Schools' Day – Additional Information

Why is Babraham Institute hosting Schools' Day?

The Babraham Institute is a life sciences research institute, focusing on the mechanisms underlying developmental and ageing processes. We are located on the Babraham Research Campus, just outside Cambridge. Schools' Day provides an exciting opportunity for around 150 students to meet our scientists; work alongside them on a hands-on laboratory project; learn about careers in science; and learn about how the research at the Institute relates to what they are learning in school.

You can read about the experiences of students at last years' event here:
https://www.babraham.ac.uk/blog/SchoolsDay-2023

Travel Fund

We have established a Travel Fund to reimburse schools for their transport costs, up to £500. This is only available to a limited number of state-maintained schools. Please indicate whether you wish to be considered for the Travel Fund on the expression of interest form.

Next Steps

Once all expressions of interest are processed, we will allocate places for each session and contact schools with invitations to attend. Further information including outlines of laboratory projects will be circulated for students to indicate their preferred areas of research and return these to us by **12th January 2024.**

Example Projects from Schools' Day 2023

Identifying genetically modified organisms – Dr Jon Houseley
www.babraham.ac.uk/our-research/epigenetics/jon-houseley

Genetically modified organisms or GMOs have revolutionised the study of biology, allowing great leaps forward in our understanding of how life works. The use of GMOs in research is in theory very simple – if you are interested in the function of a particular gene, create a GMO with a mutation in that gene and see what goes wrong. However, there are significant challenges in this process. For example, my lab routinely makes genetically modified yeast strains carrying mutations, but having made such strains we must ensure that the mutations are in the correct genes.

This is not simple as the genetically modified strain will only differ from an unmodified strain at a single site in the whole genome. Genomes are composed of bases, each of which represents a simple piece of information, much like a letter in a book. The yeast genome contains 12 million bases (for comparison, the complete works of Shakespeare contains about 6 million letters), so to test for the

correct mutation we need a technique that can rapidly search the whole genome for the gene of interest. Having amplified the gene of interest using PCR, it then becomes easy to tell if it has been mutated.

In this project, students will use PCR to differentiate yeast strains that have a particular gene mutated from those that do not.

Students will learn about genetics, the principles and applications of PCR and the use of alternatives to animals in research.

Molecular biology: The cut and paste of biology – Dr Simon Cook
www.babraham.ac.uk/our-research/signalling/simon-cook

With the completion of the genome mapping project, we now know all the genes it takes to make a human and the proteins that these genes code for. However, while we know the precise function of some of these proteins – for example amylase, which hydrolyses starch – there are still many proteins whose function is unknown to us. One way to study protein function is to introduce many copies of a gene into a cell thereby increasing the amount of the protein that the gene codes for. We can then monitor cells for changes in their behaviour which can provide important clues about protein function.

For example, one gene that we are interested in is called BIM. This is a "suicide gene" that instructs cell to die – cell death is quite an easy phenotype to monitor! To increase the amount of BIM in a cell we need to transfer the BIM gene from one cell to another. We do this using circular pieces of DNA called vectors which allow us to shuttle genes around cell to cell. We insert genes into these vectors by cutting the DNA with special enzymes called restriction enzymes and pasting the BIM gene in using another enzyme called DNA ligase.

At the end of this procedure, we need to know if the gene has been successfully pasted in or not. You are going to help us find this out by cutting DNA with restriction enzymes and looking at the products of this reaction. At the end you should be able tell which vectors have the BIM gene and which don't, so we can then use these in our research.

Students will learn about signalling pathways and the use of restriction enzymes to 'cut' DNA.

Germinal Centres: The immune cell rendezvous point that makes vaccines work – Dr Michelle Linterman
www.babraham.ac.uk/our-research/lymphocyte/michelle-linterman

Did you ever wonder how exactly your immune system responds to a flu virus or flu vaccination? This is your chance to take a look at it with your own eyes.

Our immune system is made up of many different cell types and is essential to protect us from invaders. Immune cells travel around our bodies with the spleen and lymph nodes as meet-up points where they share information, and instruct each other to help in the fight against infections. Here, B cells and T cells meet up in so-called germinal centres to mount specific immune effector and memory responses to a particular invader.

The memory response is mediated by memory cells, which act as scouts looking for the same pathogen in the future and ensure their quick removal. This allows for a faster and more effective immune response the second time you are infected with a virus. Vaccination makes use of our amazing immunological memory. By injecting a weakened/killed virus, vaccination teaches the immune system to attack and extinguish this virus upon next exposure.

Our lab is trying to understand how germinal centres work, how they react to infections and vaccination as well as how this response changes with age. In this project, you will use modern imaging technology to take a closer look at germinal centres. We will use spleens and lymph nodes from mice and show you how they are processed for imaging. You will also have the opportunity to prepare your own tissue sections. Using a fluorescence microscope, we will then have a look at these sections and the immune cells they contain.

Students will learn about the immune system, preparing tissue samples and using imaging technology.