Transposition of a rice Mutator-like element in yeast

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DNA transposable elements

Class 2 (DNA) elements

TPase-binding Site
Target site duplication
TIR: terminal inverted repeat

Autonomous and non-autonomous elements

Autonomous element
Nonautonomous element

Mutator - DNA transposon family first isolated in maize by Robertson

MULEs - Mutator-like elements from other organisms

Maize
Arabidopsis
Rice
Lotus japonicus
Neurospora crassa
Fusarium oxysporum
Aspergillus fumigatus
Bacteria
Animals

MuDR encodes two proteins, mudrA and mudrB. mudrB only present in Zea genus
Lisch 2002

Few active MULEs have been identified so far

• Mu, Jittery and TED in maize (Robertson 1978; Xu et al., 2004; Li et al., 2013)
• AtMu1 in Arabidopsis (Singer et al., 2001)
• Os3378 in rice (Gao 2012)
• No transposition observed in non-native host, suggesting for host factors
N-terminal deletion significantly enhances excision activity

Lack of net charge enhances excision activity

Wild-type Os3378 is more responsive to galactose
No correlation between excision activity and protein level among different forms of transposases

Aa 105 – 130 does not contain a nuclear localization signal

The effect of element size and TSD

N-terminal deletion alters cellular localization

Fusion of EYFP impacts excision activity, likely due to the net charge of its c-terminus

Perfect TSD promotes precise excision
Conclusions

- Yeast harbors all the host factors for transposition of MULEs
- A single transposase of Os3378 catalyzes both excision and reinsertion
- The wild-type transposase is sub-optimal for transposition, activity can be modified through deletion, fusion and substitution
- AA 105 – 130 is important for both excision activity and localization of Os3378 transposase
- Smaller elements are more competent for transposition
- Perfect TSD promotes precise excision

Thanks to

Dongyan's dissertation committee: Corny Barry, Rebecca Grumet, Shinhan Shiu, Dechun Wang

MSU Collaborator: Robin Buell, Kevin Childs, Yuehua Cui, Shinhan Shiu, Yanni Sun

Other Institutions: Sue Wessler (UC Riverside), Jeff Bennetzen (UGA), Kelly Dawe (UGA), Scott Jackson (UGA), Jiming Jiang (U. Wisconsin) Phillip SanMiguel (Purdue), Mark Yandell (U. Utah), Jason Miller (PSU), Nathan Hancock (USC)

Funding

NSF genetic mechanism program
NSF plant genome research program
Michigan State University