

PRACTICAL DNA GEL ELECTROPHORESIS

Purpose

- To use restriction enzymes to create DNA fragments and gel electrophoresis to separate DNA fragments of different sizes.

SAFETY

Write a risk assessment detailing any safety precautions. Discuss this with your teacher before starting.



Be sure to use only the HT (high tension) power supply provided, limited to <math><5\text{ mA}</math>. This delivers voltages up to 500 V, so take extra care that you do not touch any parts of the apparatus connected to such a high voltage.

Ensure the HT is turned off as soon as the experiment is complete.

Procedure

You may have the opportunity to complete experimental work using restriction enzymes and gel electrophoresis or you may use the simulation of this practical activity. To find out more about the techniques and equipment used in these practicals you can visit the websites listed in the weblinks for this activity. You may combine this activity with Activity 6.1, DNA photocopying: the polymerase chain reaction.

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Purpose

- To use restriction enzymes to create DNA fragments and gel electrophoresis to separate DNA fragments of different sizes.

SAFETY

If gel electrophoresis is to be used, a full risk assessment should be obtained for the procedure and carefully followed by both staff and students.



Review the students' risk assessments and discuss any safety precautions.

Ensure only the HT (high tension) power supply provided is used and is limited to <5 mA. This delivers voltages up to 500 V, so take extra care that no-one touches any parts of the apparatus connected to such a high voltage.

Ensure the HT is turned off as soon as the experiment is complete.

Restriction enzymes and gel electrophoresis

Note that gel electrophoresis also occurs in the second part of Activity 6.1, DNA photocopying: the polymerase chain reaction. However, digestion with restriction enzymes is only covered in this activity. All three aspects could be combined in this activity.

The use of restriction enzymes to cut DNA and electrophoresis to separate the resulting fragments is possible using equipment available from a number of suppliers including NCBE (National Centre for Biotechnology Education), Discovering DNA and Bio-Rad. Student and teacher protocols for these practicals can be downloaded as PDF files from their websites. See the weblinks accompanying this activity. Some of these practicals are presented within a context, for example, NCBE's *Nature's Dice* investigates the inheritance of a single gene. Note that as these protocols often contain many coloured images they can be large and take a long time to download and print so it is worth laminating them for use with successive groups. Some printed copies of the protocols usually accompany any kits purchased.

All of the companies supply the hardware (gel tanks, combs, micro-pipettes, etc.) and consumables (DNA, restriction enzymes, agarose, etc.). Some also supply power packs or batteries. Equipment can either be purchased in class sets or individually, with consumables also available in class-sized batches. All three organisations listed below offer training courses, frequently in association with other institutions like botanic gardens or science centres, giving teachers and technicians the opportunity to carry out the practicals themselves.

Contact details and examples of the protocols offered by NCBE, Bio-Rad and Discovering DNA:

Organisation	Website and phone number	E-mail	Example of suitable protocols
NCBE National Centre for Biotechnology Education Science and Technology Centre The University of Reading 2 Earley Gate Whiteknights Reading RG6 6AU	www.ncbe.reading.ac.uk 01189 873743	NCBE@reading.ac.uk	Lambda DNA protocol Nature's Dice – familial genetic screening simulation Plant evolution PCR
Discovering DNA Discovering DNA, Ltd PO Box 280 Hertford SG13 9DG	www.discoveringdna.com Follow links to kits and/or equipment Phone: 01992 410140 Fax: 01992 410106	All enquiries: info@discoveringdna.co m	Lots of different kits including DNA Fingerprinting – Using Restriction Enzymes Analysis

Safety checked, but not trialled by CLEAPSS. Users may need to adapt the risk assessment information to local circumstances.

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Organisation	Website and phone number	E-mail	Example of suitable protocols
Bio-Rad Bio-Rad Laboratories, Ltd Bio-Rad House Maxted Road Hemel Hempstead Hertfordshire HP2 7DX	www.bio-rad.com Follow the links to Life Science education, then About Biotechnology Explorer. See outlines of each practical with the relevant kit's contents and additional items needed using the link to Classroom kits or if you know what you want to buy then go to Equipment and supplies Freephone: 0800 181134	General enquiries: uk.lsg.marketing@bio-rad.com Orders: uk_orders@bio-rad.com Technical support: techsupport.uk@bio-rad.com	Forensic DNA fingerprinting kit Analysis of pre-cut lambda DNA kit (restriction digests already carried out) Restriction digestion and analysis of lambda DNA kit