Wildlife Vets Namibia September 2020 Edition 30

NEWSLETTER SEPTEMBER

In this newsletter:

Dear clients,

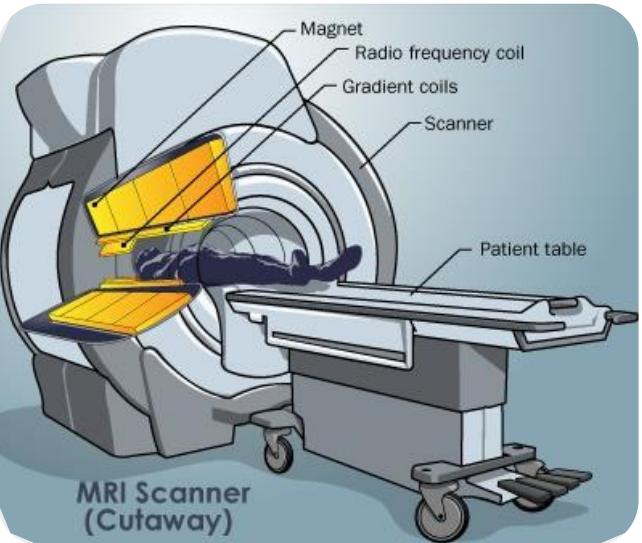
It looks like things start clearing up, the first rains have been reported and our country is finally open again! We hope that the last quarter of the year brings many good things for you. Recently we had a cheetah that needed an MRI scan, and in this newsletter we attempt to explain how this complicated machine works 😉. We also give a summary of our final rabies article, about how vaccination leads to immunity. Don't forget to watch our new rabies video, we hope you enjoy it! Kind regards, Ulf and Mariska

A CHEETAH 'DOWN THE TUBE'

Last month we had quite a special case. One of the Cheetah Conservation Fund (CCF) cheetahs had, by what it seemed, neurological issues, such as tremors (shaking movements) and he was a bit uncoordinated. X-rays and clinical examinations did not lead to a diagnosis. To find the underlying cause, the cheetah had to undergo an MRI scan. The cheetah was taken to Rhino Park Veterinary Clinic (RPVC) in Windhoek, and sedated. From here we took him to Medical Imaging at Mediclinic.

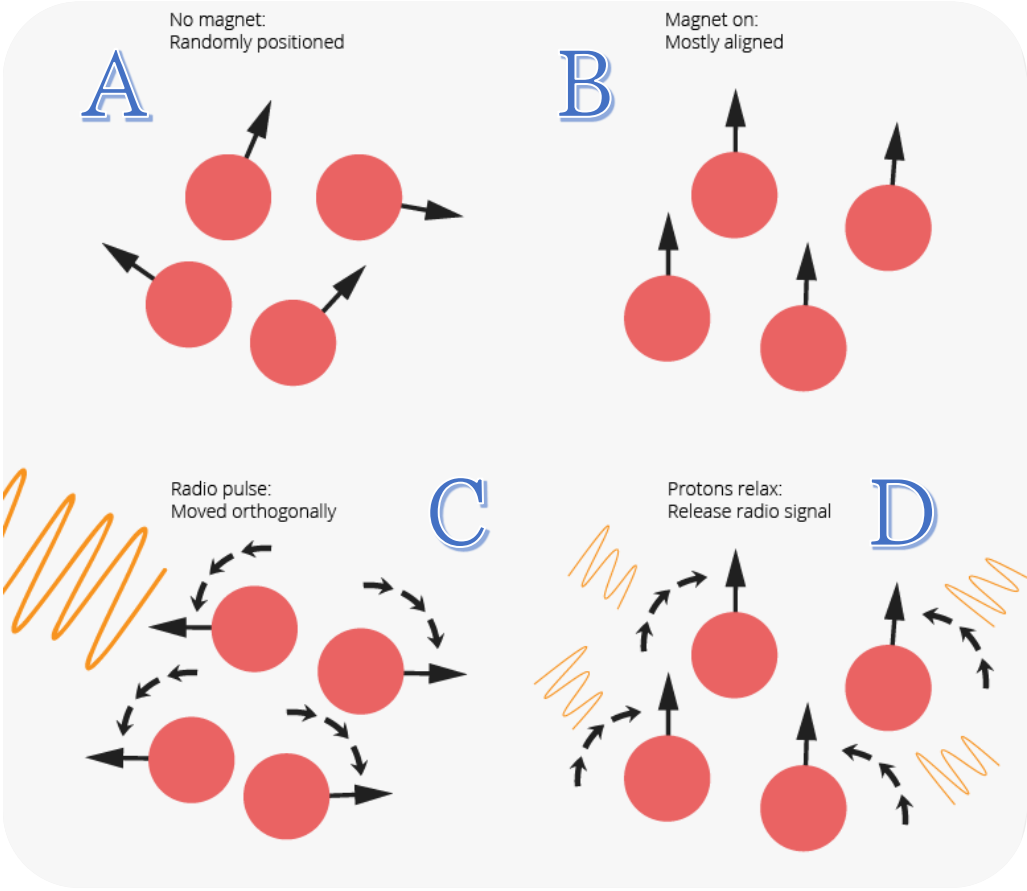
Dr Minty Soni (RPVC), Mariska, Enias (RPVC) and Dr Laurie Marker (CCF) monitor the cheetah before the MRI procedure starts © CCF

MRI is short for '*Magnetic Resonance Imaging*'. The machine uses powerful magnets (roughly 1,000 to 3,000 times stronger than a fridge magnet), radio waves and a computer to make detailed pictures of the inside of a person or animal. With an MRI a radiologist can diagnose problems with joints, cartilage, ligaments and tendons, but also infections, inflammatory conditions or tumours. An MRI image can show things that cannot be seen on an X-ray, CT- or ultrasound scan. It is a safe and painless procedure and the best way to "have a look" inside a patient, without cutting it open.



To explain how an MRI works is quite a complicated and technical story, but we try to keep it simple 😉 A body consist mostly of water molecules (H_20), and these molecules consist of hydrogen (H) and oxygen (O) atoms. In the centre of the hydrogen atom is a small particle, called a '*proton*'. You can compare a proton with a tiny magnet, it is very sensitive to magnetic fields. When the person or animal goes into the MRI, the magnetic field of the MRI interacts with these protons.

The components of an MRI system © HowStuffWorks.com



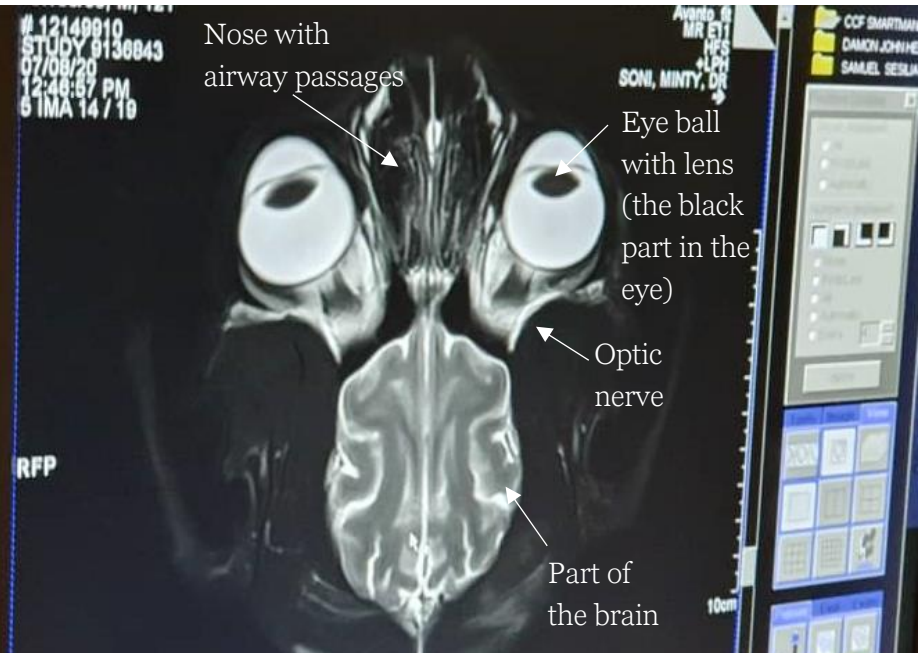
Simplified schematic overview of how the protons react during an MRI scan © B. Farnsworth

Normally, the hydrogen protons spin in random directions in the body, around their individual magnetic fields (A). When the body enters the strong magnetic field of an MRI, the protons line up in the same direction (B).

Then the MRI machine sends out radio waves to certain areas of the body. These signals basically knock the protons out of their alignment (C). These radio waves are only sent out for a short time, and the protons relax and realign again. This is now the crucial part... As the protons relax, they send out radio signals (D). These radio signals can be detected by receivers in the MRI machine.

The computer can, based on those radio signals from the protons, determine what the tissue looks like. Protons in different body tissues return to their normal status at different rates. So the computer can make out what body tissue it is, and produces very detailed images. To obtain a better idea of lesion location and size etc. many sequential images are taken in different planes. The radiologist can scroll through all of them to see if there is a problem anywhere.

Unfortunately, the MRI images did not lead to a diagnosis for this cheetah, but it did rule out certain common causes such as tumours and a slipped disk. The cheetah is now on medication, and has improved.



One image of the cheetah's head, this shows you how detailed these MRI images are. The MRI takes many many images; basically slices of the body © CCF

RABIES IN KUDU AND ELAND #3: HOW VACCINATION LEADS TO IMMUNITY

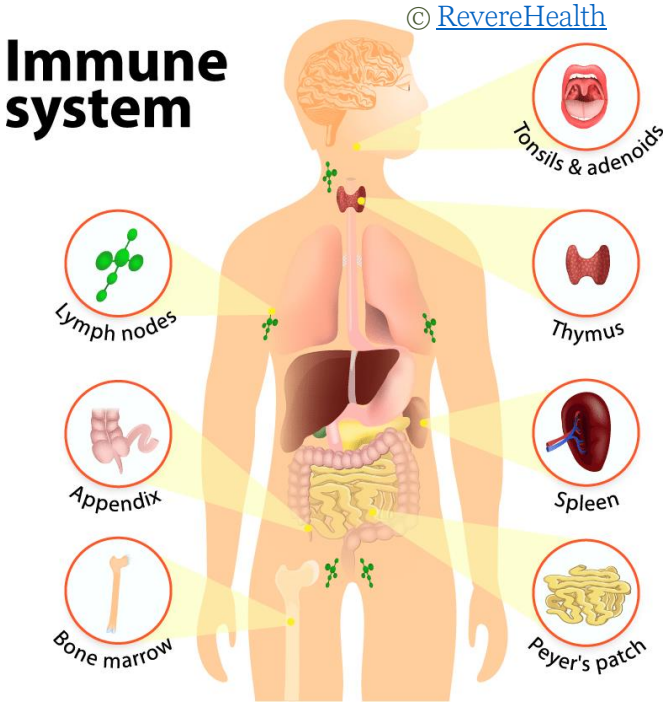
Lately we have spent quite some time on the topic rabies. So far we have written two articles;

- Rabies in Kudu and Eland #1: Implications to the game industry → how is rabies transmitted, what are the symptoms and how can you prevent a rabies outbreak on your farm?
- Rabies in Kudu and Eland #2: Herd immunity in rabies and COVID-19 → here we discuss several concepts such as herd immunity and social distancing, and explain the similarities and differences between rabies transmission and prevention compared to COVID-19.

This is a summary of the final article in this series; Rabies in Kudu and Eland #3: How vaccination leads to immunity. In this article we explain how immunity works and how animals and humans become immune to a disease after a vaccination and/or natural exposure. You can read the full article online. Also check out our new rabies vaccination video!

The immune system

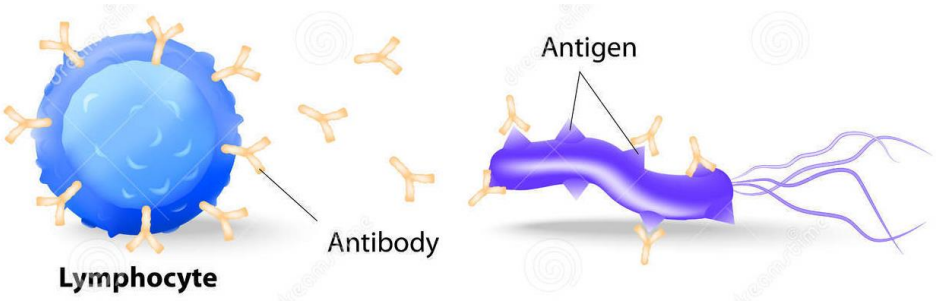
Human immune system
© RevereHealth



The immune system is made up of a specialized network of cells, tissues and organs that work together and are constantly on the lookout for invaders such as bacteria and viruses. Its function is to prevent or limit infection. The immune system can differentiate between normal healthy, and unhealthy cells, by detecting proteins that are found on the surface of all cells. Some recognise invaders and then trigger a chain reaction, leading to the formation of antibodies and the eventual destruction of the invader by inflammatory cells.

The immune system is very complex, and consists of specialised cells located in different organs (for examples, see the picture on the right).

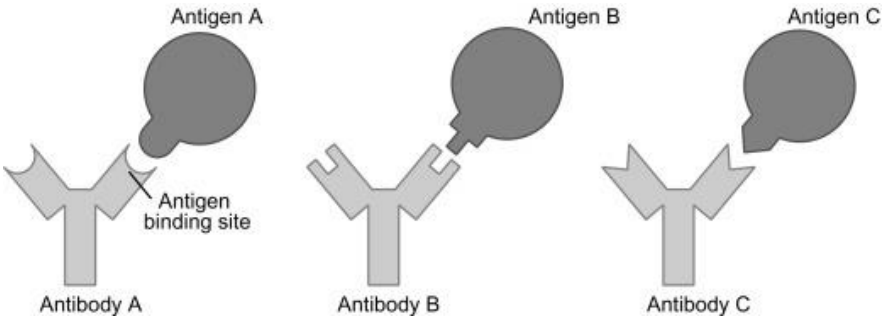
When a disease organism enters the body, the immune system picks up specific organism surface characteristics, called antigen (Ag). This triggers the immune reaction, with the B lymphocytes (a type of white blood cell) triggering the production of specific antibodies (Ab) (also called immunoglobulins) against that antigen (see picture below). These antibodies attach to the antigen to form a so-called antibody-Antigen complex. This then activates T lymphocytes as well as other white blood cells (phagocytes) who destroy the invaders.



The lymphocytes (a type of white blood cell) create specific antibodies. These antibodies then attack the invader (antigen). © Dreamstime

WILDLIFE VETS NAMIBIA

All antibodies produced are very antigen specific to the bacteria or virus detected. Once an Ab-Ag reaction takes place (lock and key effect), they trigger a specific immune response. These specific antibodies remain in the body, even after the invader has been destroyed. When the same invader enters the body again, the immune system will remember it, and will quickly destroy the invader before it makes the body sick. This protection is called immunity.

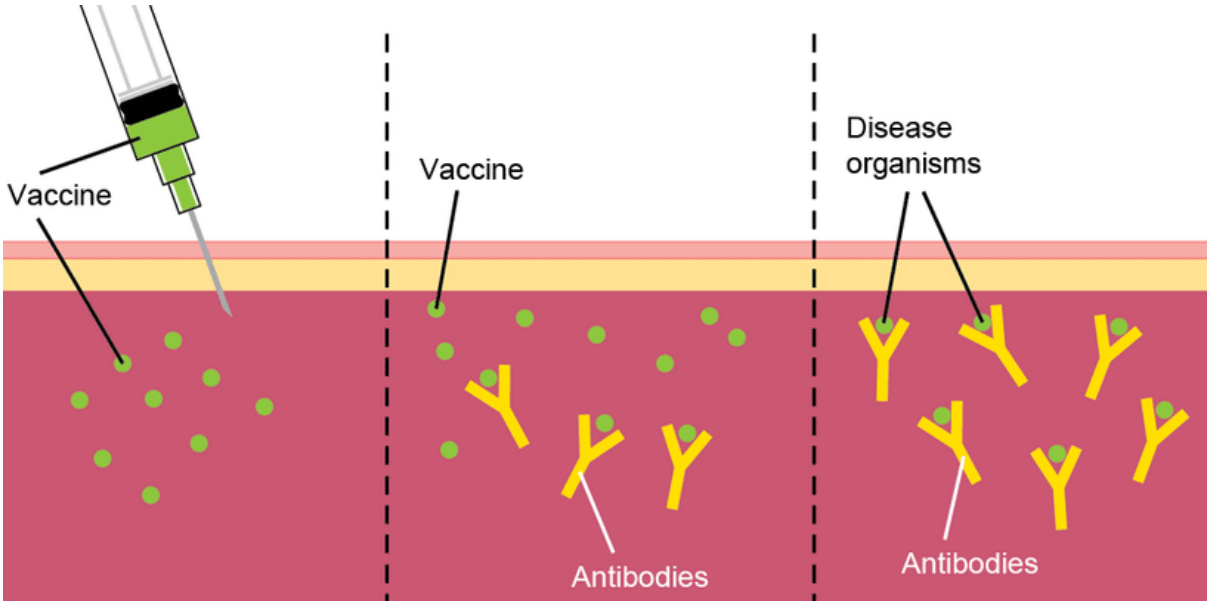


Antibodies are special proteins that lock onto specific antigens. The shape of antibodies varies, and matches the shape of the antigen perfectly. © Thomas M. Chused

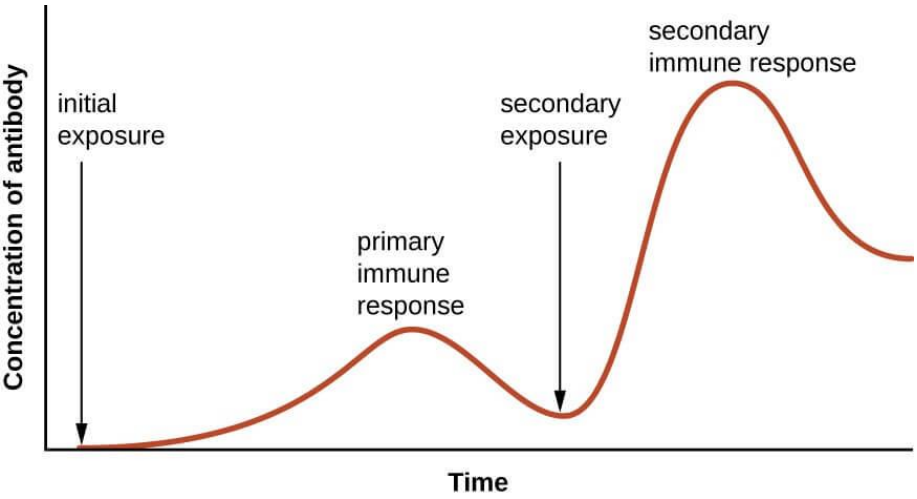
Vaccination

Vaccines provide a patient the opportunity to become immune without having to get sick first. Generally, vaccines are made of killed or weakened versions of the disease-causing organism (antigen). When a vaccine is injected, the body basically reacts in the same way as if it was exposed to the real disease.

The immune system sees the antigen as an invader → it responds by making antibodies → it remembers the antigen and how to destroy it (see below). Next time, when the body is exposed to the specific antigen, the immune system will with the aid of memory cells be able to quickly identify and destroy the disease-causing organism before it can cause disease. This is how immunity is acquired from a vaccine.



Schematic drawing on how a vaccine works; a weakened or killed form of a disease is injected. The body creates antibodies to fight against the disease. Whenever the disease comes back, the antibodies return and destroy the disease © Frank Adusei-Mensah



When an antigen enters the body, an immune reaction will occur after a specific time. If the same antigen enters the body again after a few months or even years, a secondary immune response will be shaped, and the antibodies' response will be faster, and longer-lasting. © *Immune System Health*

Booster vaccinations

As you probably know, following the first vaccination, the doctor or vet wants you, your child or your pet to return for a booster vaccination at a later stage. Why?

When a vaccine is given (or a disease is acquired), the body starts an immune response. The initial rate and magnitude of antibody production is at a modest pace, this is a primary immune response. However, following a booster vaccination or, a re-exposure to the disease, there is a near immediate and massive response by the B and T lymphocytes. Antibodies circulate in massive numbers and rapidly eliminate the disease - this is the so-called secondary immune response.

When a patient is not re-exposed to a disease for a long time (months to years) the body gradually loses the advantage of the "memory cells" with the result that the patient once again gradually becomes susceptible to that disease. This explains why re-vaccination (or booster) is so important.

When we dart vaccinate kudus and eland, we want to stimulate an immunological memory – the immune system must recognize and attack the rabies virus. As explained, the vaccine triggers the production of antibodies, and memory cells that stay in the body. Because the antibodies don't last forever, an annual or biannual booster vaccination is essential. This has been shown in research done on cattle, whereby cattle were vaccinated against rabies. One month after the first vaccination, 80% of cows had rabies antibodies. After 1 year, this decreased to only 42%. In cattle that received a booster vaccination a year after the primary vaccination, it showed that 96% of the cows had rabies antibodies.

Let's put this into an example for kudus. In this example we ignore the fact that rabies antibody levels decline with time and we mostly consider the important concept of herd immunity:

> 2018: We vaccinate 70% of a kudu population with 100 individuals – thus 25 unvaccinated animals in the herd. There is a 25% population growth per year.
>
> 2019: With the 25% increase, the kudu population now consists of 125 individuals. If we don't vaccinate, only 60% of the herd of 125 kudus is now protected (50 unvaccinated kudus out of 125).
>
> 2020: The herd increased to 160 individuals. Now only 43% is protected against rabies, BUT..., this vaccination was given already 2 years ago (how effective is the protection still?).

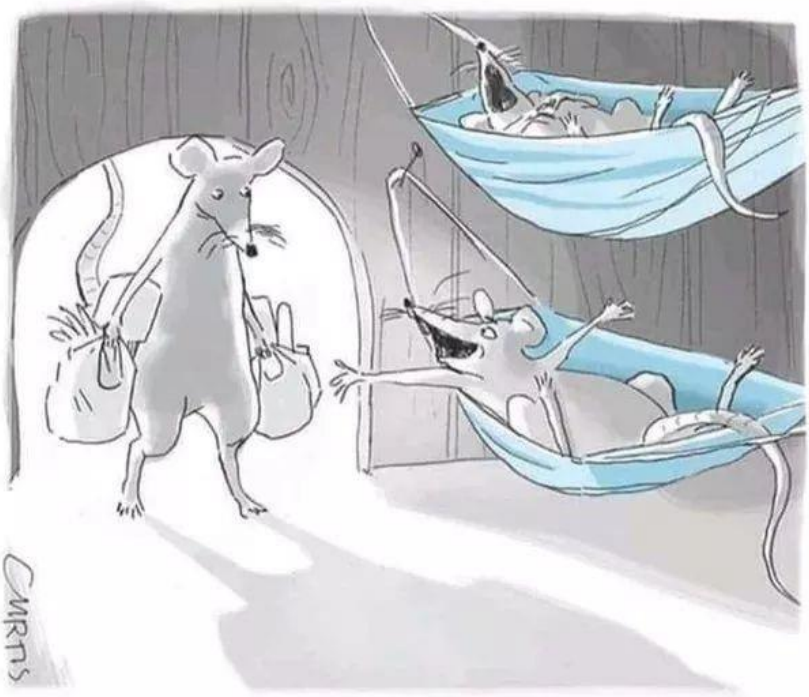
By 2020 there is no herd immunity benefit left for this kudu population. This means that a once-off vaccination is quite useless, unless you give the population a booster vaccination.

Click here to read the entire article, where **we also give some additional important considerations regarding vaccinating kudus and eland**.

WILDLIFE VETS NAMIBIA

If you are interested in vaccinating your kudu and eland population, contact other farms in your area to see if they want to join. The more farms join in, the better the populations are protected, and the cheaper the helicopter ferry- and our transport costs are.

Want to see how the vaccination process goes? Click here or on the picture below to check our rabies vaccination video on YouTube!



"FREE HAMMOCKS, all over town. It's like a miracle!"

DR ULF TUBBESING

P.O. BOX 50533, BACHBRECHT, WINDHOEK

+264 (0) 81 128 3050

ULFT@AFRICAONLINE.COM.NA

WWW.WILDLIFEVETSNAMIBIA.COM

FACEBOOK: WILDLIFE VETS NAMIBIA

YOUTUBE: WILDLIFE VETS NAMIBIA

WILDLIFE VETS NAMIBIA