Identifying essential components of a plant LINC complex

Axel Poulet1,2,3, Aline Probst1, Christophe Tatout1 Katja Graumann2 and David E Evans4

1 Current address Rollins School of Public Health, Emory, USA
2 Department of Biological and Medical Sciences, Oxford Brookes University, Oxford OX3 0BP, UK
3 UMR CNRS 6293 INSERM U1103 Clermont Auvergne Université, GREd, Aubière, France

Introduction

The higher plant NE contains a functional Linker of Nucleoskeleton and Cytoskeleton (LINC) complex based on the plant 478odomains proteins and plant specific Klarsicht/Anc1/Syne homology (KASH) domain proteins (Figure 1). Recent evidence suggests the presence of a plant lamina underlying the inner membrane and various coiled-coil proteins have been hypothesised to be associated with it including Crowded Nuclei (CRWN), Nuclear Envelope Associated Protein (NEAP) protein families as well as the CRWN binding protein KAKU4. In this study, we explore the presence of proteins of these nuclear envelope (NE) proteins from the most ancestral plant species to advanced angiosperms.

Results and Discussion

Mid-SUN proteins were present in all species studied while classical Ctet SUN domain proteins were absent in Chlamydomonas, but appear throughout the multicellular plant species studied, suggesting a key role for mid-SUN proteins. Evolution of KASH domain proteins has resulted in increasing complexity, with some appearing in all species considered, while other KASH proteins are progressively gained during evolution. Failure to identify CRWN homologs in unicellular organisms included in the study and their presence in higher plants leads us to speculate that convergent evolution may have occurred in the formation of the lamina with each kingdom having new proteins such as the Lamin B receptor (LBR) and Lamin-Emerin-Man1 (LEM) domain proteins (animals) or NEAPs and KAKU4 (plants). Our data support a model in which increasing complexity at the nuclear envelope occurred through the plant lineage and suggest a key role for mid-SUN proteins as an earliest and essential component of the nuclear envelope.

References


ACKNOWLEDGEMENTS

The work was supported by the CNRS, INSERM, Clermont Auvergne and Oxford Brookes Universities.

Members of COST Action CA16212 “INDEPTH” http://www.cost.eu/COST_Actions/ca/CA16212