乳腺癌在青年人群中的发病率越来越大。目前所有的传统癌症疗法其毒副作用大，经研究发现一些细菌具有靶向乳腺癌细胞并抑制其生长的功能。因此，使用生物技术来治疗乳腺癌是一个急迫的需求。

The incidence of breast cancer is increasing among young people. All current conventional cancer therapies have high toxicity and side effects. Some bacteria have been found to have the function of targeting breast cancer cells and inhibiting their growth. Therefore, using biotechnology to treat breast cancer is an urgent need.

在本项目中，我们决定使用一种无毒无害的菌（Ecoli-Nissle 1917）作用于乳腺癌细胞，与其他方法相比，具有副作用小，安全性高，靶向作用效率高的特点。因为细菌本身就对于癌细胞低氧低ph的微环境有靶向性作用，我们还对细菌和质粒改造，对质粒引入低氧诱导启动子，细菌表面上增强靶向作用的Her2人工抗体，同时分泌能使癌细胞凋亡的sTRAIL融合蛋白。

In this project, we decide to use a non-toxic and harmless bacterium (Ecoli-Nissle 1917) to act on breast cancer cells. Compared with other methods, it has the characteristics of small side effect, high safety and high high tumor targeting ability. Because the bacteria themselves target the low oxygen and low ph microenvironment of cancer cells, we also modify the bacteria and plasmids. The hypoxia-inducible promoter was introduced into the plasmid, and an artificial antibody to Her2 was enhanced on the surface of the bacteria, which secreted the sTRAIL fusion protein capable of causing apoptosis in cancer cells.

肿瘤的低氧低ph的环境吸引我们改造的益生菌，低氧启动子能在肿瘤周围环境表达，同时细菌还能释放融合蛋白。在分泌肽的作用下将含有His标签的融合蛋白释放到环境中，然后Her2人工抗体（体积小，仅含有58个氨基酸）将会识别乳腺癌细胞表面的特异性受体，随后可溶性融合蛋白中的sTRAIL融合蛋白将会与癌细胞表面的死亡受体DR4、DR5的胞质死亡结构域结合，转导凋亡信号，从而使癌细胞凋亡。在此处设计中，Her2抗体能增强治疗的靶向作用，减少融合蛋白对人体其他细胞的伤害。

The low-oxygen, low-PH microenvironment, which tumors are living in, attracts our modified probiotics to express around the tumors. Meanwhile, the probiotics are able to release fusion proteins. In the action of a secreted peptide the His tagged fusion protein into the environment, then the Her2 artificial antibody(small size, containing only 58 amino acids) will recognize the specific receptor on the surface of breast cancer cells, and subsequently the sTRAIL fusion protein in the soluble fusion protein will bind to the cytoplasmic death domains of the death receptors DR4 and DR5 on the surface of cancer cells to transduce the apoptotic signal, which will then allow cancer cells to apoptosis. In this design, the Her2 antibody enhances the targeting of the treatment and reduces the damage of the fusion protein to other cells in the body.