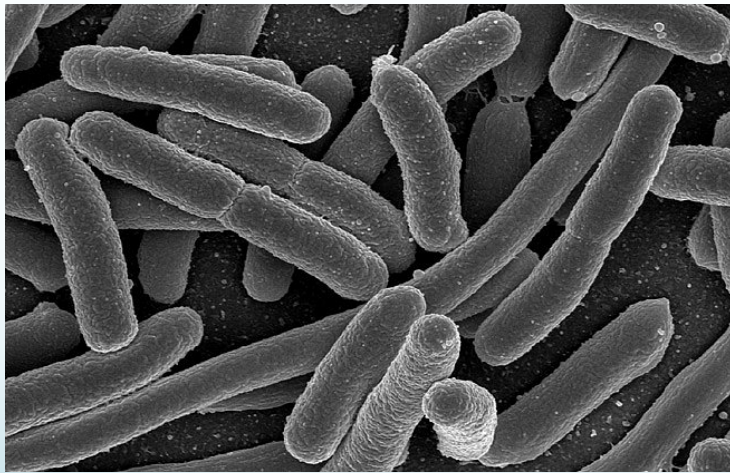


3 Ideas Presentation

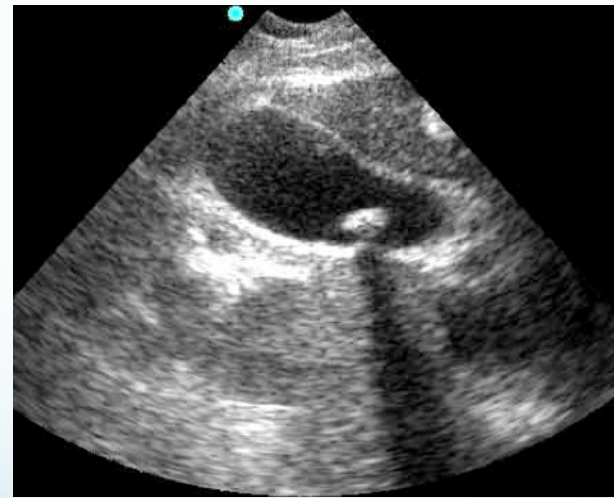
Team Drug Delivery:
Steve Cho
Eddie Farias
Nick Flores

Idea 1: Controlled Release and Production of Interferons

- Using engineered *E. coli* and ultrasound technology to treat cancer in a less invasive and destructive way.

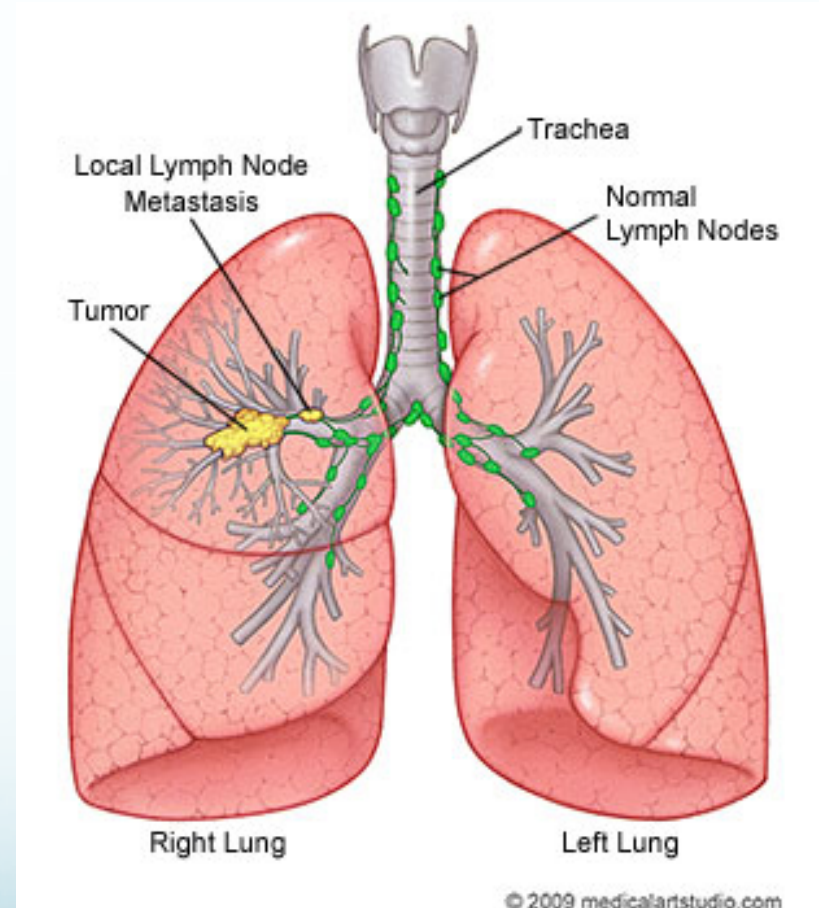


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Basic Information

- Find an alternative to chemotherapy that helps treat cancer
- Method: Use cell as factory for producing interferons that can prompt an immune response to the area where released
- By releasing the drug at a specific target area, side effects from the drug will be reduced



Importance

- Last year over 571,000 people died from cancer in the U.S.
- There were just under 1.6 million cancer cases reported in the U.S. in 2011
- Lifetime probability of developing cancer for males is 1 in 2
- Lifetime probability of developing cancer for women is 1 in 3

Impact

- Better treatment of cancer, leading to longer lifespans and lower death rates
- Less painful than chemotherapy and has reduced side effects
- Less invasive alternative to both chemotherapy and current treatments with interferons

Competition

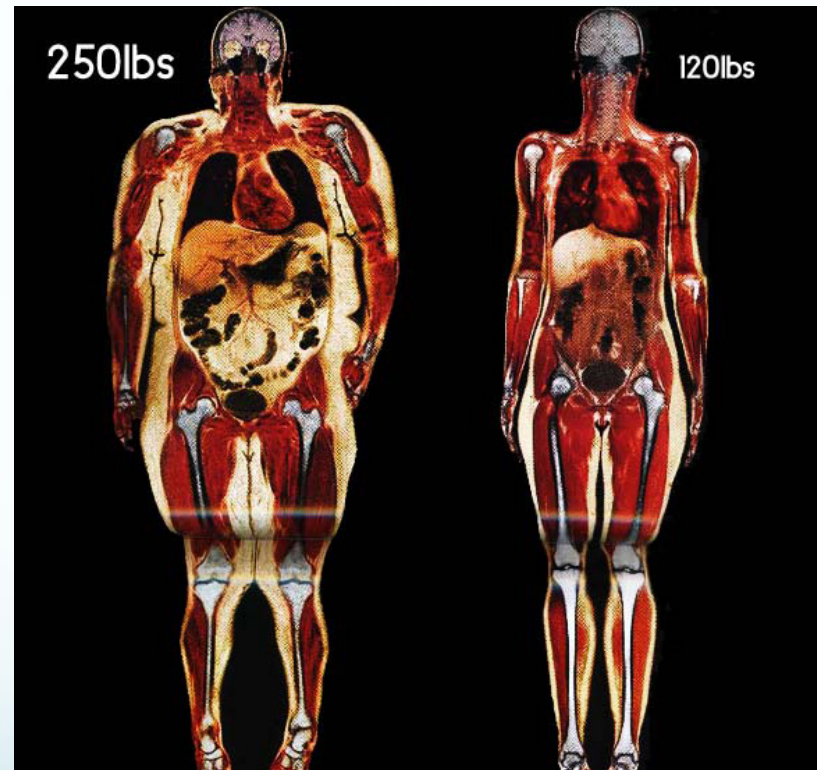
- Chemotherapy
- Surgery
- Radiation Therapy
- Biological Treatments
- Targeted Drug Therapy

Knowns and Unknowns

- Known:
 - Interferons have been used to treat cancer
 - Ultrasound can be used to alter gene regulation and RNA translation
- Unknown:
 - Effectiveness of treatment and signaling method
 - Side effect intensity compared to chemotherapy
 - Will body accept cells or will an immune response be triggered

Idea 2: Fat Eating Bacteria

- Using engineered *E. coli* that will use triglycerides and other fats as a primary source of energy (rather than carbohydrates) in order to remove excess body fat in obese patients



Basic Information

- Bacteria will be ingested and will subsequently spread to areas where fat accumulates
- After bacteria consumes a certain amount of fat, or is active for a certain amount of time, colonies will die
- Can be used by anyone, but targeted consumers are obese patients

Importance

- 17% of youth and 35.7% of adults in the United States are considered obese, with these numbers continuously rising
- No state has a prevalence less than 20%
- Obesity can lead to other health problems, including diabetes and heart disease

Impact

- Reduce risk of acquiring obesity-related diseases
 - Type 2 Diabetes
 - High Blood Pressure
 - Cardiac Problems
- Enable people to have healthier lives and improve general health of the public

Competition

Diet Pills:

- Pros
 - Can aid efforts in trying to lose weight/diet
- Cons
 - May not always work or have intended effects
 - Pills are not cheap and require continual usage

Plastic Surgery

- Pros
 - A very quick solution
- Cons
 - Is temporary, unless patient makes permanent changes to diet and exercise
 - Does not address the source of the problem

Knowns and Unknowns

- Known

- Bacteria have been previously engineered to use fats as primary source of energy
- There is a large market for weight-loss products

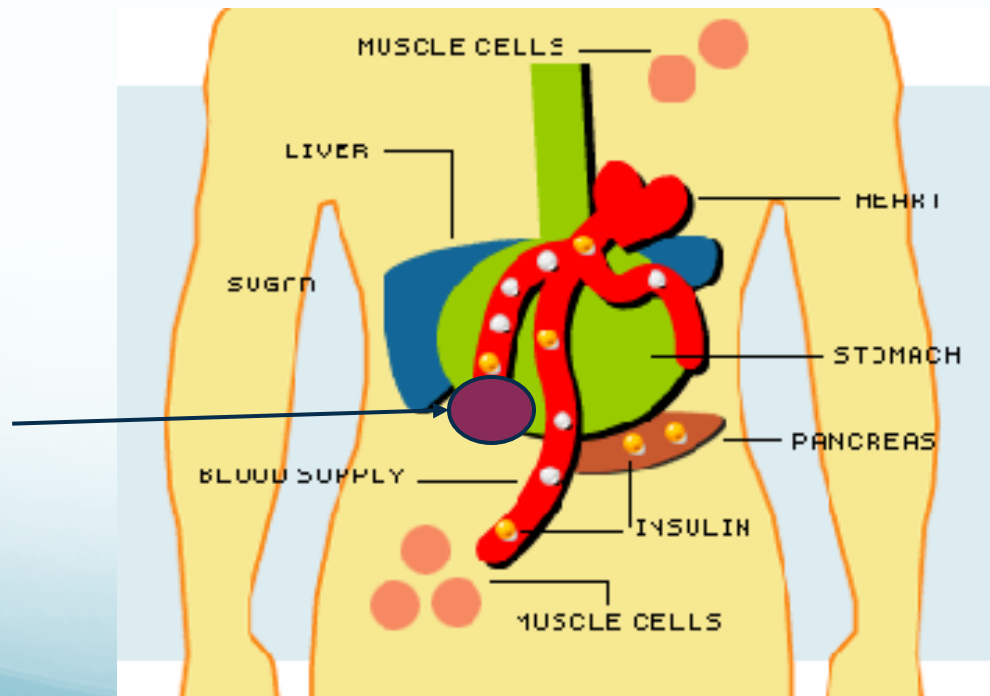
- Unknown

- Whether or not the bacteria can consume a reasonable amount of fat in a given timeframe
- Transporting bacteria to major areas of fat accumulation
- Whether or not body will attack bacteria where it is not naturally present

Idea 3: Artificial “Organ” for Insulin Production

Using engineered *E. coli* cells to create a source of insulin production in diabetic patients.

E. coli
organ



Basic Information

- Targeted towards Type 1 diabetics but also helps Type 2 patients who still require insulin
- Compensates for the lack of insulin production in such individuals
- Use *E. coli* colonies to detect and produce insulin in the body
- Place *E. coli* near liver/pancreas to mimic natural system

Importance

- About 1 out of 12 Americans have diabetes
- Over 1.3 million have Type I diabetes and millions of Type 2 patients require insulin injection along with other treatment
- 1.9 million new cases per year
- 200 thousand deaths related to diabetes per year
- Over \$150 billion spent on diabetes per year

Impact

- Solves problems with current treatment
- One time treatment (occasional follow-up)
- Saves a tremendous amount of money (\$150 billion +) for the US
- Reduces occurrences of kidney failures, cardiology problems, high blood pressure, and other diseases to free up time for other patients

Competition

- Traditional insulin injection/diet control
 - Pros: no operation; no "foreign" cells; easier to monitor and control
 - Cons: continual checks necessary; prone to mistakes that could be fatal; restrictive
- Islet cell transplantation into liver
 - Pros: can completely cure Type I diabetes
 - Cons: hard to obtain appropriate islets; islet rejection by immune system

Knowns and Unknowns

- Known

- *E. coli* reside in our large intestines
- *E. coli* is used for industrial production of insulin already
- The method by which our pancreas produce insulin is well studied and would be relatively easy to replicate

- Unknown

- How to localize and control *E. coli* population
- Prevent harmful mutation
- Possibility of using insulin as transcription repressor
- Possibility of controlling specificity of insulin level to prevent hypoglycemia

Questions?

