Essentiality of Ku70/80 in *Ustilago maydis* is related to its ability to suppress DNA damage signalling at telomeres

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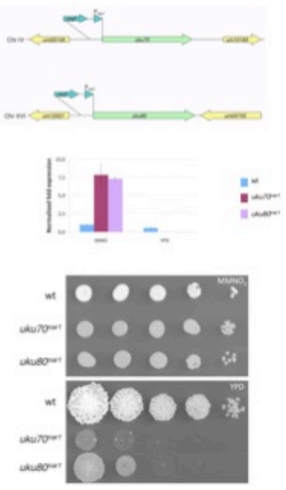
Ku heterodimer is formed of two subunits Ku70 and Ku80 that bind with high affinity to DNA ends in a sequence independent manner. Ku has a role in several cellular processes including DNA repair, telomere maintenance, transcription and apoptosis. Ku heterodimer is essential in human cells as well as in *Ustilago maydis*, a well-characterized fungal system used in DNA repair studies. We found that depletion of Ku proteins in *U. maydis* elicits a DNA damage response (DDR) at telomeres resulting in a permanent cell cycle arrest, which depends on the activation of the Atr1-Chk1 signalling cascade.

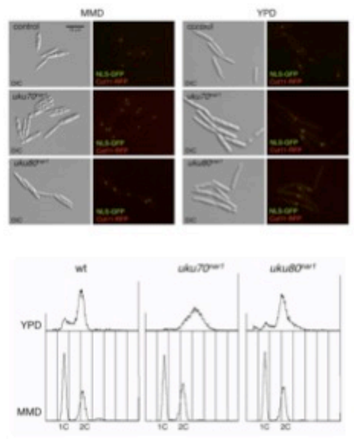
A consequence of this inappropriate activation is the induction of aberrant homologous recombination at telomeres manifested by the formation of extrachromosomal telomere circles, telomere lengthening and the accumulation of unpaired telomere C-strand. Abrogation of the DDR response by deleting either *chk1* or *atr1* genes alleviates much of these aberrant recombination process suggesting that one of the roles of Ku proteins at telomeres in *Ustilago maydis* is related to the suppression of unscheduled DNA damage signalling at telomeres, in addition to the protection of telomeres.

Ku70/Ku80 complex in *U. maydis*

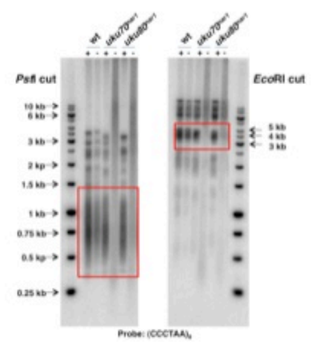
uku70 and *uku80* are essential genes in *U. maydis*



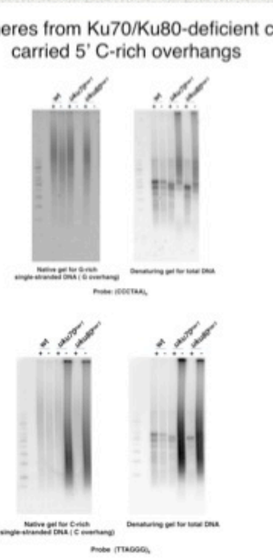
Down-regulation of *uku70* and *uku80* expression resulted in a G2 cell cycle arrest



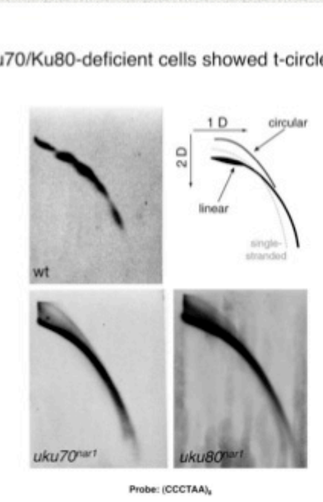
Ku70-Ku80 deficiency produces ALT (alternative lengthening of telomeres)



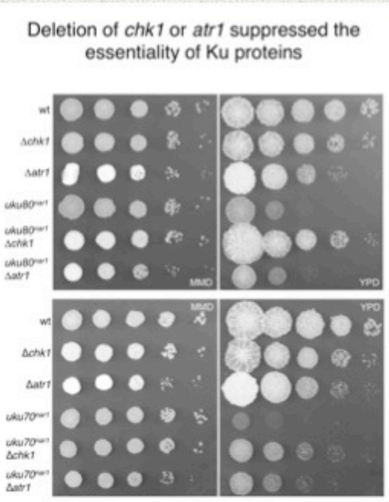
Telomeres from Ku70/Ku80-deficient cells carried 5' C-rich overhangs



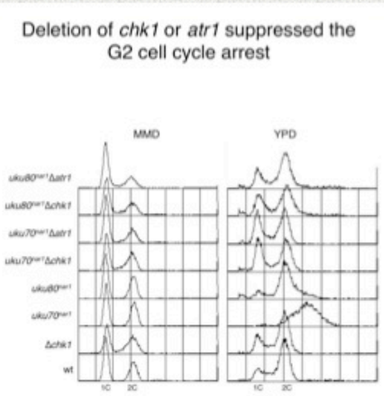
Ku70/Ku80-deficient cells showed t-circles



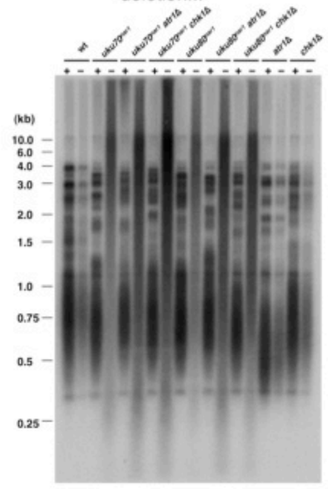
Deletion of *chk1* or *atr1* suppressed the essentiality of Ku proteins



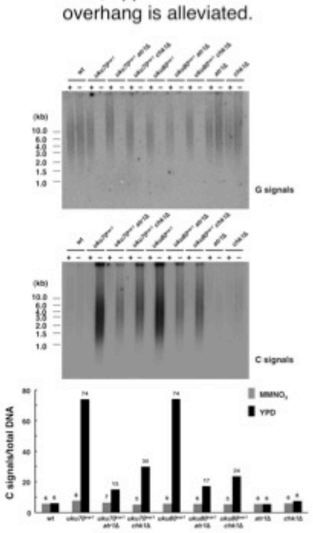
Deletion of *chk1* or *atr1* suppressed the G2 cell cycle arrest



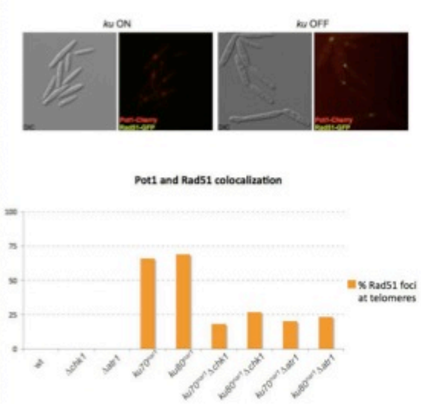
ALT is not suppressed by *chk1* or *atr1* deletion...



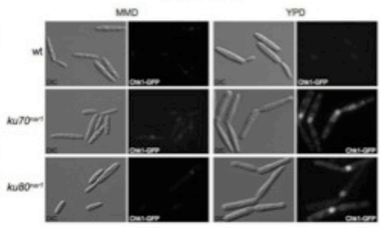
However, appearance of C-rich overhang is alleviated.



Ku deficiency correlates with a Rad51 preferential localization at telomeres



Ku deficiency triggers the DNA damage response



Our working hypothesis

Funding