

There are many similarities between humans and animals, including their musculoskeletal systems. In this lesson we will look at some of these similarities and in particular how knee replacement operations are completed with humans and dogs. Prepare to be amazed!



Learning Objectives

Students will learn:

- That canine and human musculoskeletal systems have similarities.
- How a damaged knee is treated in humans and dogs
- How this means One Medicine is important for human and animal health



Resources Required

Resource 1:

Powerpoint

Resource 2:

Worksheets

Resource 3:

Answers for questions are all in the Teacher's Notes



Key Words

musculoskeletal, knee, stifle, replacements, ligaments, shoulder, tibia, fibula, femur



Learning Outcomes

By the end of the lesson, students will be able to:

- Recognise the similarities between treatment of musculoskeletal anatomy injuries and damage in humans and dogs
- Identify why this means One Medicine is important to our health and the health of our dogs.

NC Links

Aims and objectives of Science: understand how society makes decisions about scientific issues and how the sciences contribute to the success of the economy and society

Subject content: 8. Biology. Knowledge and Understanding:

11. Biology specifications must ensure that there is an appropriate balance between plant biology, animal biology and microbiology and include an appreciation of the relevance of sustainability to all aspects of scientific developments.

13. Biodiversity: recent approaches draw on a wider range of evidence to clarify relationships between organisms. Working scientifically - informing students of the role of science in understanding the causes of and solutions to some of the challenges facing society.

Development of scientific thinking: appreciating the power and limitations of science and considering ethical issues which may arise

Activity	Description	Timing
Introduction	Discuss with students what the musculoskeletal system comprises of.	10 min
Quiz	Quiz: Can be completed together verbally or on whiteboards to discuss answers together. Worksheet available. Answers in teacher's notes.	10 mins
Name that bone!	Slide 4 - study the illustrations of the canine and human. Many of the bones are the same, but the position may be slightly different or the size of the bone differs. Can you name the corresponding bones in each species? (Answers in teacher's notes).	15 mins
Name those smaller bones!	Slide 5 - A dog's paw and lower limb are similar to our fingers, hands and wrists, just look at those bones! (Answers in teacher's notes).	10 mins
Watch clip - musculoskeletal disease	Watch and discuss the contents of the clip - what are the similarities in the surgeries in dogs and humans? Use slide 9 to discuss. Also available as worksheet number 2 (all answers are in teacher's notes).	15 mins
Cloze procedure	Complete exercises 1, 2 on worksheet 1.	10 mins
Plenary	Mark worksheets together.	5 mins

Key questions:

What is the correct name of the knee in a dog?

What caused Val's knee injury?

What breed of dog is Adam?

Plenary/ Assessment of learning



Assessing Progress

Are the students able to complete the cloze procedure and answer the questions on the musculoskeletal system?

Extension activities/Homework



Write a newspaper headline/article headline relating to the key concepts of this lesson.
This could be about the musculoskeletal system, or about knee replacements in humans and dogs.



Teacher's Notes/Observations

Teacher's Notes

Additional Information:

Slide 2: QUIZ ANSWERS:

How many bones in a human body? 206

How many bones in a dog's body? 319

How many cervical vertebrae do humans have? 7, Dogs have 7, Horses have 7, Giraffes have 7 so do all mammals

How many thoracic vertebrae do humans have? Your thoracic spine is the middle section of your spine. It starts at the base of your neck and ends at the bottom of your ribs. It's the longest section of your spine. Your thoracic spine consists of 12 vertebrae, labelled T1 through T12.

Dogs have 13 thoracic vertebrae, horses have 18

Lumbar V – humans have 5, dogs have 7

What does a muscle do? A human has over 600 muscles, skeletal muscle, smooth muscles which are inside blood vessels and organs like the intestines and cardiac muscle is involuntary and keeps our hearts beating.

Muscles cross over a joint. As the muscle contracts (shortens) it bends a joint.

Dogs have around 350 pairs of muscles – including skeletal, cardiac and smooth

What kind of issues can people have with their joints?

Diseases and injury will damage joints – Arthritis is one of the most common, which is suffered by humans and animals alike. 80% of dogs over the age of 8 will have at least one arthritic joint.

What kind of issues can people have with their muscles?

- Injury or overuse will damage muscles, such as sprains or strains, cramps or tendinitis.
- People can have a genetic disorder, such as muscular dystrophy;
- Inflammation,
- Some cancers
- Inflammation, such as myositis
- Diseases of nerves that affect muscles
- Infections
- Certain medicines

Slide 4: ANSWERS:

Green – skull

Peach – mandible

Light blue – spine

Peach – shoulder blade

Yellow forelimb – humerus

Green - radius and ulna

Light blue – metacarpals

Purple – phalanges

Purple – pelvic bones

Hind limbs – femur

Green – tibia and fibula

Light blue hind limbs – tarsus

Purple – metatarsus and phalanges

Teacher's Notes

Additional Information:

The most obvious difference is in the length of the bones in the arms and legs. Canine front legs contain the same bones as human arms and the hind legs, like the human legs, are joined to the pelvis. However, what most people consider the canine upper leg is indeed the lower leg and the lower leg is equivalent to the human hand and feet. While the dog's toes are equivalent to human fingers/toes except they are bent to reduce the impact on the bones.

Slide 5:

Pink – radius

Yellow - ulna

Green - carpus

Purple - metacarpals

Orange – proximal phalanx

Grey – middle phalanx

Green – ungual process

Slide 6:

Talk in general about the difference in stance, but similarities in the skeletal system.

Slide 7:

Knee replacement, also called knee arthroplasty or total knee replacement, is a surgical procedure to resurface a knee damaged by arthritis. Metal and plastic parts are used to cap the ends of the bones that form the knee joint, along with the kneecap. This surgery may be considered for someone who has severe arthritis or a severe knee injury.

Recovery in a human: You should be able to stop using your crutches or walking frame and resume normal leisure activities 6 weeks after surgery. However, it may take up to 3 months for pain and swelling to settle down. It can take up to a year for any leg swelling to disappear.

Knee replacements in canines and humans

Exercise 1 Fill in the missing words in the passage below

Adam the Alaskan Malamute has had two replacements due to cruciate ligament damage. Valery had to have a knee replacement due to an old knee

The technology used in human and knee replacements are the same.

In the UK in 2018, when the video was made, there were 3,500 that gave their lives to give safe implants and drugs. In 2021, the number has gone up to 4,227 thousand. (UK Government statistics)

Most human cost million pounds to conduct. We can decrease the cost and length of study if we work together and use One Medicine.

Word list: knee, thirteen, dogs, canine, human, injury, One, studies

Exercise 2. Yes or No?

Which of these are almost identical between humans and animals?

	Yes	No
Heart rate		
Nerve supply		
Infections		
Post surgery complications		
How bone grows into the implant		

Exercise 3: In pairs, spend three minutes on each question.

What could we learn from the surgery in dogs that would help humans?

What could we learn from surgery in humans that would help dogs?

Collate the answers and list the similarities/differences between humans and animals

Similarities

Differences

Knee replacements in canines and humans

Answer Sheet

Exercise 1 Fill in the missing words in the passage below

Adam the Alaskan Malamute has had two KNEE replacements due to cruciate ligament damage. Valery had to have a knee replacement due to an old knee INJURY.

The technology used in human and CANINE knee replacements are the same.

In the UK in 2018, when the video was made, there were 3,500 DOGS that gave their lives to give HUMANS safe implants and drugs. In 2021, the number has gone up to 4,227 thousand. (UK Government statistics)

Most human STUDIES cost THIRTEEN million pounds to conduct. We can decrease the cost and length of study if we work together, which is ONE Medicine.

Which of these are almost identical between humans and animals?

Exercise 2. Yes or No?

Which of these are almost identical between humans and animals?

	Yes	No
Heart rate	X	
Nerve supply	X	
Infections	X	
Post surgery complications	X	
How bone grows into the implant	X	

Human hand and dog paw

Can you correctly label the bones?

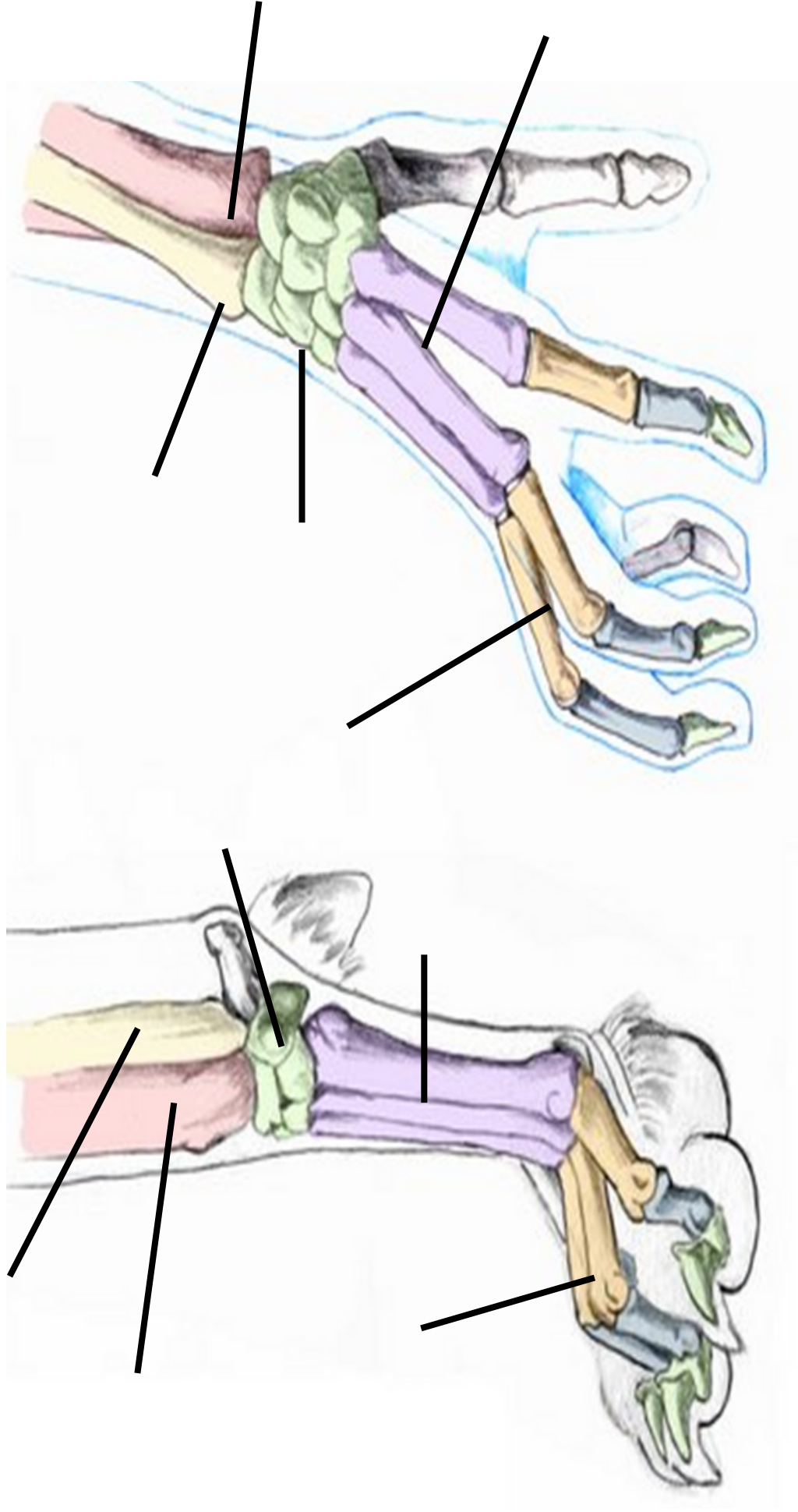


illustration courtesy of Kyle Hall