Plant and mouse EB1 proteins have opposite intrinsic properties on the dynamic instability of microtubules.

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Abstract

Objective Most eukaryotic cells contain microtubule filaments, which play central roles in intra-cellular organization. However, microtubule networks have a wide variety of architectures from one cell type and organism to another. Nonetheless, the sequences of tubulins, of Microtubule Associated proteins (MAPs) and the structure of microtubules are usually well conserved throughout the evolution. MAPs being known to be responsible for regulating microtubule organization and dynamics, this raises the question of the conservation of their intrinsic properties. Indeed, knowing how the intrinsic properties of individual MAPs differ between organisms might enlighten our understanding of how distinct microtubule networks are built. End-Binding protein 1 (EB1), first described as a MAP in yeast, is conserved in plants and mammals. The intrinsic properties of the mammalian and the yeast EB1 proteins have been well described in the literature but, to our knowledge, the intrinsic properties of EB1 from plant and mammals have not been compared thus far.

Results Here, using an in vitro assay, we discovered that plant and mammalian EB1 purified proteins have different intrinsic properties on microtubule dynamics. Indeed, the mammalian EB1 protein increases microtubules dynamic while the plant EB1 protein stabilizes them.

Full-text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the manuscript can be downloaded and accessed as a PDF.

Figures

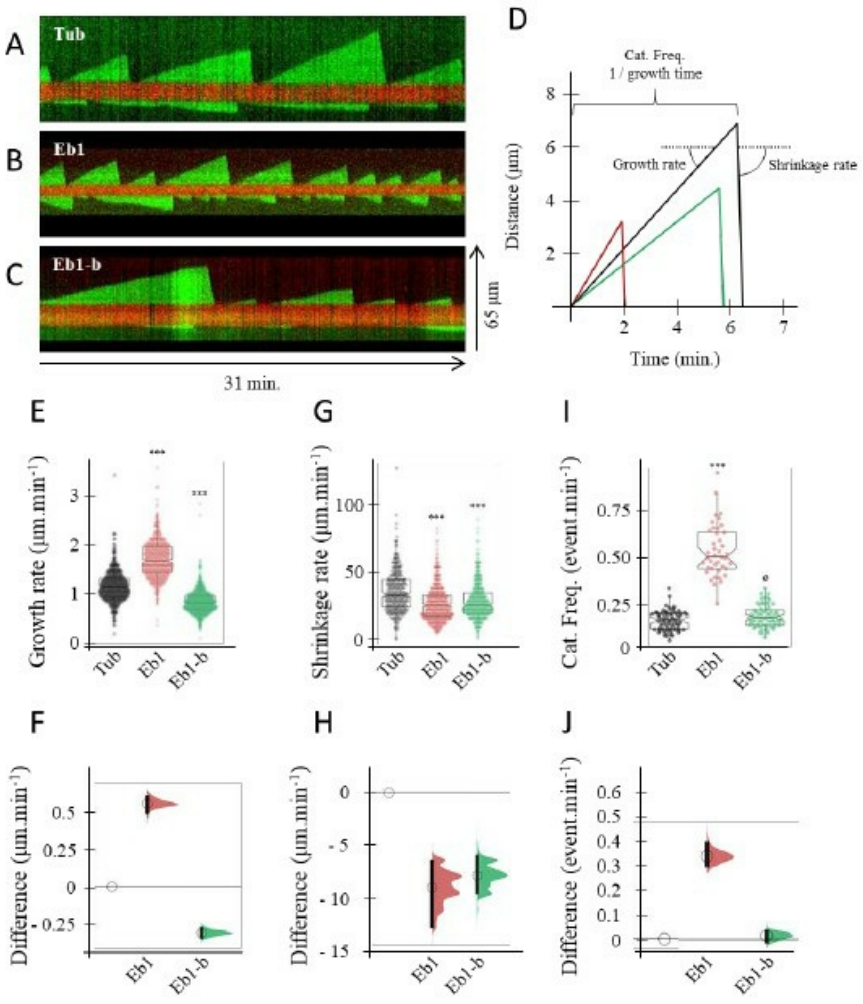

Figure 1

Comparison of the effect of mammalian and plant EB1 protein on microtubule dynamics. Representative kymographs of microtubule seeds (in red) growing in presence of 15 µM of tubulin (A), 15 µM of tubulin and 75 nM of EB1 from mammals (B), and 15 µM of tubulin and 75 nM of EB1-b from plant (C). All kymographs are oriented with the + end to the top. (D) is a schematic of the ideal microtubule tracks for each condition based on the average parameters of their dynamic instability estimated from the kymographs in (A), (B) and (C). The schematic also shows how the parameters are estimated from the kymographs. Graphs in (E), (G) and (I) show the growth rate (E), the shrinkage rate (G) and the catastrophe frequency (I) of microtubules grown in 15 µM of tubulin (black), 15 µM of tubulin and 75 nM

of EB1 from mammals (red) or 15 µM of tubulin 75 nM of EB1-b from plant (green) as jittered dots (visibility: 0.1). The summary of the data is shown as a boxplot, with the box indicating the interquartile range (IQR), the whiskers showing the range of values that are within 1.5*IQR and a horizontal line indicating the median (visibility: 0.9). The notches represent for each median the 95% confidence interval (approximated by 1.58*IQR/sqrt(n)). Plots in (F), (H) and (J) show the absolute effect size, relative to the 15 µM tubulin condition for the growth rate (F), the shrinkage rate (H) and the catastrophe frequency (J). The bootstrap samples that are used to calculate the 95% confidence interval of the effect size are shown as a distribution. 95% confidence intervals are represented as black bars.