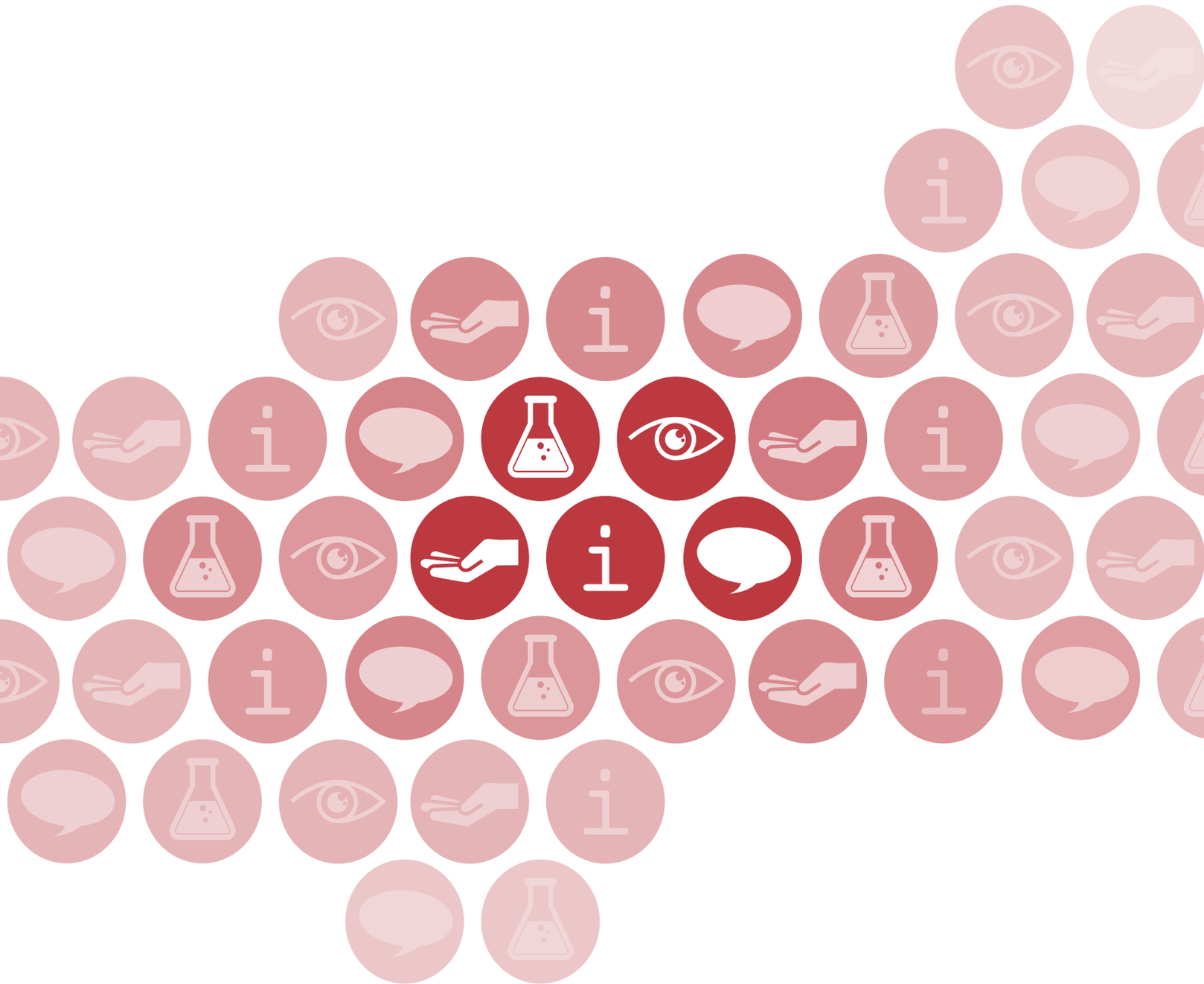
The Royal College of Pathologists
Pathology: the science behind the cure



PAWS FOR THOUGHT
RESOURCE PACK

This activity is suitable for both Key Stage 2 (7- to 10-year-olds) and Key Stage 3 and 4 (11- to 18-year-olds) with some adaptations. Also suitable for drop-in events.

Learning objectives

- learning about the genetics of breeding dogs, inbreeding, and the possible health issues that may arise
- understanding that pathology is not just about humans, that veterinary pathology is an important specialty too
- learning to question and discuss issues that may affect their own lives and the wider world.

Materials required

- a poster or similar with images of different dog breeds
- breeding diagram
- a box with a lid (e.g. shoebox)
- 'dog quality' cards
- a cuddly dog toy (Note: the toy should fit inside the box)
- health issue 'dog tags'
- wool/string to tie the health issue dog tags to the cuddly toy dog
- example card with table showing well-known dog breeds and associated health issues
- coefficient of inbreeding table (optional – depends on time and audience)

Setting up the activity

- choose a health issue dog tag to tie around the cuddly toy dog (which can be changed throughout the event, for the new participant[s]), and place the toy in the box.
- lay out the poster, breeding diagram, dog quality cards, and coefficient of inbreeding information (if using) on a table, next to the box.

Health & safety

Ensure the cuddly dog toy(s) are safe from choking hazards (e.g. loose eyes etc.) in case of very young children participating.

Time taken

Thirty minutes for a class session, reinforcing previous lessons on inheritance with further in-depth conversation around ethical issues; 10 minutes for drop-in event sessions.

Practical

Introduce yourself (if you are a pathologist explain what you do in your job) and what pathology is all about. As a teacher, you may wish to mention how pathology is a special part of medicine (anything with 'ology' is a branch of study – a part of a subject, 'a study of'), and pathologists are the doctors who can tell what might be wrong with a patient. Pathology is not just about human health though, veterinary pathologists look after the health of all animals, including dogs.

Show participants the dog breeds poster. Ask how many people like dogs, have their own pet dog, if there is any particular breed of dog they like, and why?

Explain that some people do not want any old pet dog. They want a puppy with particular characteristics or qualities i.e. a certain phenotype. Perhaps they want a friendly Labrador, an energetic Dalmation, a cute, little pug or a long, slender dachshund. Expert dog breeders help people get their perfect dog.

What qualities would you look for in a dog?

Ask participants to choose 2-3 qualities from the dog quality cards that they would like in their dog. Ask them to put these cards in the box.

Show participants the breeding diagram. Normally, in the wild, animals would mate and produce offspring. By domesticating animals (having them as pets) we are making specific individual animals mate who may never have met in nature. By looking at the parents' qualities, a breeder could choose two parent dogs (a sire [father] and a dam [mother]) to increase the likelihood that the resulting puppies have the same qualities. Half of the genetic material comes from the father, the other from the mother. The genotype is what results in the phenotype. If you don't know the genetics of the parents, how can you be sure you will have a healthy puppy with the same qualities?

Open the lid of the box to reveal a toy puppy wearing a health issue dog tag. What health issue does the puppy have?

Health conditions can include heart defects, deafness, blindness, kidney stones, patellar luxation (knee cap dislocation/moves out of its normal position), malocclusion (where the upper and lower jaws do not meet, making eating difficult), epilepsy (brain disorder causing seizures/fits), spinal problems (ruptured discs), hip and elbow dysplasia (abnormal development, leading to lameness and pain), allergies, infections and behavioural issues.

Explain that when dogs are bred it is important to think about their health as well as how they might look. Dog breeders need to be knowledgeable, experienced and understanding. They need to know the genetics and background (pedigree) of the dogs to be bred to make sure that health conditions do not get passed on to the next generation. Veterinary pathologists can help determine the genetics, but also diagnose conditions such as hip dysplasia (looseness of the hip joint) to ensure these dogs do not enter a breeding programme.

Show participants the breeding diagram again and mention the issue of inbreeding. Some breeders think it is easy to get related individuals to mate so that the puppy inherits all the same qualities. However, this can result in severe health issues for the puppy. Knowledge of an individual dog's genetics, can help discover their ancestry or pedigree. It is better to breed two parent dogs that are unrelated if the resulting puppy is to be healthy.

Reputable breeders listed by the Kennel Club (see below) are those who have been inspected to ensure they only breed from healthy dogs.

Optional extension activity if time allows

(recommended age group: 14+)

We can find out how related two dogs are by looking at their 'coefficient of inbreeding', which is based on the pedigree information already available. This is a percentage, called 'r', which tells us how related two individuals are. The higher the 'r', the more related the individuals are, for example

- an 'r' of 0% means the puppy comes from two unrelated parents
- an 'r' of 12.5% means the puppy comes from a grandfather-to-granddaughter mating, or a half-brother to half-sister mating
- an 'r' of 25% means the puppy comes from a father-to-daughter mating, or a full-brother to sister mating.

Show participants the breeding diagram and the 'coefficient of inbreeding' table, give them a value of 'r' and see if they can find the possible relationship between the parent dogs.

Further discussion (if time permits): Is choosing the phenotype without knowing the genetics and background of your pet dog the right thing to do - picking what you want, rather than what is best for the health of your dog? Especially when animal shelters are full of lonely dogs looking to be loved.

Useful Links

The Kennel Club Assured Breeders:

https://www.thekennelclub.org.uk/services/public/acbr/Default.aspx

The genetics of dog breeding:

https://www.nature.com/scitable/topicpage/genetics-of-dog-breeding-434

Inbreeding:

https://www.thekennelclub.org.uk/health/for-breeders/inbreeding

Dog breeds:

https://www.petfinder.com/dog-breeds?see-all=1

Diagnosing hip dysplasia in dogs:

http://www.petwave.com/Dogs/Health/Hip-Dysplasia/Diagnosis.aspx