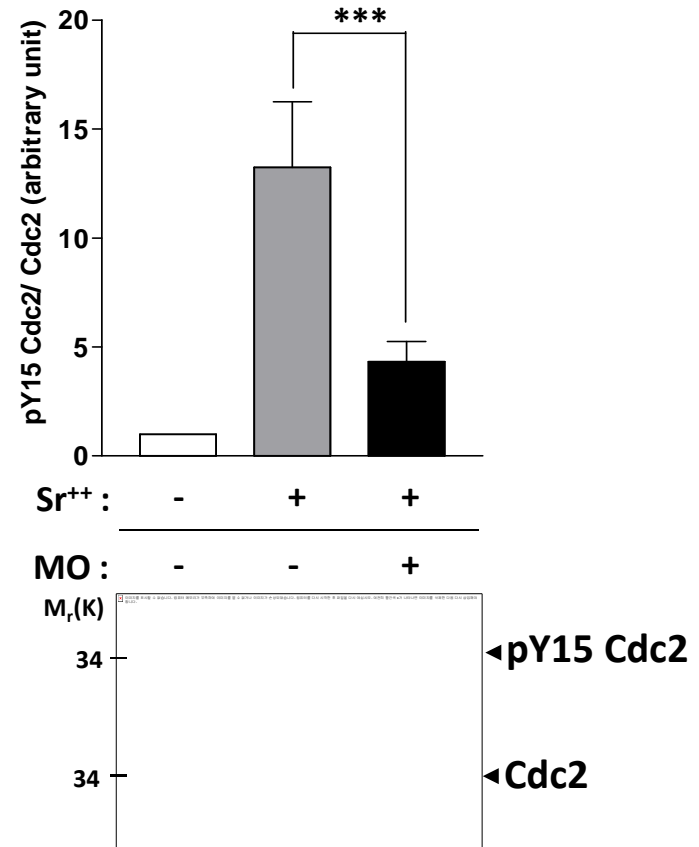


Wee1B-mediated inhibition of Cdc2 is required to complete M-phase

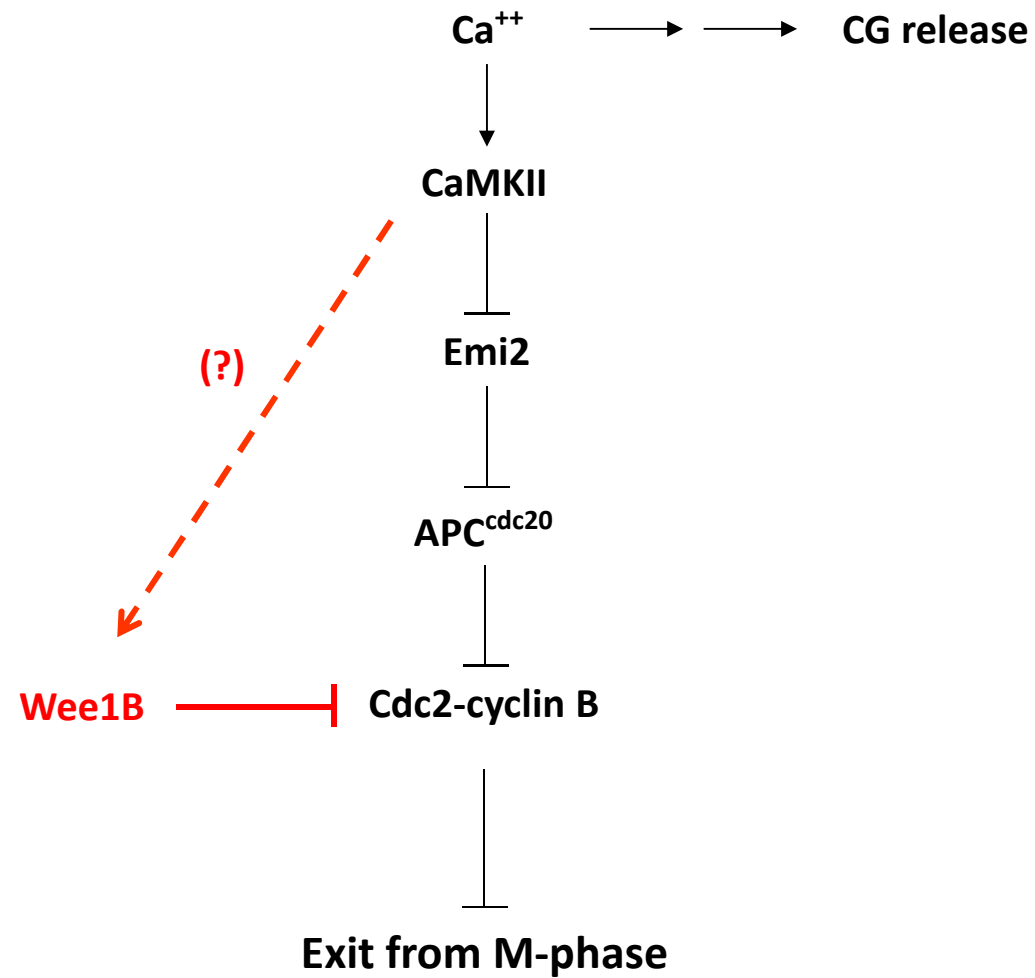
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What is the upstream of Wee1B signaling ?

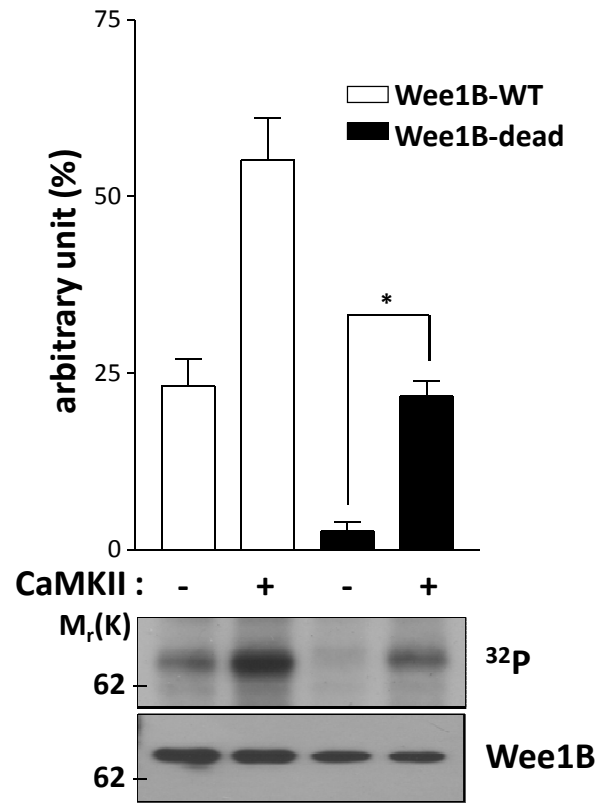


CaMK II activates Wee1B

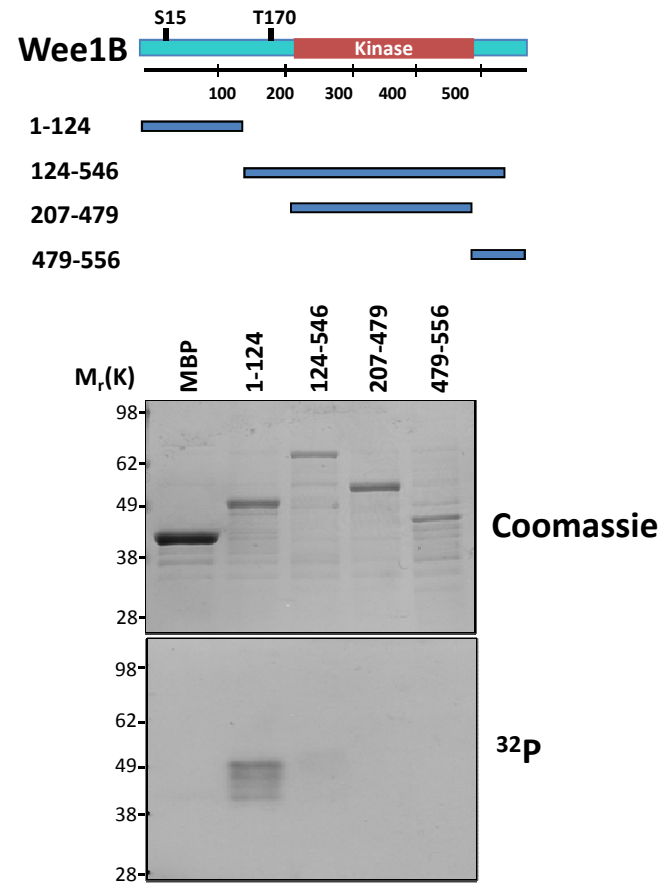
CaMKII consensus sequence : R/K-X-X-S/T

Wee1B(1-124) : MADTETDQGLN**KKLS**FSFCEEDTESEGQMTAQDIGGAQSQKPGREESEELEGPVPPTRDELHTSLSRD
 KGSPGPDWLKSVSGPPKCPETPVLHSSKSKPPVPTNFSTPKNSLGLQPEISLLEKLSS---

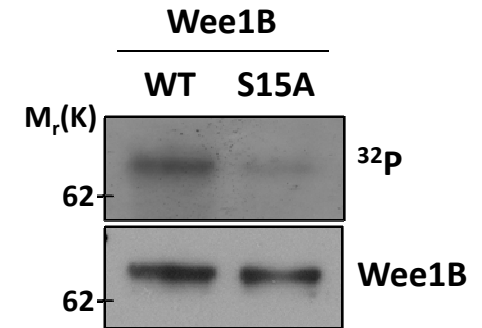
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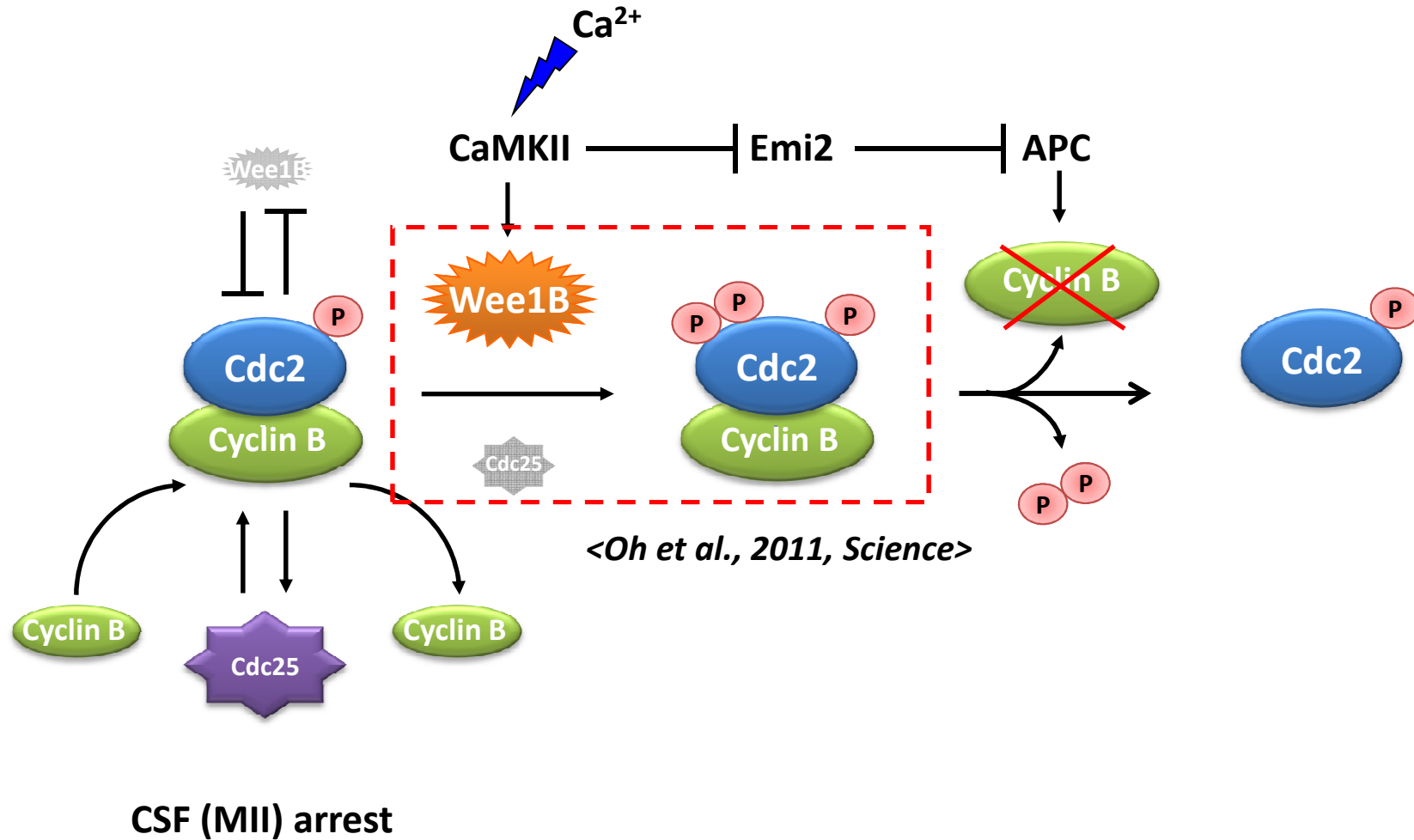
B



C



Proposed model for cell cycle resumption during egg activation



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