

# AMGEN<sup>®</sup> Biotech Experience

## Scientific Discovery for the Classroom

### Singapore



# OVERVIEW OF ABE

- Provides teachers and students with research-grade equipment and supplies, as well as invaluable professional development for teachers and workshops for students to conduct real-world experiments.
- Sponsored by Amgen Foundation for a 3 year programme from July 2017 – June 2020
- Pilot phase was done with 5 schools in Singapore with very positive feedback
- Target group: Secondary and tertiary level



# ABE GOALS

Through their participation in the programme:



- Teachers:
  - are prepared to engage students in science learning experiences that promote knowledge of biotechnology and biology;
  - show students how the science they are learning has real-life applications; and
  - provide students with information about careers related to pharmaceutical biotechnology.
- Students gain:
  - understanding of key biology concepts,
  - knowledge of real-world biotechnology applications,
  - awareness of biotechnology and biotech careers, and
  - interest in biotechnology and science.



# WHAT IS INVOLVED

Teachers interested to implement the ABE programme MUST attend a teacher workshop



Complete the “Student Workshop Booking Form” to book the rental of kits and reagents or workshop



Possible ways to implement the programme

Teachers will borrow the kits and conduct the programme on their own in school

Cost: Free

Science educator from Science Centre will conduct the programme in the school

Cost: \$9/lab/pax

Science educator from Science Centre will conduct the programme at Science Centre

Refer to ABE Express options

Schools to complete the “Equipment Checklist” Form and liaise with Science Centre on the rental of the kit


# LABS INVOLVED

There are currently 6 labs available:

- Lab 1 - Learning the tools of the trade
- Lab 2 – Restriction digest
- Lab 3 – Ligation
- Lab 4 – Verification of results through gel electrophoresis
- Lab 5 - Bacteria Transformation
- Lab 6 – Protein Purification

Schools can choose to do all 6 labs or to do some of the labs only.

**Lab 3**



Gene of Interest  
Recombinant Plasmid


Use ligase to make a recombinant plasmid from DNA fragments.

**Lab 4**



Verify the restriction and ligation procedures.

**Lab 2**



Plasmid DNA Gene of Interest


Use restriction enzymes to digest a plasmid and isolate the gene of interest.

## THE BIG IDEA

DNA → Protein → Trait

DNA contains all the information needed by organisms to survive and reproduce. The information in DNA is translated into proteins, which contribute to the traits of an organism. Altered DNA can result in non-functioning proteins and can lead to genetic disease. Biotechnology research and development can provide functional proteins to patients and alleviate the symptoms of certain diseases. Through the Amgen Biotech Experience labs, you will gain hands-on experience in producing a functional protein from genetically modified bacteria.

**Lab 5**



Gene of Interest  
Recombinant Plasmid  
E. coli with the Recombinant Plasmid

Transform bacteria by adding the recombinant plasmid.


**Lab 1**



DNA  
Porous gel

Learn how to use biotechnology lab tools.

**Lab 6**



Grow bacteria to produce protein of interest, and purify the protein.



# WHAT IS PROVIDED

- Teacher and student guidebook with the scientific concepts, experimental procedures and questions
- Teaching resources
- Training for the teachers and lab officers
- All reagents required for the experiment
- All equipment required for the experiment
- Transportation of kits to the school



# WHAT THE SCHOOL NEEDS

- A science lab (if this is done in school)
- Ice, refrigerator and freezer
- Lab coat (optional)
- Gloves
- Microwave (for lab 4)



# WHAT IS REQUIRED OF THE SCHOOL

- To plan if this will be implemented as part of the curriculum or after school activity
- Work closely with Science Centre on the schedule of the kit rental
- Check the kit upon receipt and before returning to ensure everything is in order
- Ensure that the equipment are well taken care of
- Teacher or lab officer to set up the lab and prepare some reagents that can only be prepared just before the class
- Complete the feedback form at the end of the programme