

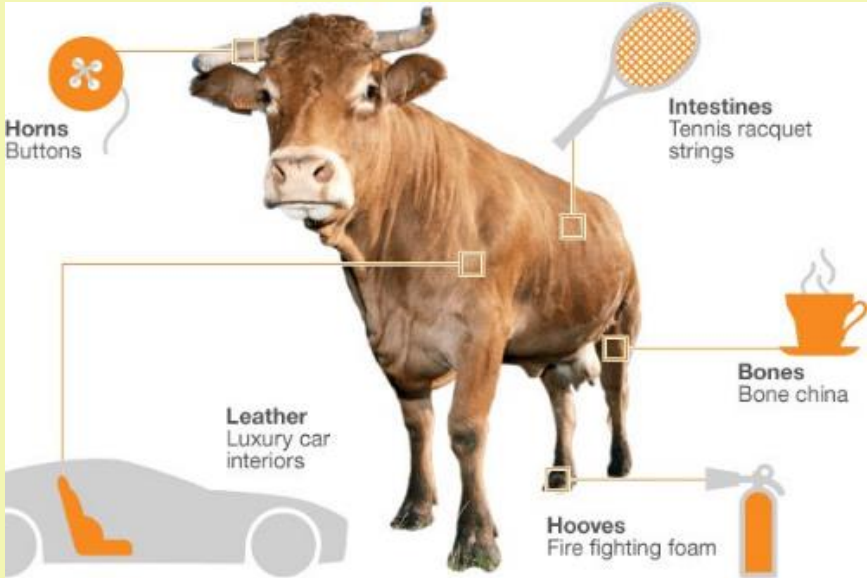
Theme 6: Animal health management

LIVESTOCK PRODUCTS AND PUBLIC HEALTH



A publication sponsored by the ICSIAPL project

Livestock products and public health



Cattle by-product uses in the manufacturing industries

1. You will learn about (learning objectives):

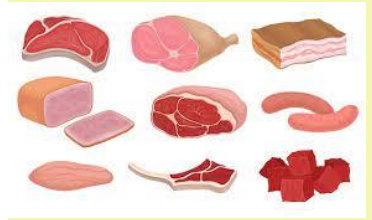
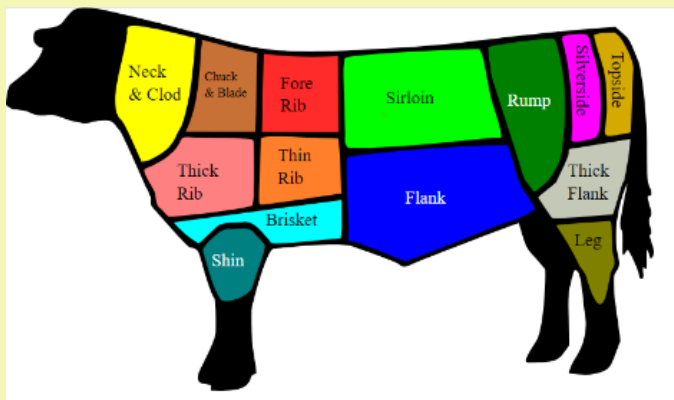
- Identify products and byproducts produced by and originating from livestock.
- Identify zoonotic diseases affecting livestock.
- Identify worms that affect livestock and humans
- Identify effect of livestock products on public health
- Identify the importance of one health campaign



Healthy looking cattle

Introduction

- Livestock are a critical part of food production-, health-systems, economy and the environment through provision of food (animal protein) for example; milk and meat.
- They also provide a source of livelihood from the sale of animal products (e.g. milk and meat) and by-products, for example; manure, skin (leather) and draft power.
- Animal diseases interfere with the normal animal development, animal welfare and can go to extreme ends of causing death to the animal and even affecting public health.
- Global production and consumption of animal protein and livestock products is increasing over time and so are the safety concerns regarding the spread of animal diseases including zoonotic diseases associated with these livestock products.



Livestock products and by-products

- Some livestock products associated with agro-pastoralists economy are listed below;
 - Cattle – milk, meat (beef), blood
 - Sheep – milk, meat (mutton),
 - Goats – milk, meat
- Livestock by-products refer to the secondary product produced after the main product has been secured. For example;

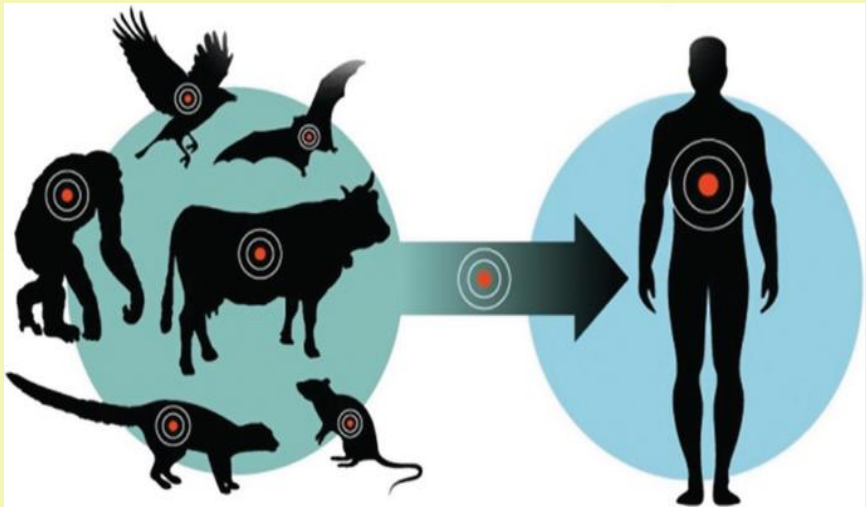


Top picture: beef cuts depicted on a bull. Bottom picture: Blood from cows used as a meal in the Maasai community.

Products	By-products
Manure, dung	Fertilizer, fuel, building material
Hides and skin	Leather
Bones	Bonemeal, tallow
Hooves and horns	Glue

Free from diseases and contaminants

- To get clean products and by-products from animals, they need to be healthy. This can only be achieved through balanced feeding to maintain animal health and welfare.
- Sick or unhealthy animals are less productive and can possibly spread diseases between animals and to humans.
- Animals which are not productive due to poor animal health have a negative effect on the environment because resources like feed and water are utilized less efficiently (low conversion of feed into animal protein) and as a result high methane emission intensities per kilogram animal protein.



Animals can spread some diseases to humans

Zoonotic diseases

- Zoonoses are infectious diseases that spread using pathogens (virus, bacteria, fungi or parasites) from animals to human or from humans to animals for example; salmonellosis and ebola virus.
- Zoonoses or zoonotic diseases easily become endemic (spread easily and easily get out of hand).
- Zoonotic diseases easily get out of control if not given proper attention.
- Example of zoonotic diseases or zoonoses:
 - Rabies
 - Brucellosis
 - Anthrax
 - Rift Valley fever
 - Salmonellosis

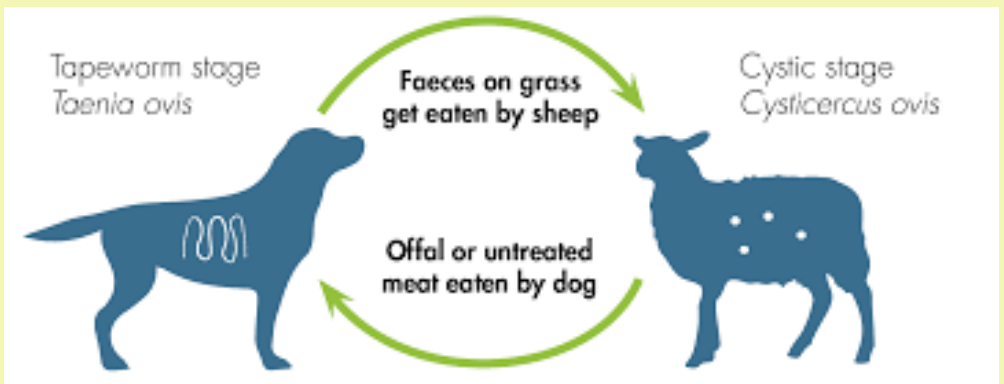


Illustration of an example of zoonoses spread from animal to animal, in this case from a dog to a sheep and vice versa

5.1. Rabies

- Rabies is a viral neuroinvasive diseases that means it causes inflammation in the brain (central nervous system) and it is deadly.
- Rabies mostly affects mammals (dogs and humans) and are mostly spread by rabid dogs with rabies through wound licking (saliva) when biting, scratching or direct contact with mucosa (eg. Mouth, open wounds or eyes) with other dogs and humans.
- There are other means of rabies spread like; but dogs are the main source of human rabies spread and deaths.
- To prevent spread of rabies to humans dog bites should be avoided, avoid animals you do not know and most of all dogs should be vaccinated against rabies infections.



Illustration of how humans can contact Rabies from a sick dog bite

5.1.1. Rabies symptoms

- Rabies takes between 2-3 months or 7 days-1 year for signs to develop depending on viral load and location of the virus.

Signs in humans

- Headache and/or fever
- Weakness, discomfort and pain
- Unusual pricking or burning sensation at wound site
- Anxiety and confusion
- Inflammation of the brain
- Inflammation of the spinal cord

After the virus spreads to the central nervous system

Signs in animals

- Anxiety and restlessness
- Aggressive behaviour
- Hyper salivation
- Muscle spasm and convulsion



Hyper salivation in dogs

5.1.2. Rabies effects on public health

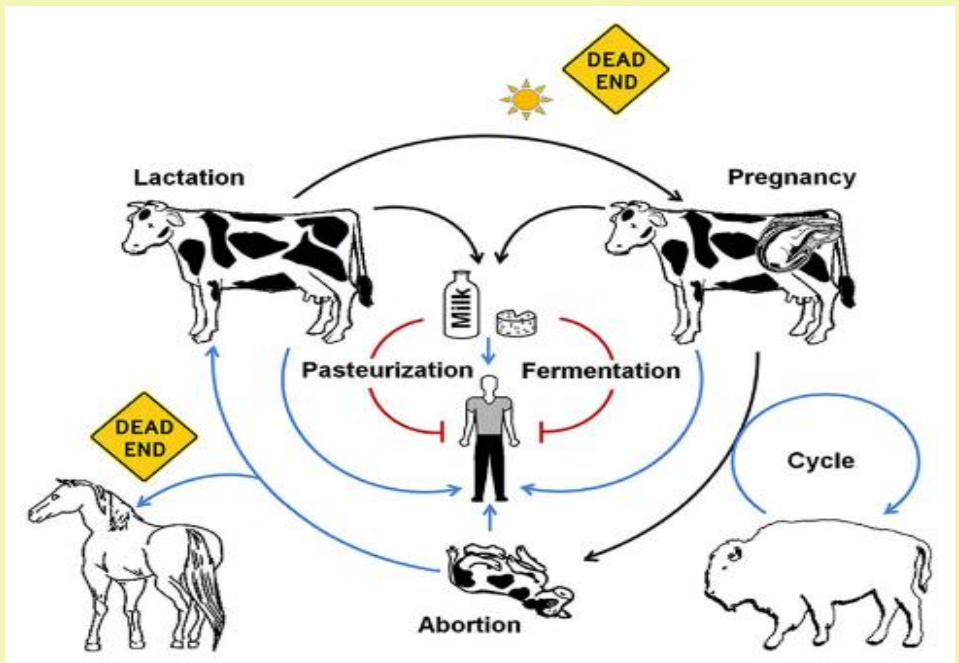
- Rabies majorly affects children under the age of 15 years.
- Rabies spread and death in Africa and Asia accounts to over 95 % despite some of the rabies cases not being reported.
- Rabies immunization should be given to dogs and humans. There are available vaccine effective after an exposure to suspected dog bites (as post-exposure prophylaxis [PEP]) or before exposure to rabies.
- Rabies vaccination before exposure (pre-exposure prophylaxis [PrEP]) is encouraged for people in high-risk areas



A veterinarian vaccinating a dog against rabies

5.2. Brucellosis

- Brucellosis is a contagious disease that is caused by a bacteria from the Brucella family.
- Brucellosis in cattle is spread when cows aborts or gives birth.
- The birth fluids of an infected animal contains high level of bacteria in it and the bacteria can survive outside the environment for months and are infectious to other animals when they ingest the bacteria from the environment.
- Brucellosis is spread to humans when they drink raw contaminated milk from infected cows. It can also be spread through cuts in the skin or mucous membranes.
- Veterinarians, workers and farmers are vulnerable to infections when they handle infected animals and its organs.
- *see module 9.6 Vaccination schedule & planning



In the picture the blue arrows shows the cycle of brucellosis transmission while the red arrows shows the prevention measures of brucellosis

5.2.1. Brucellosis symptoms

- Incubation period usually takes 2-4 weeks or from 7 days-2 months.

Symptoms in animals

- Bacteria causing Brucellosis can cause arthritis if it localizes in the joints
- Swelling of testicles in males.
- Poor reproductive performance
- Abortion
- Infertility
- Retention of the placenta

Symptoms in humans

- Fever
- Weakness
- Weight loss



Picture shows an aborted fetus due to brucellosis infection of the dam

5.2.2. Brucellosis management

- Proper disposal, burying of dead animal or foetus after births, internal organs and animal body.
- Culling (selling) cows to be slaughtered.
- Farmers should carry individual animal testing of milk to screen for the presence of the bacteria.
- Vaccinating of cattle, sheep and goats in areas of high risk.

Prevention of spreading from animal to human:

- Boil milk or pasteurize milk to kill bacteria

Treatment in humans:

- Seek medical advice!! World health organization advises Treatment using doxycycline 100mg twice a day for 45 days, plus streptomycin 1g for 15 days.

[Source: <https://www.who.int/news-room/factsheets/detail/brucellosis>]



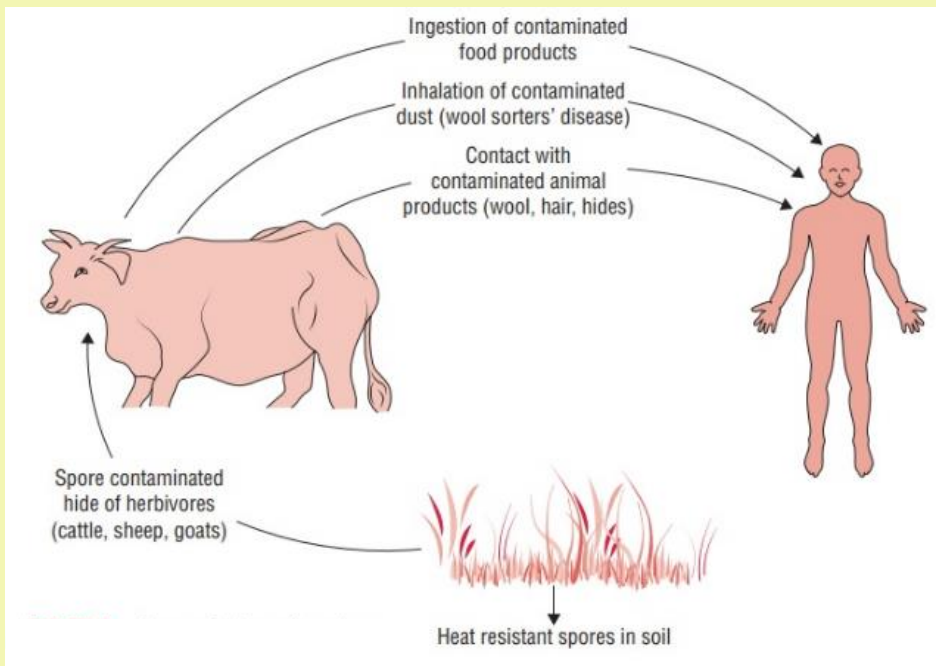
A veterinarian vaccinating a goat against brucellosis



Boiling raw milk or pasteurizing raw milk to eliminate brucellosis bacteria before consumption is recommended.. Packed milk (pasteurized or UHT (Ultra Heat Treatment or Ultra High Temperature) is safe for consumption without boiling

5.3. Anthrax

- Anthrax is caused by a spore-forming bacteria. Anthrax spores can stay in the environment (soil, hair, or on wool) for many years even after an outbreak.
- Spores found in the soil are very resistant and stay in the soil for a long time and when ingested can cause disease symptoms.
- Anthrax is a serious zoonoses that causes death.
- The bacteria produces spores when in contact with oxygen and if inhaled by the animal or entering wounds of animals the spores germinate and cause the disease to spread.
- Rodents and insects can easily spread anthrax from infected animal



Anthrax can be transmitted from an infected cow to human

5.3.1. Symptoms of anthrax

Signs in animals

- Progressive fever
- Weakness
- Muscle tremors
- Difficulty in breathing
- Un-clotted blood coming from body opening
- Stiff body of animal after death
- Death



Anthrax infection in cattle can result in death

5.3.2. Control of anthrax

- Practising quarantine of area where suspicious animal was.
- Carcass (dead body of animal) should be covered to avoid exposure to oxygen (air) so as to limit bacteria to form spores.
- Quarantine and vaccinate all animals near the premises of suspicious animal(s).
- Proper disposal of dead animal preferably by incineration (destruction by burning) or burying the dead animal deep below the soil with quick lime (Calcium oxide - formula: CaO) .
- Clean and disinfect the area to control insect and rodents.



Veterinairians quarantine and vaccinate all animals near the premises of susceptible animal

5.4. Worms

- Worms are internal parasites that affect animals and man, some of the common worms are;
 1. Tapeworm
 2. Liverflukes
 3. Roundworms
- Some of these worms are zoonotic (transferred from animal to human).
- Some common worms in semi-arid areas are for example; *trychostrongylus*, *haemonchus*, *oesophagostomum*, *T. saginata* and *T. soillum*



The picture shows four common worms that live in livestock

5.4.1. Tape worm

- A tape worm is a flat, parasitic worm that lives in the intestines of an animal host. Tapeworm gets its name from its flat shape, resembling a tape measuring ribbon.
- Tapeworm cause hydatid diseases which is a zoonotic diseases.
- Tapeworms need two hosts; For example, definitive hosts who are mostly carnivores like dogs who are intermediate host are mammals who are humans or cattle.
- When dogs scavenge on infected animal carcasses containing cysts, they become infected, they contaminate grasslands with their faeces and when cattle graze on grasses get re-infected when they ingest the cysts.
- When humans feed on raw meat they also get infected.



A close picture of a tapeworm

5.4.1.1. Management of tape worm (hydatid disease)

- Restrict access of dogs to livestock and wildlife carcasses or waste from slaughterhouses.
- Treat dogs with an anthelmintics (active ingredient praziquantel) to kill adult tapeworms.
- Vaccinate livestock against the development of the larval stage of tapeworms.
- Recording cysts detections on meat during meat inspections to target infected farms and communities.

Source: <https://www.woah.org/en/disease/echinococcosis/>



Dogs and wild animals are medium for tapeworm spread

5.4.1.2. Impact of tapeworm on public health

Tapeworms are passed to humans through various practices such as;

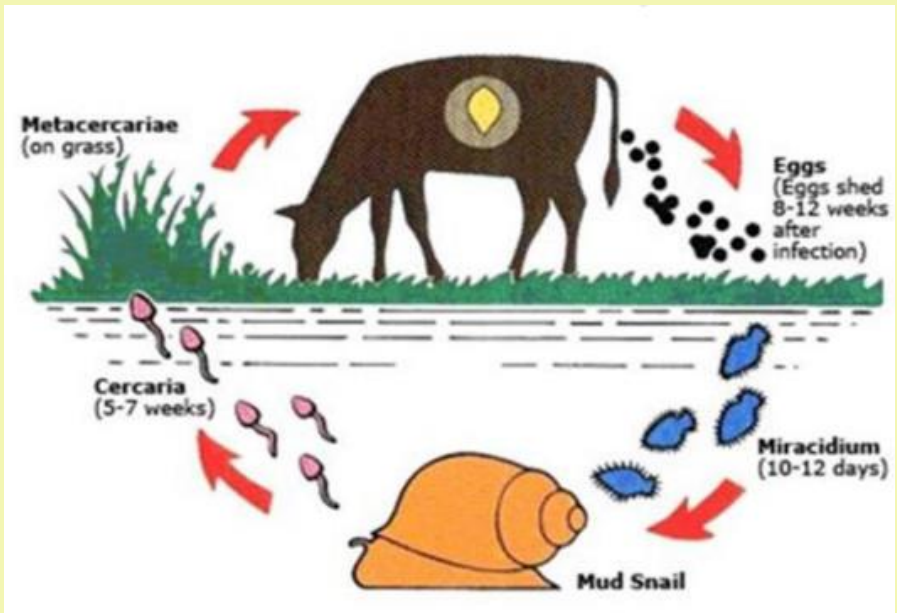
- Eating of raw meat.
- Exercising poor hygiene.
- Lack of access to clean water.
- Poor sanitation and areas with poor sewage disposal systems.
- Area of high risk for example; swampy and marshy areas.



Consuming raw meat exposes a person at a risk of tapeworm and other zoonotic diseases

5.4.2. Liver fluke

- There are two species and *Fasciola hepatica* is common.
- It is mostly found in the bile duct and liver of cattle, sheep and goat. Liverfluke is a zoonotic disease which means humans can be infected
- Liverflukes are commonly found in marshy and low-lying wet areas. Cows are infected when they graze on pasture grasses in such areas.
- For liverflukes to be spread it requires two hosts, that is a freshwater snail and the definitive host (e.g. cattle).
- Snails need to be present for the larvae to develop in the snail for 2-3 months before passing from the snail to form cysts which are then ingested by livestock while they graze on pastures.



Picture illustrates the lifecycle of Liverfluke

5.4.2.1. Symptoms of liver fluke infestation in livestock

- Poor growth
- Diarrhoea
- Dullness and poor thrift/movement
- Chronic wasting and abdominal pain
- Anaemia which is seen through pale gums
- Swelling (oedema) mostly of the lower jaw "bottle jaw".
- Sudden death from liver failure and internal bleeding (common in sheep)
- Liver lesions (seen postmortem)



Liver lesions and Liverflukes can be seen during postmortem

5.4.2.2. Prevention of liver fluke infestation in livestock

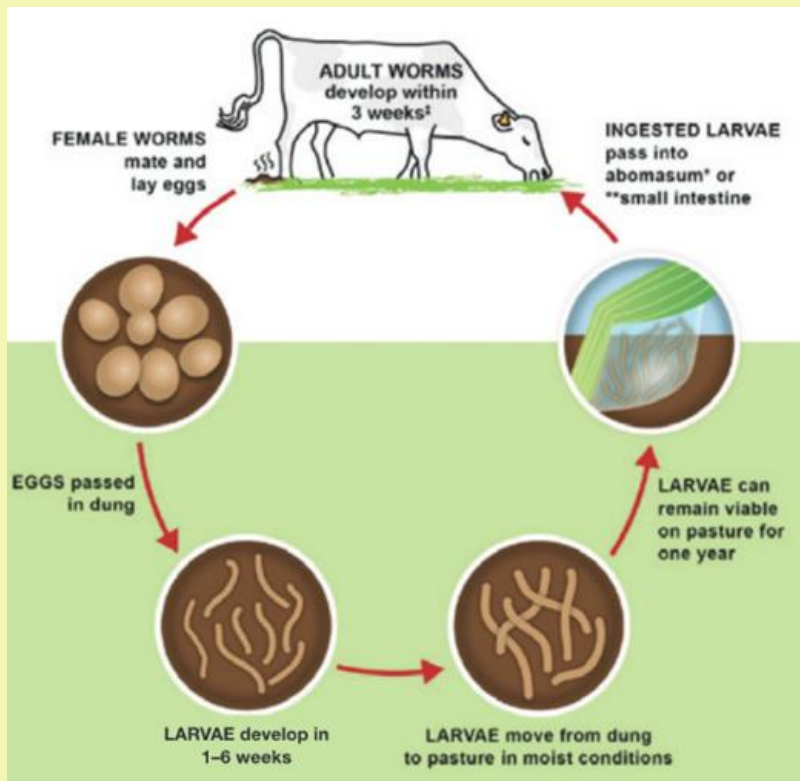
- Avoid grazing in marshy/wet areas near rivers, streams or lakes.
- Properly and regularly clean water troughs.
- Provide water to cattle using troughs that above the ground.
- Drench all animals coming from areas susceptible of liverfluke as prescribed by the veterinarian.
- Regulate the use of areas that are susceptible to liverflukes or swampy zones in the grasslands, for example; use water sources during dry season.
- Control intermediate hosts (snails) using molluscicides (snail baits)



Avoid grazing your livestock in marshy/wet areas. Ensure that the drinking area is dry and clean for example providing water troughs like in the picture in the left

5.4.3. Roundworms

- Roundworms are parasites that are found in cows in various parts of the body.
- Roundworm spread occurs when contaminated soil, food or plants or animal faeces are accidentally placed into the mouth and ingested or swallowed.
- Grazing animals are exposed to round/gut worms which influences their production, younger animals are most at risk until they get their immunity.
- Larval worms accumulate on pasture over the grazing period. They mostly damage the liver and lung tissues as they move to other parts.



Picture illustrates the lifecycle of roundworms

5.4.3.1. Signs and symptoms of roundworms in livestock

- Calves experience profuse watery diarrhoea.
- Constipation and variable degree of anaemia- mucous membrane show snow white colour.
- Poor production by cows for example; rough coat
- Issues with reproduction.
- Poor feed usage/loss of appetite.
- Oedema (bottle jaw)
- Poor weight gain among animals or progressive weight loss.
- Rapid breathing and coughing in young calves.



Picture of small intestines infested with roundworms can be seen during postmortem

5.4.3.2 Causes and control of roundworms

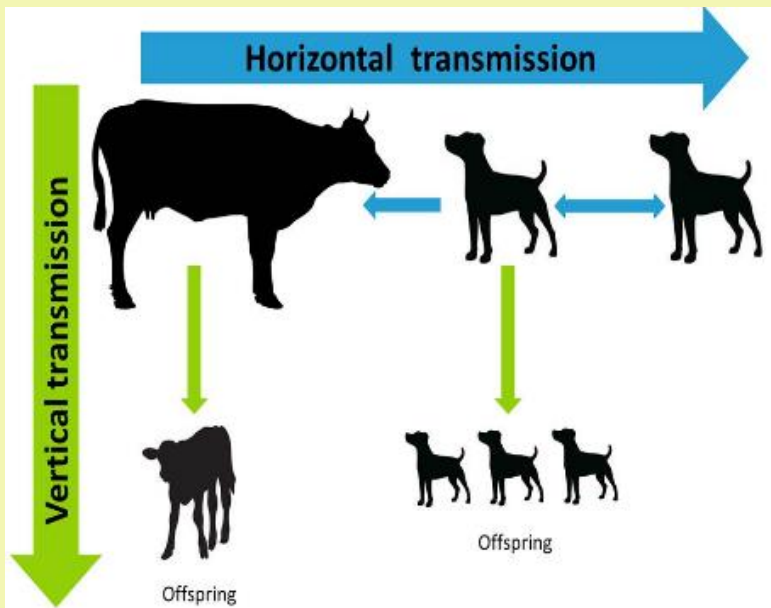
- Roundworm is caused by poor standards of hygiene and contamination of water and food by manure containing the larvae is another way it is spread.
- Cattles acquire immunity when exposed to roundworms. However, it takes relatively long time and older cattle tend to have smaller burdens of adult worms than young cattle.
- Practice good pasture management by restricting and monitoring grazing through the following methods:
 - Avoiding over grazing
 - Practice paddocking where possible or rotational grazing practices.
 - Avoid marshy, low-lying areas
 - Allow grasslands to have rest periods for at least 10 weeks.
- Control using broad spectrum anthelmintics as prescribed by the veterinarian.



Round worms can be controlled using broad spectrum anthelmintics as prescribed by the veterinarian

6. Means of transmission of worms to humans

- Feeding on contaminated meat from livestock.
- Feeding on partially cooked meat (especially roasted meat) or feeding on raw meat.
- Unhygienic handling of meat, that is eating with unwashed hands and poor handling of meat.
- Handling of dog's faeces with eggs.
- Defecating in bushes which end up washed up into water sources causing water contamination.
- Walking barefooted.
- Roaming pigs.



Means of disease transmission can be vertical or horizontal

7. Economic effects of poor public health

- Spread of disease to other animals, for example; diarrhoea.
- Reduced productivity of animals due to poor health leading to, for example; drop in meat and milk production, poor hides and skins quality.
- Presence of worms lowers meat value.
- Losses due to condemnation at meat inspection.
- Expenses incurred when handling infestation caused on animals and man during treatment.



A worm seen in the meat tissues of cattle

8. Management of animal and public health

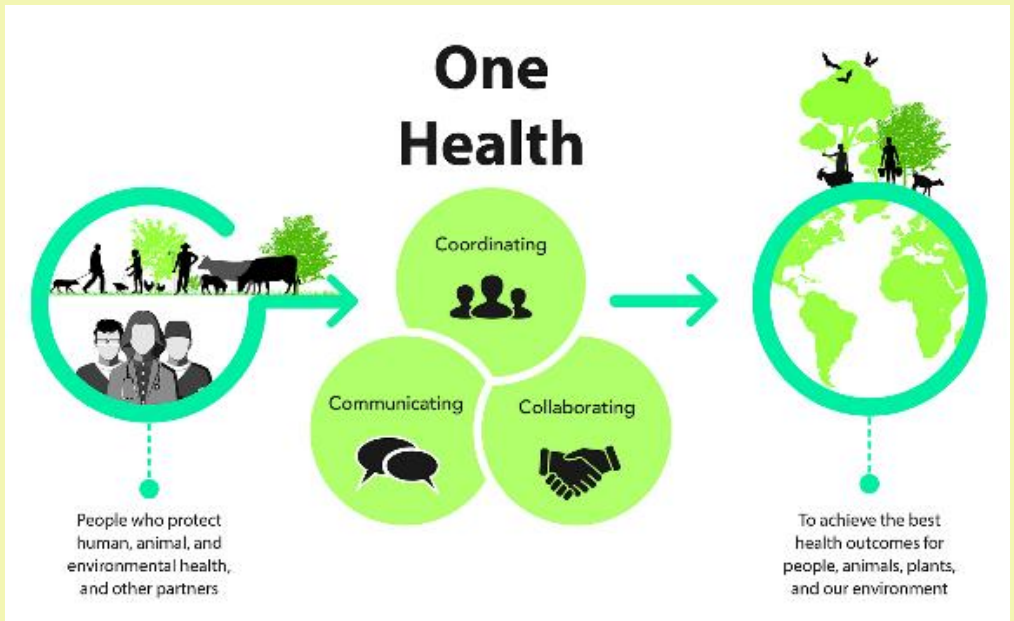
- Deworm livestock routinely, for example; every 3 months or as frequent as advised on the label of the product.
- Practice self-deworming routines for humans
- Restrict dog-human contact.
- Consume inspected meat that is passed as fit for human consumption.
- Use toilets and use them properly and avoid defecation in the field or public areas.
- Wash hands properly before eating.
- Wash fruits and vegetables before eating and cooking.



Meat inspectors in Kenya Meat Commission (KMC) plant inspecting meat before packing meat products for human consumption

9. One health approach

- One health is an approach that links health practices in human, (domestic) animal and the environment (e.g. wildlife) to efficiently deal with infectious diseases that spread between these systems.
- One health is a collaborative effort between these three disciplines to work together so as to attain optimal health in humans, (domestic) animals and the environment.
- Everyone in the livestock production chain to contribute towards sustainable food production, this is possible through well-established traceability mechanisms along the chain.
- Good animal husbandry practices, production land processing leads to better handling leading to maximum use of resources leading to better returns.



To achieve healthy animal products and by-products there are multiple key player in the value chain

9.1. One health approach explained

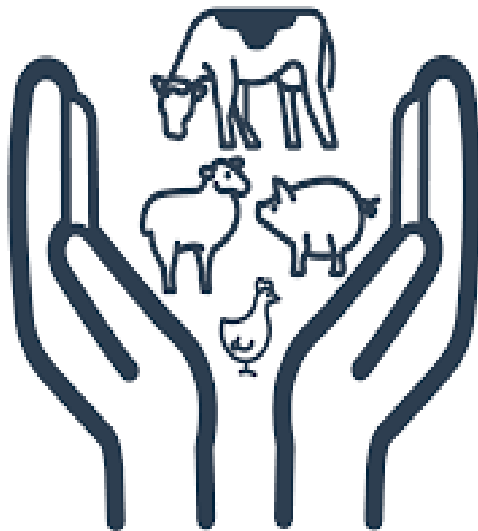
- One health identifies that all living systems in the environment is interconnected and stressing one system (human, animal and environment) affects the other system in one way or the other.
- For example; Shifting grazing into forest and destroying wildlife habitat makes wildlife to shift (closer) to human habitat (settlement) and through domesticated animals spread infectious diseases to human beings.
- Treating domestic animals (dogs) reduces spread of infectious diseases to human beings. For example; rabies
- Understanding the impacts that each system has to other systems, cooperating with the different sectors (doctors, veterinarian etc.) through communicating and education the public we can achieve one health.



The impact of one health approach in the different environments

9.2. One health through animal welfare

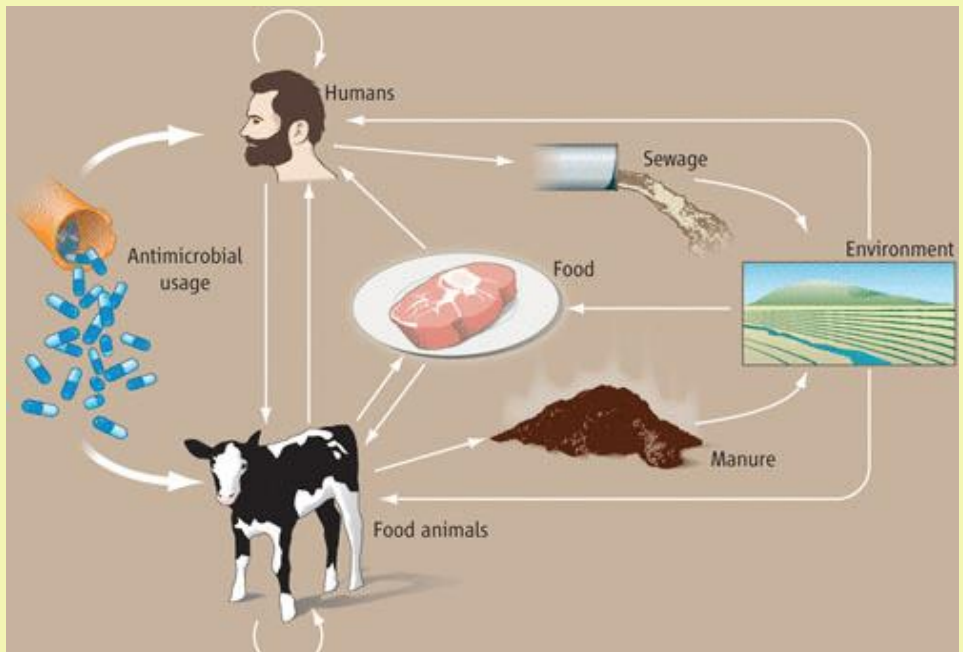
- Good animal welfare is an ethical responsibility that ensures good health and productivity.
- Well maintained animal welfare is shown to reduce stress and improve yields.
- This can be done through; good feeding and access to water freedom from pain & injury, providing lighting, air/ ventilation, good physical state and mental state of the animal.
- Good animal welfare approaches is also a reflection of human wellbeing.
- Communities that care for their animals tend to work and maintain farming practices that care for the environment while securing availability of animal-derived products.



Humans play a big role in protecting both animal and human welfare needs

9.3. Antimicrobial use and source of antimicrobial resistance

- Antimicrobials are used to prevent and treat diseases in food animals like cattle and poultry. Note that nearly all the classes of antimicrobials used for humans are also used on animals.
- **First**, resistance can occur through food-borne routes that is when animals and humans eat food infected by enteric bacterial pathogen for example; Salmonella infections.
- The **second** way is through direct contact between animals and humans through the spread of bacteria and antibiotic residues spread from animals to the environment.
- Spread of manure is the common way in which they are spread, manure introduces these bacteria in the environment and wild habitat making these environments resistant and a source of re-introduction into the animals (food-animals e.g. cattle) and human bodies.



Source of antimicrobial resistance in both humans and animal

9.4. One health approach and antimicrobials

- Caution should be taken when using antimicrobials so as to reduce food safety issues and reduce resistance in future.
- It is important to note that the use of antimicrobials in animals contributes to a rise in antimicrobials in humans hence the need to monitor antimicrobial use in animals in farms.
- Farmer should adopt better animal health and welfare practice to prevent the use antimicrobials.
- These practices are for example; adopting biosecurity measures in farms and early immunization.

Good animal husbandry practices



Balanced feeding practices



Scheduled vaccination as an approach to good health management



Comfortable housing



Good environment to allow normal behaviour expression by animals

9.5. Management of antimicrobials

- Communities should be taught, and policies put in place to control over-prescription and controlling access of antimicrobials to ensure proper use of it.
- For disease prevention farmers can practice good farm practices, adopt biosecurity, use vaccines and immune modulators.
- For growth promotion use of antimicrobials should be banned and waste before disposals like sewage should be treated to eliminate residual antimicrobials.
- Development of resistance to antimicrobials should be monitored at farm level by farmers through veterinarians and recorded for regional-national managements as well as by other stakeholders like doctors for better identification and action against future rise to resistance of antimicrobials.



Public health practitioner on house-to-house vaccination program

10. Sustainable food production practices

- Farmers and stakeholders can ensure longevity through sustainable practices such as;
 - Selecting suitable livestock species for the area in question.
 - Identifying suitable routes of producing or accessing good quality feeds.
 - Safeguarding water sources and access by animals.
 - Practising sustainable production through for example; ensuring animal welfare and keeping good biosecurity measures.
 - Access to quality veterinary products and services.



Healthy cattle, healthy product and by-products for human



Ministry of Foreign Affairs of the Netherlands

About the ICSIAPL Project

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