The regulation and initiation of mitochondria-dependent apoptosis is strictly controlled by members of the BCL2 protein family. The pro-apoptotic protein BAX and its structural homolog BAK are able to mediate the permeabilization of the outer mitochondrial membrane (OMM). While BAK is constitutively anchored in the OMM, BAX resides in its inactive conformation in the cytosol. Nevertheless, a minor fraction of BAX is also in non-apoptotic cells associated with the mitochondria and is frequently shuttled back to the cytosol by the anti-apoptotic protein BCL-X_L to counteract accumulation of BAX at the OMM. In response to an apoptotic stimulus, BAX becomes activated and translocates to the mitochondria, where it forms oligomers and causes the rupture of the OMM. The subsequently released innermembrane space proteins like cytochrome c mediate the activation of caspases, which leads to the execution phase of apoptosis and cell death.

This study was conceived to elucidate factors, which are promoting the membrane insertion of BAX. Since the interactions of BAX with mitochondrial membranes exhibit a dynamic and reversible nature, BAX was specifically analysed for a lipid-based, post-translation modification.

The analysis of BAX revealed that Cysteine 126 is modified with palmitate and that this palmitoylation can be significantly reduced by application of 2-Bromopalmitate. The substitution of Cysteine 126 by serine prevented the palmitoylation of BAX and simultaneously reduced its pro-apoptotic activity following its overexpression. Non-palmitoylated BAX C126S exhibited a significantly reduced membrane affinity, which correlated with diminished formation of oligomers, a significantly reduced caspase 3 activity and decreased apoptotic body formation. BAX with a substitution of Cysteine 62 by serine, was characterized by an increased pro-apoptotic activity, which was due to the designated mutation within the BH3 domain. The increased affinity of BAX C62S for the OMM was accompanied by a significantly elevated caspase 3 activity as well as an increased formation of apoptotic bodies. Since the pro-apoptotic effect of the C62S mutation was able to mask the impact of the C126S mutation, the double mutant BAX C62S C126S was indistinguishable from BAX WT and showed no reduced pro-apoptotic activity. The mutation within the BH3 domain of BAX did thereby not disrupt the interaction with the anti-apoptotic BCL-X_L, as both proteins could be co-immunoprecipitated. Furthermore, the expression of BCL-X_L led to complete functional inhibition of BAX C62S, which was mirrored by a significantly reduced caspase 3 activity. The substitution of Cysteine 62 by serine was shown to prevent the nitrosylation of BAX and causes therefore maybe the pro-apoptotic effect seen for the mutant BAX C62S.

This study also proved that the palmitoylation of BAX can be accelerated *in vitro* by the activity of DHHC proteins namely DHHC 3, 7, 11, 12 and 21. It could be shown that enhanced palmitoylation of BAX is sensitizing the cells towards apoptotic stimuli, which was demonstrated upon apoptosis induction by a significantly increased caspase 3 activity in cells overexpressing one of the respective DHHC proteins.

These results prove a functional correlation between the palmitoylation of BAX and initiation of apoptosis, leading to the conclusion, that palmitoylation is a major contributing factor in targeting BAX to the mitochondria.