Term project

- **Objectives：**
  - **To boost the ability of thinking in critical and creative ways**
  - **To practice how to draw a creative idea**
  - **To learn how to collaborate with group members**

- **Contents**
  - **Current status**
  - **Major barriers / problems?**
  - **What are your new ideas about**
    - **How to tackle them**
    - **New approach or applications**
  - **Rationale and reasoning**

- **Tentative schedule**
  - **Each group comprising 3 or 2 people.**
  - **Submission of a one-page outline by April 10**
  - **Presentation of term project in English: End of May**
  - **Submission of final report by June 20**

Tentative topics

- **Pharmaceuticals :**
  - New source, new metabolic pathways, new process
- **Development of therapeutic proteins**
  - New target, design / engineering, new applications
- **Industrial enzymes**
  - New utility, design/ engineering of existing enzymes or new ones, new enzymatic process
- **Genome editing methods and applications**
  - Minimum off-target, efficiency, new applications
- **Cell-specific delivery of proteins**
- **Diagnosis of diseases : new methods and discovery of targets**
  circulating tumor cells/DNA, virus, pathogens,
- **Immuno-therapy: Immune cell therapy**
- **Regenerative medicine: Tissue engineering, applications of stem cells**
- **Nanomedicine/Nanobiotechnology:**
  - Integration of nanotechnology with existing medical and biotechnology
- **Others**

Example of a topic

Pfizer stakes a claim in plant cell–made biopharmaceuticals

On December 1, Pfizer became the first big pharma to commit to take to market a late-stage biologic drug produced in plant cells. It acquired rights to taligurase alfa, a form of the enzyme glucocerebrosidase in development for the treatment of Gaucher's disease, from Protalix Biotherapeutics in Carmiel, Israel. Protalix has completed phase 3 studies and has submitted a new drug application for the drug, also known as prGCD, eyeing US marketing approval in 2010. At the request of the US Food and Drug Administration (FDA) last year, the company has already begun supplying prGCD to patients in the US under an expanded access program and similarly to patients in the EU under a compassionate-use protocol. This apparent comfort level of regulators, along with the interest of a major drug company, signals a new level of recognition of plant cell–based manufacturing as a viable and potentially less expensive alternative to mammalian and bacterial production of biopharmaceuticals, including biosimilar versions of existing drugs.

Protalix has already collected $65 million from the deal, which gives New York–based Pfizer worldwide rights to prGCD, excluding Israel, and could earn another $50 million in milestones. Protalix will continue to manufacture the drug, which it produces in carrot cells, pay 40% of all expenses going forward and receive the same percentage of revenues in return. The company's prGCD will compete with Genzyme's Ceredase (alglucerase), a form of the enzyme beta-glucocerebrosidase purified from human placental tissue that is modified to be terminated with mannose, and Cerezyme (imiglucerase), a recombinant human beta-glucocerebrosidase with a His495→Arg substitution and the same sugar modification. Both of Genzyme's products are indicated for the treatment of Gaucher's disease, a rare lysosomal storage disorder resulting from a hereditary deficiency in the glucocerebrosidase enzyme. Gaucher's disease is the most prevalent among the group of lysosomal storage disorders, which have been a historic focus for Genzyme in Cambridge, Massachusetts.

This is Pfizer's first move into the area of rare and neglected diseases, the result of a process the company began a year ago to identify such opportunities. "Protalix's name and technology platform and their work in Gaucher's disease came to the top of that list. We approached them in the middle of last year and things moved fairly quickly," says Andrew Curtis, biosimilar and orphan drugs director for Pfizer's established products business.

It's long been believed that plant cell–based manufacturing has the potential to be less expensive than mammalian or Chinese hamster ovary cell–based methods, in part because plants produce protein with a glycosylation pattern closer to human, says

Protalix's bioreactor plant cell system. The GMP-approved system is set up to manufacture a range of proteins, including antibodies, complex enzymes and plant-derived pharmaceuticals.

Term project schedule

- **Detailed schedule will be announced:**
- **Each group is given 20 min for presentation in English**

  All members should participate in presentation
- **Final report: June 20**
- **Final Exam : 1:00 PM on June 13**

2017 Spring BS223 Introductory Biotechnology

No.	Student Number	Name	Group
6	20140585	최보인	1
14	20150814	홍유진	1
22	20160463	이서희	1
1	20122019	황현태	2
12	20150583	이유경	2
17	20160155	김종현	2
9	20140818	고은비	3
16	20150920	Le Hong Anh	3
24	20160516	이주호	3
2	20130132	김원구	4
13	20150701	정하은	4
18	20160268	박준영	4
7	20140593	최영진	5
15	20150914	Ailian Wu	5
23	20160473	이승균	5
3	20130135	김유진	6
8	20140813	Ana Melisa Barsallo Cochez	6
19	20160341	신치홍	6
4	20130636	지수연	8
20	20160344	심성욱	8
26	20170114	김선규	8
10	20150079	김경준	9
25	20160780	정경환	9
28	20170755	Isabel Crisotomo	9
11	20150491	오혜찬	10
27	20170410	오현창	10
29	20170626	Foo Wee Min Alicia	10