

# 11 Animal physiology

## 11.1 Antibody production and vaccination

### Antigens in blood transfusion

- blood groups are based on presence or absence of certain antigen types
- important to know in blood transfusions; mismatches between donor and recipient can lead to an immune response (agglutination) and destruction of red blood cells (hemolysis)
- all three alleles have the basic antigen sequence H
- blood type B modifies antigen H with additional molecule galactose: antigen B results
- blood type A modifies with N-acetylgalactosamine: antigen A results
- blood type AB involves presence of both antigens
- blood typing involves mixing samples of blood with antigens
- blood type O does not react to any of the serums

### The eradication of smallpox

- example of contributions that intergovernmental organizations can make
- campaign was successful because: only humans can catch and transmit smallpox (no animal reservoir where it could be maintained), symptoms of infection emerge quickly, immunity to smallpox is long-lasting

### Pregnancy tests employ monoclonal test kits

- monoclonal antibodies are used in a broad range of diagnostic tests
- pregnancy tests detect hCG (human chorionic gonadotrophin) which is uniquely produced during pregnancy by the developing embryo and the placenta

## 11.2 Movement

### An insect leg has antagonistic muscles

- all insects have three pairs of appendages; hindlimb of a grasshopper is specialized for jumping
- three main parts: below joint is the tibia, base of tibia is a joint below which is the tarsus, above the joint is the femur (here are massive muscles)
- flexing: prepares to jump, flexor muscles contract, tibia and tarsus are brought closer, extensor muscles relax
- extensor muscles will contract, extending the tibia and producing a powerful propelling force

## 11.3 The kidney and osmoregulation

### Dehydration and overhydration

- dehydration: more water leaves the body than comes in; factors are exercise, insufficient intake, diarrhea; can lead to disruption of metabolic processes
- sign for dehydration is darkened urine (higher solute concentration), lower blood pressure
- overhydration: less common; result is over-dilution of blood solutes; might happen after exercise when a lot of water is consumed without replacing the electrolytes

### Treatment options for kidney failure

- kidney failure mostly happens due to diabetes or chronic high blood pressure (hypertension)
- hemodialysis is required when kidneys no longer can filter waste products from blood properly; blood passes over an artificial semi-permeable membrane in the dialysis machine: small waste products pass through but larger molecules are retained
- alternative to dialysis is a kidney transplant; donor can be living or dead; living donor is possible because a person can survive with one kidney
- drawback to transplant is that the recipient's body can reject the organ

### Urinalysis

- urine is a product of osmoregulation, excretion, metabolism
- urinalysis: clinical procedure that examines urine for any deviation from normal composition
- compared via a strip that has different test areas

- high glucose levels can be a sign of diabetes; high protein levels can indicate kidney failure
- drug tests work based on monoclonal antibody technology

## 11.4 Sexual reproduction

Gestation times, mass and growth, and development strategies

- mammals differ in their growth and development strategies
- altricial species give birth to helpless, incompletely developed offspring; immobile, lack of hair, unable to obtain food on their own
- precocial mammals: offspring has open eyes, immediately mobile, hair
- mammals with large body size are more likely to be precocial which is correlated with a long gestation period