Bacterial tubulin: Btubs as a model for a eukaryotic tubulin ancestor?

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Tubulin is one of the major components of the eukaryotic cytoskeleton and assembles as an obligate heterodimer into protofilaments that in turn form microtubules generally made up of 13 protofilaments. Tubulin has long been considered an exclusive eukaryotic feature, however bacterial tubulin (Btub) has recently been discovered in several Prosthecobacter species (Jenkins et al., 2002). The Btubs (BtubA and BtubB) show high structural homology with their eukaryotic counterparts and assemble as heterodimers into head-to-tail protofilaments (Schlieper et al., 2005). They have also been shown to form 5 protofilament tubes *in vivo* thus confirming their close structural resemblance to eukaryotic microtubules (Pilhofer et al., 2011). The btub genes are always present in a three-protein operon, that is thought to have been acquired by the bacteria as a functional unit via horizontal gene transfer (Pilhofer et al., 2007). The third protein, BKLC, shows similarities to eukaryotic kinesin light chain sequences, however its role in the context of the bacterial tubulins remains unclear. Using *in vitro* assays, we show that BKLC can bind to polymerized Btubs. State of the art cryo immuno-gold labeling electron tomography allowed us to confirm the presence of BKLC on Btubs protofilaments, showing yet again the close functional resemblance to eukaryotic microtubules and microtubule-associated proteins (MAPs). Our work contributes to a better understanding of what a eukaryotic ancestor of the tubulin cytoskeleton may have looked like.

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