Winter…
Pneumonia time!

As winter approaches, colds, flus and other respiratory diseases are on the rise. Not just with us humans, but certainly also in animals. Pneumonia is quite common, and can cause big problems in your herd!

Pneumonia (Afr. longontsteking) refers to inflammation of the lungs. It occurs all year round, but usually peaks in winter, and especially late winter. Cold weather, winds, dust and big temperature differences between day and night makes animals more vulnerable for pneumonia. In this article we go deeper into this complex topic. We start off with the basics, how does the respiratory system protect the body? Then we explain what pneumonia exactly is, how you can recognize it, and how you can protect your animals against it.

The airways

To understand what pneumonia is, and how it can affect an animal, we first need to understand how the airways protects the animal against diseases.

The airways, or the respiratory tract (Afr. lugweg, Figure 1), is the part of the respiratory system that moves air in and out of the lungs. The upper airways include the nasal cavity, sinuses, pharynx and larynx; they basically bring the air into the body. The lower airways are the trachea or windpipe, bronchi and bronchioles, who lead the air into the lungs.

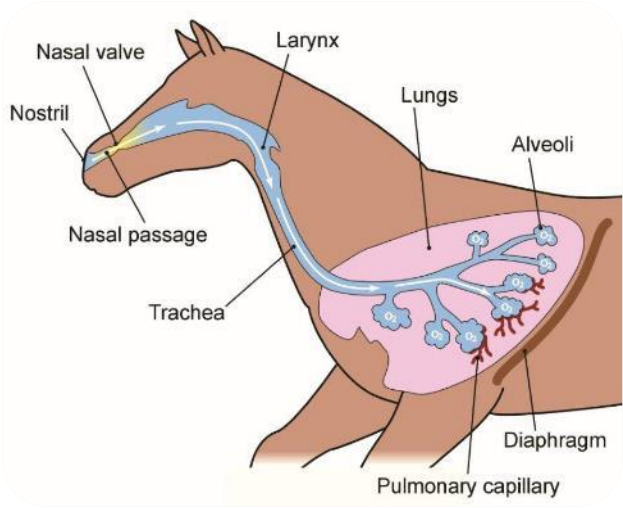

Figure 1 Schematic drawing of the airways in a horse © Flair equine nasal strips

The airways protect the body against harmful particles, such as dust and bad microorganisms. Firstly, as an animal breathes, the airways add moisture and warm up the air before it enters the lungs. Secondly, the airways are lined with a smooth, moisture-covered mucous, which act as a barrier - the mucous blocks and traps harmful micro-organisms from getting in. Parts of the airways have little bristles, who actively work the mucous (with possible bad micro-organisms) layer upwards. By coughing or sneezing, it is worked out of the body. In the mucous layer are antibodies that work against specific disease-causing organisms that the animal has been previously exposed to (e.g., by getting sick, or by vaccination). Down in the lungs are also specifically adapted white blood cells that can neutralize harmful micro-organisms.

When compared to their body size, the lungs in ruminants (Afr. Herkouwers); cattle, sheep, goats, antelopes etc.) are relatively small. Thus, if just a small part of the lung is affected, it can quickly affect the breathing capacity of the ruminant.

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What is pneumonia?

Pneumonia is an inflammation of the lungs, and is often caused by an infectious agent, such as a virus, bacteria or fungi. A combination of factors, such as an infectious agent together with cold weather, certain types of animal management and a poor immune system can increase the risk of a pneumonia. Pneumonia causes a swelling of the tissue in part of the lung, the one lung, or both lungs, and the air sacs may fill with fluid or pus (Figure 2).

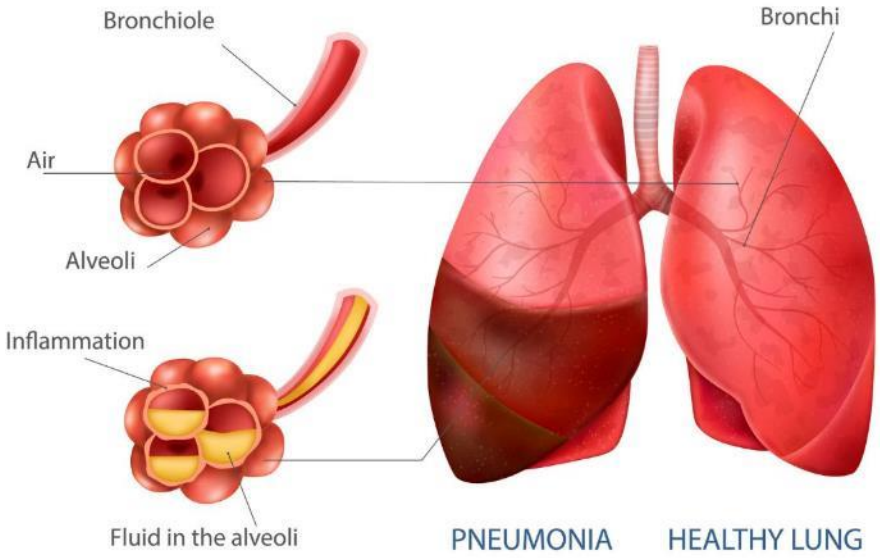

Figure 2 Pneumonia is a condition that causes an inflammation of the air sacs in the lungs. This infection can be caused by bacteria, viruses and fungi, and the risks of a pneumonia can be increased by factors such as the weather, management practises, a poor immune system, etc. © Continental Hospitals

Some viruses that can lead to pneumonia are *Bovine Rhinotracheitis* (IBR), *Bovine Respiratory Syncytial* (BRSV), *Parainfluenza 3* (P13), *Bovine Virus Diarrhoea* (BVD), etc. Examples of bacteria that can be involved are *Mannheimia hemolytica*, *Pasteurella multocida*, *Histophilus somni*, Salmonella spp., and Mycoplasma spp.

In contrast to the above-mentioned diseases, aspiration pneumonia, which is due to inhalation of some foreign material (e.g., bottle-fed animals might get milk in the lungs), is not a contagious disease.

Some micro-organisms, such as Pasteurella, occur naturally in small numbers in the upper respiratory tract of animals. Under normal circumstances, this is not a problem. But, if the natural immune system gets compromised, these bacteria may spread, and can enter the lower airways and the lungs. This can then cause a serious pneumonia, and death might quickly follow.

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How to recognize a pneumonia?

The lungs are sensitive organs, and pneumonia can quickly kill an animal. If effective treatment is given early enough it can recover, but often the lungs are damaged for life. This becomes evident in production animals, where growth is retarded or milk production is reduced. If the animal survives the pneumonia, the affected lung tissue might transform into connective tissue, which contracts or causes adhesions. This affects the animal's lung capacity, and the production capacity of the animal over time. It is thus important to recognize and treat pneumonia early! Daily observation of the animals, and rapid examination when an animal starts showing symptoms can lead to successful treatment.

Signs of pneumonia can be: nasal/ocular/oral discharge, depression, lethargy, emaciated body condition, laboured or rapid shallow breathing, coughing, extended head and neck, and hanging ears (Figure 3).

It is important that you, but also your workers, look for the following signs, and take note of the timeframe of the developing symptoms:

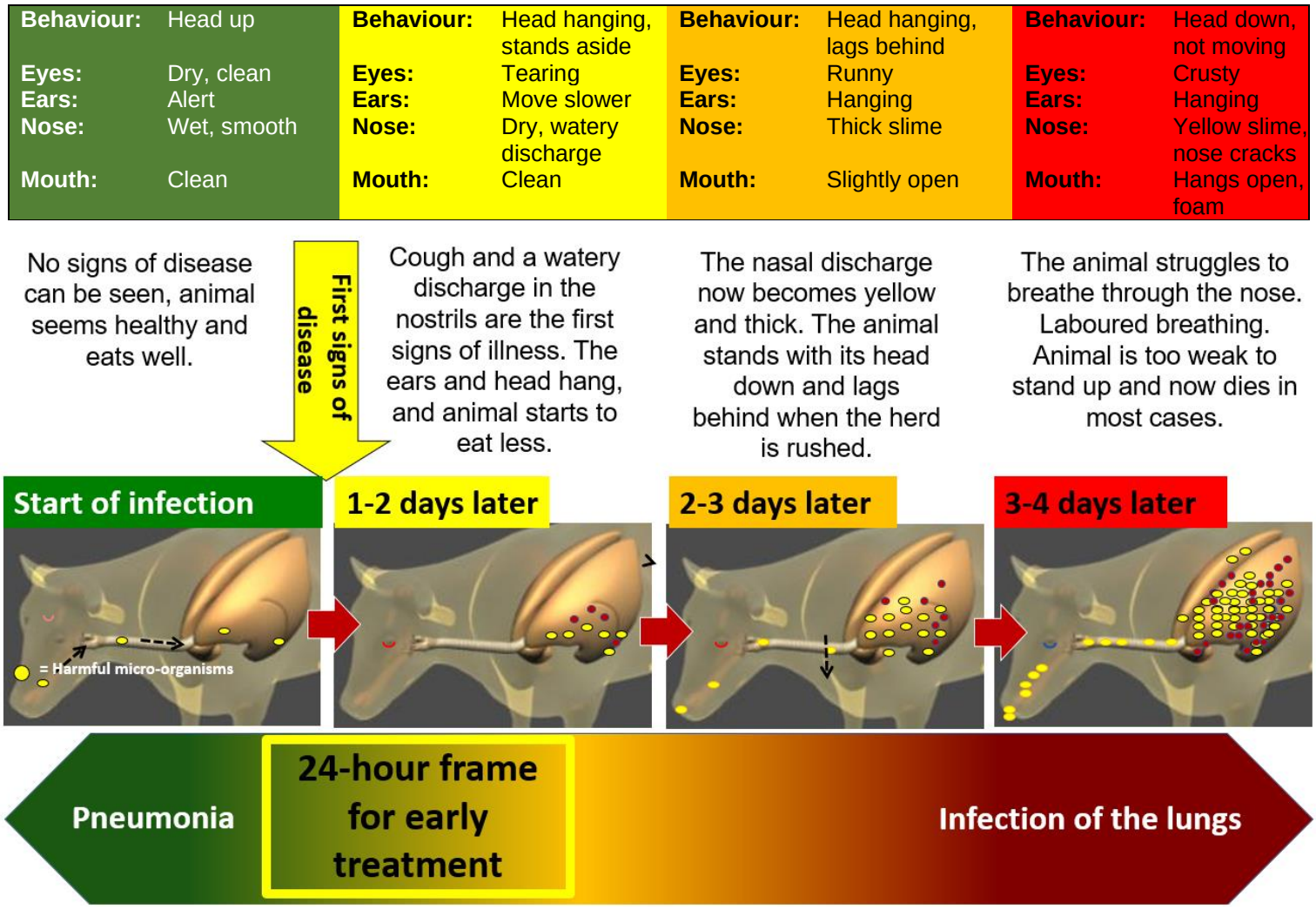

Figure 3 Signs of pneumonia over time © Dr Danie Odendaal

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Early identification of pneumonia determines the success of treatment. As soon as you or your workers see any signs of disease, the animal needs to be examined. Start by measuring the rectal temperature. If the animal has a fever (>40°), you can be quite sure there is a systemic infection (meaning affecting the entire body), such as a pneumonia, in the body. In such cases, call your vet and don't waste time!

When treatment is started early enough, the animal can fully recover. When treatment is started late and the animal survives, the lungs will be permanently damaged.

Post-Mortem findings

When you find an animal dead, it is important to contact your vet, and do a Post-Mortem examination. In case of a pneumonia, you will specifically see the lungs being affected. Normal lungs should be pink, uniformly soft & spongy. In case of pneumonia, the lungs often feel firm, and are discoloured. This can be patchy, or all over the lungs (Figure 4, Figure 6). The lung surface may be covered with lines (fibrin strands), and it may stick to the rib cage (adhesions, Figure 5).

It is important to know that just a discoloration of the lungs, does not necessarily have to mean a pneumonia. When an animal dies and lies on a side for a while, blood pools at the bottom. Therefore, it is important to feel the lungs – are they soft and spongy, or rubbery or firm (like a liver)? Samples can be taken in formalin, and send off to the lab.

Figure 4 Pneumonia in a roan antelope © U. Tubbesing

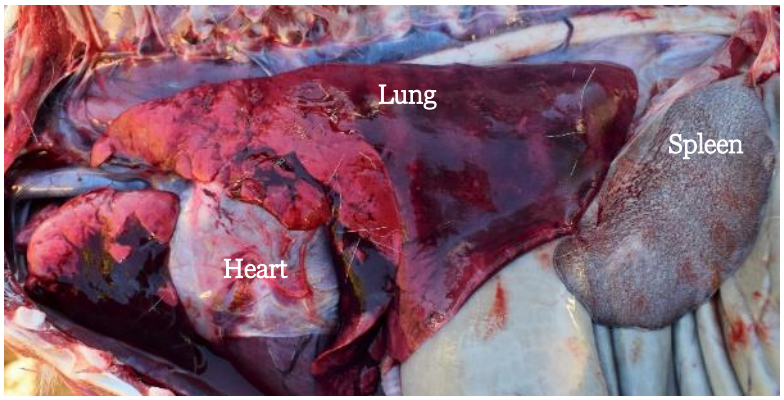

Figure 6 Severe pneumonia in a springbuck

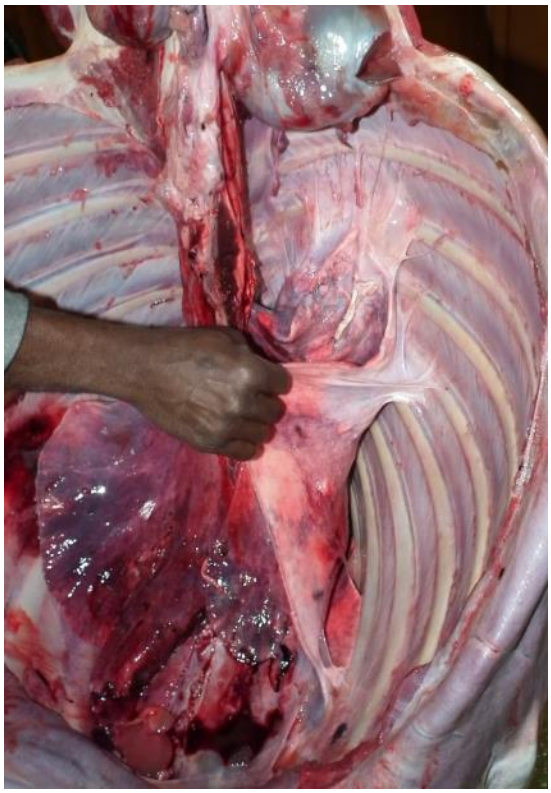

Figure 5 Lung adhesions to the rib cage in a roan antelope © U. Tubbesing

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Treatment

Pneumonia is a serious condition, and veterinary care and the right drugs are needed! Most antibiotics that farmers have at home are over the counter antibiotics (e.g., tetracyclines and sulphonamides). These antibiotics are 'bacteriostatic'; they suppress the growth of bacteria and work slowly. In cases of a pneumonia, the animal needs a "bactericidal', that works quickly and kills the bacteria. These can only be obtained from a vet.

Not all antibiotics are equally effective in the treatment of pneumonia. Discuss the pneumonia outbreak with your veterinarian to ensure that he prescribes the optimal antibiotics. Giving an anti-inflammatory injection will also be of benefit. It is advisable to also inject the animal with a multivitamin/mineral. If possible, isolate the affected animal(s), provide improved housing (warmth/shelter from dust) and proper nutrition are further essential components.

What predisposes to pneumonia?

Bacteria, viruses and fungi can all cause a pneumonia. As you now know, normally the airways and the body fight off any possible invaders that can cause a pneumonia. But there are circumstances that can lead to a higher risk of your animals getting a pneumonia.

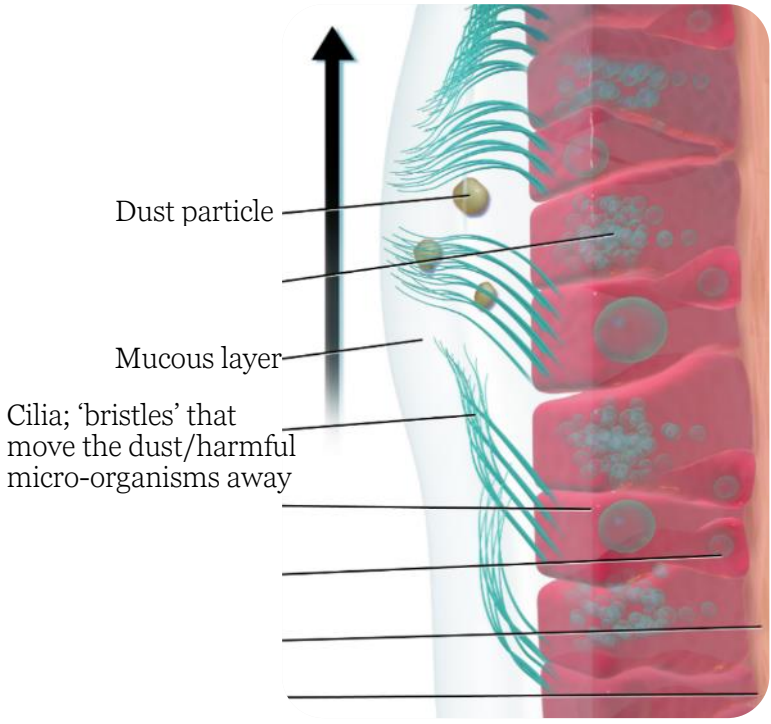

Figure 7 The bristles in the airways make a 'waving' motion, which transports the mucous (with the trapped dust particles and micro-organisms) outside of the body. © Blausen

- **Dust** is probably one of the most important causes that will affect the functioning of the normal protective mechanism of the airways. Too much dust can 'overload' the system (all the inhaled particles need to be trapped and transported out), but it is also a carrier for disease-causing micro-organisms. When animals stand in a stable with a lot of manure, a variety of organisms will build up. They will enter the animal via dust particles, and when the body cannot get rid of all this stuff, it might enter the lungs, and make the animal sick.
- **Cold** has a negative effect on the speed of the bristles in the upper airways, as they move slower when it is cold. The animal's body also needs to work harder to keep its temperature up, especially when the temperatures between night and day vary a lot. Exposure to cold leads to an increased secretion of cortisol. While cortisol has beneficial functions, it also suppresses the general disease resistance of the immune system. Remember, the worst form of cold exposure is when animals are transported on an open truck!
- Some **viruses** can cause damage to the mucous membranes of the airways. Although they are usually not the primary cause of the pneumonia, they make the mucous membrane's defense mechanism weaker, so it is easier for micro-organisms to enter. Other viruses, such as Bovine Virus Diarrhea (BVD) and Infectious Bovine Rhinotracheitis (IBR) damage the mucous membranes, but also suppress the immune system. Viruses have the best change of making an animal sick when the animal is in a stressful situation, such as calves/lambs being weaned, animals on transport etc.

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- Malnutrition
  - Any disturbance in **macro nutrition** (energy, proteins and minerals) can decrease the animal's immune system way before any other related problems can be observed. An example is the low availability of protein in the veld in autumn, winter and early spring. Calves and lambs that just got weaned undergo not just a lot of stress, but also a big nutritional change. In case of livestock, it is important to supplement the youngsters with a high-protein (not just urea) weaning supplement for 2-4 weeks.
  - A deficiency in certain vitamins and trace elements (**micro nutrition**) can also cause a decrease in the animal's immune system. A good example is vitamin A, which normally keeps the cells of mucous membranes healthy. This vitamin is stored in the liver, but the storage is usually depleted 3 months after the last green grass was available.
  - When **water** is not available, and animals are (partially) dehydrated, the mucous membranes can dry out, and cannot perform optimally anymore. This is especially important in areas where animals have to walk long distances to get to water, and during long-distance transport where there is no water available.
- Other causes of **stress**. When an animal is stressed, the body reacts. Adrenaline is secreted to make the animal ready for a 'fight or flight' response. Blood supply to the muscles and nervous system is increased, but the blood supply to for example the liver and digestive tract (which is needed for digestion, absorption and metabolism) is reduced. If the stress situation persists, this has a negative effect on the animal's metabolism. Additionally, in stressful situations cortisol is secreted. When stress persists, this increase in cortisol will suppress the natural immune system. Stressful situations are for example:
  - The weaning of calves/lambs
  - Change in environment (translocations)
  - Change in group composition

  Remember, the weaker individuals in the group are the ones that have a higher risk of getting a pneumonia.

Prevent a pneumonia

Prevention is always the best cure! Farmers can take preventative measures against pneumonia by eliminating and/or limiting the predisposing factors that can lead to a pneumonia. Protect animals against dust, extreme cold weather (provide shelter), make sure there is clean water and proper nutrition available and limit stress. Make sure that you and/or your workers monitor animals closely. As soon as the first signs of a pneumonia are seen, contact your vet.

Vaccination is also an important tool in limiting pneumonia. A vaccination at the beginning of winter can help to re-active the animal's immune system. The vaccination will stimulate the making of high levels of antibodies, so when a disease-causing organism enters the body, the immune system will respond quickly.

In cases when calves are weaned and go to a feedlot, vaccinate them at least 2 weeks before the event. Studies in South-Africa have shown that this reduces the incidence of pneumonia up to 50%.

Pneumonia is a complex disease, and vaccinations will not completely prevent it, but it will help to increase the animal's resistance, and in limiting lung damage. For more information on how vaccination works, read our article 'How vaccination leads to immunity'. It is important to make a vaccination schedule in consultation with your vet, so specific disease-causing organisms can be tackled.

We like to thank Dr Danie Odendaal for sharing his interesting articles with us, thanks to his insights and information we could create this article! For more information on the Pasteurella bacteria that can cause pneumonia, read our 'Pasteurellosis' article. Another article which fits well with this pneumonia topic, is 'Animals and cold weather'.

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