

Xplora Thematic dossier: DNA

by Alexa Joyce – alexa.joyce@eun.org

Every month, Xplora will release a new thematic dossier on an important topic in science, complete with background information, recommended resources, experiments, training opportunities and more.

This month the focus is DNA – it includes top tips for extracting DNA from bananas, animations for illustrating key aspects and more.

Until just over 50 years ago, nobody knew what deoxyribonucleic acid (DNA) was. Now, DNA is one of the hottest topics in science and hits the headlines every day. Researchers [James Watson](#), [Francis Crick](#), [Maurice Wilkins](#) and [Rosalind Franklin](#) each contributed essential work to discover this special molecule, which is found in the nucleus of every living cell.

DNA is the template for cells to produce the proteins and other molecules that make the cell machinery work smoothly. Without DNA, no cells would even exist, whether plants, animals or humans. Profiling the DNA of an organism helps us to understand how it works, by getting an insight into the kinds of proteins that the organism builds and uses. It can also help to understand disease, by comparing healthy genes with those that cause health problems.

However DNA profiling techniques will challenge our society in new ways. For instance, if a DNA profile shows that a patient will die young because of a disease, should the patient be informed? And who else should receive DNA profile information – for instance the police, health insurance companies or others?

DNA profiles could encourage discrimination – a company boss might reject a new applicant for a job if she has a gene for mental illness, even if the person has never suffered from the problem. Read more about genetic profile databases and their potential effects [here](#).

In this thematic dossier, we will take you through some of the best fact packs, experiments, interactive tools and resources for you to try out with your pupils.

1. Resources

Interactive fact pack from Canada – English and French

The Canadian Museum of Nature has produced this excellent resource for teachers and older students. It explains the basics, tells the stories of major DNA researchers such as Gregor Mendel and Jacques Monod, gives ideas of how DNA technologies are being used and offers games, polls, videos and quizzes.

http://www.nature.ca/genome/index_e.cfm

http://www.nature.ca/genome/index_f.cfm

Designer baby – English, French and German

Bionet, a group of museums working in biosciences, created this Flash activity to show children how genes make up a baby. It's a simple and fun introduction to the issue.



<http://www.bionetonline.org/francais/content/babygame.htm>

<http://www.bionetonline.org/deutsch/content/babygame.htm>

<http://www.bionetonline.org/english/content/babygame.htm>

DNA video clips and spare parts from stem cells – German only

These German resources were produced by the Deutsches Museum. The first is a sequence of videos looking at the issues surrounding DNA and forensic sciences – how human DNA is obtained, use of polymerase chain reaction (PCR) to replicated DNA, cutting and sorting DNA using enzymes, and finally how to visualise DNA.

<http://www.deutsches-museum.de/dmznt/dna/index.html>

Thanks to DNA technologies, in the future we may be able to grow "spare parts" for the human body using stem cells – special types of cells that can be converted into any other type of cell using different hormonal signals.

<http://www.deutsches-museum.de/dmznt/ersatzteile/zellen/index.html>

French molecular biology and genetics animations

Sometimes it can be hard for pupils to get a grasp of how genetic processes work without seeing an illustration. These annotated animations explain key topics such as operons, DNA translation, genotype and phenotype, dominant and recessive genes and more. They were produced by the Pierre & Marie Curie University in Paris, France.

<http://www.snv.jussieu.fr/bmedia/sommaires/gbm.html>

2. Projects and activities

Genetic Testing Role Play – in English only

It is unusual to use role plays in science lessons, but it is an interesting approach for dealing with the ethical issues around DNA and genetic technology. This activity for 14-18 year olds aims to help pupils understand the consequences of genetic testing, and think about how genetic profile information should be used by society. The activity is produced by the European Molecular Biology Organisation, and includes PDF fact sheets, background reading, glossaries and more for download.

<http://www.ceebe.embo.org/projects/project19/project19.html>

DNA Detective

The @Bristol Museum, UK and IBM have teamed up to offer this online activity for younger secondary pupils. It's a short and fun activity that asks kids to play the role of the DNA Detective to find the criminal in a skateboard theft. It's a good ice-breaking activity for children working individually.

English version

http://www.tryscience.com/experiments/experiments_dna_online.html

German version

http://www.tryscience.com/de/experiments/experiments_begin.html?dna

French version

http://www.tryscience.com/de/experiments/experiments_begin.html?dna

DNA Project Day – German only

Pupils aged 13-14 years old at Laaerberg Gymnasium in Vienna, Austria report about a one day project activity, where scientists from a local university came to school and extracted DNA from the students. It gave them insight into the different methods of DNA analysis – available in German only.

<http://www.grg10laa.asn-wien.ac.at/homepage/Dateien/projekte/dna/dnamain.html>

3. Experiments at school

Extracting DNA from bananas – English only

Getting DNA from inside a cell's nucleus isn't as hard as it sounds – you could even do it in the classroom! This experimental procedure from the European Learning Laboratory for the Life Sciences, run by the European Molecular Biology Lab, explains how.

<http://www.ceebebt.embo.org/projects/project8/project8.html>

Isolating DNA from cells – French only

Fun Biology is a French website that gives ideas for biology activities. In this page, it has a good introduction to DNA, and then goes on to explain how to extract DNA using simple lab equipment.

<http://www.didier-pol.net/1biomol.htm>

DNA experimental kit for schools – German only

The Institute of Microbiology at the University of Erlangen, Germany, offers an experimental kit to be used in schools. The experiments are designed for children aged 17-18 at gymnasium and require either three afternoons of practical work in the lab, or a whole day. The kit consists of four aluminium boxes with material for five groups of pupils, and it can be borrowed for free in the region of Erlangen.

<http://www.biologie.uni-erlangen.de/mibi/schule/schuleindex.htm>

Blue genes – German language

Roche, the pharmaceutical company, also offers a kit for experiments. The kit contains two experiments on DNA with precise descriptions for lesson planning. A PDF file with detailed information about the experiments is downloadable from the website. The kit is not free, but available for a small fee.

<http://www.roche.de/diagnostics/biochemica/bluegenes/index.htm>

4. Teacher training opportunities

French School of DNA

This training centre based in Nimes focuses on DNA technologies, and offers free training to teachers at secondary level and higher. Contact the organisation for more details about what is available currently, as the website doesn't have an up to date list.

<http://www.ecole-adn.fr/>

UK Teachers: Gene Technology Training

The Bio-Rad, Institute of Biology and BBSRC, offers UK teachers a one-day continuing professional development course in DNA fingerprinting, DNA extraction and even genetic engineering of bacteria. After the one day course you can show your pupils a bacterium that glows in the dark thanks to a jellyfish gene that you have inserted yourself into its DNA! The one day courses take place around the UK from March to July 2005.

<http://www.iob.org/downloads/genetech.doc>

KölnPUB Teacher Training for German teachers

This non-profit organisation offers teacher training in the field of DNA. They offer two one-day courses. As part of the course, you receive documentation and experimental material.

<http://www.koelnpub.de/lehrerfortbildung-termine.html>

5. External lab sessions for teachers and pupils

School of DNA

This organisation also offers lab sessions for teachers together with their pupils. The sessions are also free. The organisation also offers special "lab kits" containing all the tools and materials needed to do experiments at school.

<http://www.ecole-adn.fr>

Lab work experience for British 16-18 year olds

The London IDEAS Genetics Knowledge Park is piloting a new activity just for post 16 pupils, where they can experience what it is like to be a researcher in genetics. The one week course will include introductions to polymerase chain reaction (PCR) techniques, DNA extraction and gel electrophoresis. Places are limited so contact them quickly if you would like your pupils to take part.

http://www.londonideas.org/internet/school/work_experience.html

Explo Heidelberg Learning Laboratory

This institute offers teachers and pupils the opportunity to do experiments that require a high level of technical skill and equipment, and to go further in experimentation than in a school lab. Experiments available include polymerase chain reaction (PCR), transfection of bacteria or the expression of protein molecules can be carried out.

<http://www.explo-heidelberg.de/aktion/lernlabor/lernlabor.htm>



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