**Global crisis:**

Cancer is the second leading cause of death worldwide, accounting for 14% of total deaths. 90 % of all adult human cancers encompass solid tumours. 19.3 million new cases and nearly 10 million deaths were reported in 2020 due to cancer. The average total cost of cancer treatments is around $150,000. **(Select stats from here for interactive/ animated display)**

Also, the currently available treatment regimes suffer from a plethora of severely detrimental side effects. Conventional methods like radiotherapy and chemotherapy cause side effects like hair loss, loss of appetite, degenerative issues etc. Treatment of cancer is both physically and mentally traumatising.

**Treatment:**

**Select image from BLAST slides- AIIM on currently available treatments.**

**Side-effects can be incorporated in interactive/animated display.**

**Solution:**

Our project aims to reduce the cancer load by significantly regressing tumour size, using an effective antitumor therapy that will lead to tumour-cell-specific apoptosis while ensuring no damage to normal cells. Our solution uses *Bifidobacterium longum,* an obligate anaerobe shown to localize in hypoxic tumour regions in vivo, and secrete tumour-specific apoptosis-inducing peptides in the tumour microenvironment. We plan to transform a fusion of TRAIL-Smac gene, the human TRAIL gene (mediates apoptosis via extrinsic pathway) and a cell-permeable Smac/DIABLO gene (mediates apoptosis via intrinsic pathway) in our chassis. We will design an AND gate for the promoter of TRAIL and Smac/DIABLO fusion peptide such that secretion occurs only in tumour cells where high lactate concentration and hypoxia are present. Furthermore, to prevent the environmental release of the engineered bacteria and ensure patient safety, we will include a lactate-inducible Holin-Antiholin Kill Switch to ensure that bacteria would only survive in an environment where the lactate concentration is above a certain threshold level. This would kill bacteria that localise at the vicinity of normal tissue where the high lactate level condition is not satisfied thereby preventing damage to normal cells.

**References:**

**From Aditi’s list of references.**