Educational Organizations

Colleges and Universities around the world are continually exploring ways of both training their students in the theory of new bio-molecular technologies and techniques and providing hands-on training in the use of the tools of modern biotechnology. To this end, EBPI has taken its screening test kits used by the research communities around the world and adapted them for post secondary classroom use. We have worked with a number of post-secondary educational institutions across North America and customized the kits for use in classes of varying sizes and operate under a range of budgetary constraints. The following are a few example of how EBPI's kits have been used in this application.

Toxi ChromoTest™ Kit - Testing for toxicity

- This test kit has been used to illustrate how a number of different environmental compounds can, at lower concentrations affect gene expression and at higher concentrations cause acute toxicity. The test is supplied with both a standard reference toxicant known to the students and one or more unknown single compounds or mixtures of compounds with "unknown" effects. Students, after receiving some theory in the nature of genes and their induction, can measure the induction of the LacZ gene directly in a laboratory period lasting under three hours. Techniques involving the use of micropipetors, microplates and incubation can be taught along with the calculation of LC--50- -or LC20 concentrations from response curves the students plot from the data they obtain for both the reference and test materials. The laboratory teaching method requires only a micro pipette and a 37˚C incubator, plus bench space and an autoclave or chlorine bath to kill the bacteria following the testing. Good laboratory practice should be followed as with all testing using bacteria.

SOS ChromoTest™ Kit - Testing for genotoxicity

- This test has been designed so that the lab instructor can begin to grow the SOS bacteria the evening before the lab and the students can complete the

laboratory exercise easily within a three hour time period the following day. The laboratory provides an introduction to the use of a genetically engineered E. coli bacterium in which the promoter for the SOS gene repair complex has been linked to the LacZ gene. The theory is based upon the fact that in all cells when DNA is damaged by a “genotoxic agent” the cell tries to repair the damage through the induction of one or more DNA repair systems, such as the SOS system. In this test, when the DNA of the test bacteria is damaged, the bacteria “tries to activate” the SOS gene repair complex, but because the promoter that turns on the SOS system has been linked to the LacZ gene, the Lac Z gene is activated instead and the enzyme beta galactosidase is produced and excreted into the growth well. A chromogen is introduced to the growth well and if the cell has suffered DNA damage and it is "trying to repair it" using the SOS repair system, a blue color will be produced. The test kit is supplied with a positive and negative control to ensure that acute toxicity has not occurred during the test and that it is functioning properly. The strength of the response of “unknowns” can be directly compared with the response of the “known” genotoxic positive control.

Concepts associated with the appearance of genotoxicity

following metabolism can also be taught through the illustration of the activation of genotoxicity following exposure to the S-9 liver enzyme.

The laboratory requires only a micro pipette, a 37˚C incubator, bench space, a spectrophotometer to measure the bacteria density in the test suspension and an autoclave or chlorine bath to kill the bacteria following the testing. Good laboratory practice should be followed as with all testing using bacteria.

Muta ChromoPlate™ Kit - Tests for mutagenicity based on the 'Ames Test'

- This test kit has been designed to illustrate the fact that mutations are continually occurring in cells (background rate) and that when exposure to known mutagens occurs the rate of mutation can increase. The test will be set up by the students and the instructor on the first day of the Laboratory and the results read by the students after the bacteria have been allowed to grow and mutate for a five day period. The test is based on the AMES “reverse mutation” assay, where a

mutation in the wild strain of Salmonella has resulted in the loss of the bacteria's ability to metabolize histidine. As the bacteria "reverse mutate" back they gain the ability to metabolize the histidine present in the growth media and this results in a colour change in the wells in the microtiter plate in which the bacteria are growing. A simple chart is provided by which a statistically significant difference between the natural background rate of mutation and the rate of mutation when exposed to different chemicals can be determined. The TA-100 or TA98 strain basic test kit is recommended for laboratory use. It can also be used with S-9 activation if the instructor wishes to illustrate the formation of mutagenic materials through the metabolism of less mutagenic materials. The test kit comes with a positive control compound.

The laboratory requires only a micro pipette, a

37˚C incubator, bench space, and an autoclave or chlorine bath to kill the bacteria following the testing. Good laboratory practice should be followed as with all testing using bacteria.

Please contact EBPI for university protocols and laboratory designs