Genetic modification of bacteria

Posted by Anonymous on Wed, 2019-03-13 17:34

Genetic modification of bacteria: I'd like to make transgenic bacteria by placing a jellyfish gene producing Green Fluorescent Protein (GFP) into *E. coli*. I know that genetic modification is quite tightly regulated, but I can't seem to find any information on whether this is allowed to be done in schools or not.

I understand that you can buy kits for it but can you tell me if this is an OK experiment to conduct at school?

Voting:

No votes yet

Year Level:
Senior Secondary
Laboratory Technicians:
Laboratory Technicians

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Answer by labsupport on question Genetic modification of bacteria

Submitted by sat on 13 March 2019

Regulation

The Office of the Gene Technology Regulator website has the legal information regarding the regulation of genetically modified organisms, see http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/factsheets. A link to a **Fact Sheet - GM kits in Schools** is provided on this site and contains the information that you require**.**

Suitability of this activity for schools

It is important to be aware of the risks and safety issues regarding the microbiological aspects of these kits and to confirm if the required techniques and procedures are allowed in your school jurisdiction.

If your school jurisdiction allows, then this activity is permissible provided that a site-specific biological risk assessment has been conducted and approved by your school. (See below). Detailed information for this activity has been provided in a previous Q&A Transformation of E.coli with pFluoroGreen, some of which is repeated below.

Subculturing – This activity requires *E.coli* cultures to be subcultured from both solid and liquid media. The specialised technique of subculturing requires sound knowledge and expertise to minimise risks involved. Many jurisdictions do not allow cultures to be opened for any manipulation due to the significant risks of contamination and growing unknown microorganisms.

Incubation temperature – This activity requires growth at 37^0C as the *E.coli* will not grow well at temperatures below this. School jurisdictions recommend incubation of microorganisms at room temperature up to a maximum of 30^0C and not at 37^0C to minimise the likelihood for growth of human pathogens.

Selective media – The use of simple media such as nutrient agar is recommended for use in schools. Selective or enriched media which encourages the growth of pathogens is not advised for use in schools.

Use of penicillin – This activity requires the addition of an antibiotic (ampicillin) to agar, which produces a selective medium for the growth of *E.coli* which contains the gene for ampicillin resistance. Ampicillin is also a member of the penicillin family of antibiotics and staff or students who may be allergic to penicillin should avoid all contact.

Sterilisation and decontamination – The genetically modified bacteria produced need to be killed and not released into the environment. The use of an autoclave is the method of choice to decontaminate microbial cultures and waste. This activity suggests using 10% bleach (a disinfectant) as an alternative if an autoclave is not available. Science ASSIST does not recommend the use of 10% bleach (chemical sterilisation) as it is an unsatisfactory alternative to autoclaving. It has a number of limitations and is less effective against spores.

Other microbiology considerations

There are many other aspects to conducting microbiology in schools that must be considered before proceeding.

Firstly, schools must ensure that they have the required facilities and equipment and the necessary staff training to be able to manage the risks of microbiological work.

Secondly, schools should choose the microorganism with the lowest level of risk that will meet the learning outcomes.

Thirdly, before, schools embark on working with microorganisms they should ask the following questions and perform a site-specific biological risk assessment.

- What microorganism is being used? Is it a Risk Group 1 microorganism?
- Do the school facilities comply with the requirements of Physical Containment Level 1 laboratories?
- Does the school have the necessary equipment for sterilisation and decontamination procedures?
- Do the staff have training in microbiological skills?
- What manipulations are being performed with the microorganism? Are methods being used to eliminate or minimise exposure to potentially infectious material via aerosols, splashes, ingestion, absorption and accidental inoculation?
- Are any staff or students wishing to participate in microbiological activities immunocompromised or immunosuppressed (include those who are pregnant or may become pregnant, or are living with or caring for an immunocompromised individual)? These individuals are more prone to infections and they should consult a doctor to determine whether their participation is appropriate.

Science ASSIST has produced GUIDELINES for best practice for microbiology in Australian schools. See https://assist.asta.edu.au/resource/4196/guidelines-best-practice-microbiology-australian-schools

We recommend that your school is familiar with the content of this guide before contemplating the delivery of practical activities in microbiology. In particular, see pp 12-13 for section 3.1 Risk assessment.

We have previously answered the following related questions, which can be viewed on our website:

Using E. coli bacteria in schools

Gene induction experiment?

Transformation of E.coli with pFluoroGreen

References and further reading:

‘Activity 4: Transformation of *E. coli* using green fluorescent protein’, The American Phytopathological Society website, https://www.apsnet.org/EDCENTER/K-12/TEACHERSGUIDE/PLANTBIOTECHNOLOGY/Pa...(Accessed March 2019)

‘Fact sheets’, Office of the Gene Technology Regulator website, http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/factsheets (27 September 2018)

Science ASSIST. 2017. *GUIDELINES for best practice for microbiology in Australian schools*, Science ASSIST website, https://assist.asta.edu.au/resource/4196/guidelines-best-practice-microbiology-australian-schools

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