



1 **Controlling cell proliferation:**
 The upregulation of cell cycle progression proteins (CDKs) favors cellular states characterized by metabolic activity and cellular size compatible with high protein production (e.g., p21CIP1 or p27KIP1).

2 **Engineering survival pathways:**
 The modulation of proteins involved in the apoptotic cascade delays the induction of apoptosis, prolonging the cellular lifespan and ultimately increasing protein production (e.g., downregulation of Bax and Bak).

3 **Engineering protein secretory pathways:**
 The upregulation of proteins involved in protein folding and processing in the secretory pathway increases the accumulation of high-quality recombinant proteins. (e.g., Overexpression of XBP1).