Using E. coli bacteria in schools

Posted by Anonymous on Thu, 2019-02-21 09:54

Using *E. coli* bacteria in schools: A student is planning an experiment and would like to grow *E. coli* pili 1 strain and test antibotics on it. Can this strain of *E. coli* be used in NSW schools?

Voting:

No votes yet

Australian Curriculum:
Planning and conducting
Year Level:
7
8
9
10
Senior Secondary
Laboratory Technicians:
Laboratory Technicians

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Submitted by sat on 21 February 2019

In brief: The bacteria you describe is a human pathogen and would be considered a Risk Group 2 microorganism and therefore would not be permitted in NSW schools[1]. The only

strain of *E. coli* suitable for use in schools is the *E. coli* K-12 strain which is a Risk Group 1 microorganism.

Science ASSIST has produced GUIDELINES for best practice for microbiology in Australian schools. See p15 for section 3.3 Choice of microorganism.

We recommend that your school is familiar with the content of this guide before contemplating the delivery of practical activities in microbiology.

Escherichia coli

Escherichia coli (E. coli) is a type of bacteria, that lives in the intestines of people and animals. Whilst many strains may be considered harmless, there are several different strains, some of which can cause illness and severe disease in humans and animals.[2] These strains are referred to as pathogens. A characteristic of pathogenic strains is the presence of virulence attributes, which enable them to infect and damage a host and cause disease.[3,4]

***E.coli* pili 1,** which you have referred to, has a virulent attribute known as an adhesive organelle called type 1 pili that has been associated with urinary tract and even kidney infections[5]. This places it in the category of a Risk Group 2 microorganism. As such it is not permitted in NSW Schools and is not suitable for use in any schools.

***E. coli* K-12** is a non-pathogenic strain of *E. coli*. It has no virulent attributes. For example, it has no toxins, no adhesion factors and no invasion factors[6]. It is classified as a Risk Group 1 microorganism, which means that it is unlikely to cause disease in a healthy person. This is the only strain of *E. coli* that is suitable for use in schools, along with safe procedures and a site-specific risk assessment. It should be sourced from a scientific supplier. See the Science ASSIST list of School science suppliers.

Microbiology

There are many aspects to conducting microbiology 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.

References and further reading

[1] NSW Department of Education, 'Chemical Safety in Schools (CSIS)' resource package. NSW DoE website, http://www.dec.nsw.gov.au/ DoE Intranet, login required.

[2] '*E. coli (Escherichia coli)* Questions and Answers', Centers for Disease Control and Prevention website, https://www.cdc.gov/ecoli/general/index.html (Accessed February 2019)

[3] 'Medical Definition of Virulence', MedicineNet website, https://www.medicinenet.com/script/main/art.asp?articlekey=6911 (December 2018)

[4] 'Virulence', Wikipedia website, https://en.wikipedia.org/wiki/Virulence (Accessed February 2019)

[5] Joel D. Schilling, Matthew A. Mulvey, Scott J. Hultgren, 'Structure and Function of *Escherichia coli* Type 1 Pili: New Insight into the Pathogenesis of Urinary Tract Infections', *The Journal of Infectious Diseases*, Volume 183, Issue Supplement_1, 1 March 2001, Pages S36–S40, https://doi.org/10.1086/318855 or https://academic.oup.com/jid/article/183/Supplement_1/S36/2191070

[6] Kuhnert, Peter and Frey, Joachim. 1996. '*Tools for Safety Assessment Identification and monitoring of Escherichia coli K-12 safety strains'*, Centre for Biosafety and Sustainability website, http://www.bats.ch/bats/publikationen/1996-1_e.coli/96-1_e-coli_k12.php

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-microb....
