The MAK-1 and MAK-2 MAP kinase modules have related but different functions in cell-cell fusion in *Neurospora crassa*
The Ascomycete *Neurospora crassa*
Germlings of *Neurospora crassa* fuse into a supracellular network

Ungerminated conidia

Conidia germinate, interact, and fuse

Hyphal-network resulting from fusion
The MAP kinases MAK-1 and MAK-2 are essential for germling interactions

WT  Δmak-2  Δmak-1

85 ± 5%  0%  0%

MAK-2 is recruited to germling tips in an oscillating manner.
The MAP kinases MAK-1 and MAK-2 are essential for germling interactions

WT  Δmak-2  Δmak-1

85 ± 5%  0%  0%

MAK-1 does not localize during cell-cell communication but localizes at the contact point

Weichert et al. 2016 PNAS
Chemical genetics: Analog sensitive kinases can be specifically inhibited by a bulky ATP analog.
Chemical inhibition of either MAK-1 or MAK-2 disrupts tropic interactions

Serrano et al., 2018
Chemical inhibition of either MAK-1 or MAK-2 disrupts tropic interactions

Serrano et al., 2018
Chemical inhibition of MAK-2 interrupts the cell-dialogue

Serrano et al., 2018
MAK-1 and MAK-2 have distinct functions during the interaction process
MAK-1 and MAK-2 have distinct functions during the interaction process.

mak-1\textsuperscript{E104G} and Lifeact-GFP show that actin-cables vanish, actin-patches stay for 1-NM-PP1 treatment.
MAK-1 and MAK-2 have distinct functions during the interaction process.

For Mak-1<sup>E104G</sup>, actin-cables vanish, but actin-patches remain.

For Mak-2<sup>Q100A</sup>, actin-cables change their location.

Serrano et al., 2018
MAK-1 activity is required for cell-cell contact recognition

Communication

No communication

Weichert et al. 2016 PNAS
MAK-1 activity is required for cell-cell contact recognition

Weichert et al. 2016 PNAS
MAK-1 activity is required for cell-cell contact recognition

Weichert et al. 2016 PNAS
Conclusion

• MAK-1/MAK-2 are both essential for cell-cell interactions, but have distinct functions in the process

• MAK-2: Cell-**dialogue**; **Focus** of actinaster

MAK-1: Cell-**recognition**; **Stabilization** of actincables

• Chemical genetics has outstanding potential for investigation of kinases
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