**INTRODUCTION**

Inorganic pyrophosphate (PPi) is an abundant by-product of cellular metabolism whose removal is essential to drive the equilibrium of anabolic reactions towards biosynthesis. Two different proteins that can hydrolyse PPi to orthophosphate occur in plant cells: soluble pyrophosphatases, that catalyse this reaction releasing heat, and PPases-dependent proton pumps or H-PPases, that couple the energy of PPi hydrolysis to the generation of a proton gradient across the tonoplast or the Golgi membrane. The chimaera TcGFPA VP1 acidifies vacuoles and recover the functional complementation of V-ATPase by H-PPases and the increased sodium tolerance by overexpression of a Na+-PPase from archaean origin. Moreover, studies of in vivo processing and degradation of the heterologous chimeric polypeptides have also been performed by immunodetection using different antibodies, either against the GFP or against the PPase domains. This experimental approach may be particularly useful for future structural studies on these remarkably simple ion pumps.

**RESULTS**

The optimization of the expression along with the use of appropriate mutant yeast strains generated in our laboratory allowed us to carry out in vivo studies that tackle important issues such as the functional complementation of V-ATPase by H-PPases and the increased sodium tolerance by overexpression of a Na+-PPase from archaean origin. Moreover, studies of in vivo processing and degradation of the heterologous chimeric polypeptides have also been performed by immunodetection using different antibodies, either against the GFP or against the PPase domains. This experimental approach may be particularly useful for future structural studies on these remarkably simple ion pumps.

**CONCLUSIONS**

- Membrane-bound inorganic pyrophosphatases (H/Na+-PPases) functionally complement yeast cytosolic soluble PPase and this complementation can be enhanced by making chimaeras with appropriate signal peptides and further addition of GFP at the N-terminus of the Na+-PPase from *M. mazei* (MmVP) and expression of the Na+-PPase from *S. cerevisiae*.
- A chimaera made with the N-terminal signal peptide of *T. cruzi* H-PPase, GFP, and the H-PPase of *A. thaliana* tonoplast (AVP1) complements yeast vacuolar H-ATPase.
- A chimaera made with the N-terminal signal peptide of *S. cerevisiae* Suc2p invertase, GFP and the Na+-PPase of the archaean *M. mazei* complements yeast Na+-ATPase.