Pores and membrane remodelling by amphipathic peptides in single vesicles

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Pore formation, domain remodelling, fusion and fission of membranes are separated functions executed by a variety of proteins and protein complexes. However, similar activities can also be performed by a large number of amphipathic peptides. Throughout decades many studies have been conducted to elucidate the mechanisms behind these processes, but the success has been very limited because of the lack of direct structural information. Here we study the leakage, membrane remodelling and fission induced by fragments of apoptotic proteins of the Bcl2 family, using single vesicle fluorescence microscopy. The leakage occurs stochastically within the vesicle population and the kinetics can be analysed for individual vesicles using exponential models. We find quantal per vesicle leakage rates, which allows obtaining the distribution of pore size and the density of pores in the membrane. In parallel, some peptide versions are able to induce lateral domains in the membranes, accompanied by fusion and fission of vesicle, and the different activities are closely related the presence of cardiolipin in the lipid composition. I will discuss the connections between these apparently distinct functions based on the background intrinsic curvature of the lipids and the stretching and line tension effects exerted by the peptides.