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Quality Veterinary Diagnostics from Disease to Optimal Health

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LABORATORY FOR CLINICAL DIAGNOSTICS

Third World Congress Veterinary Dermatology (WCVD) Summary

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Our third summary from the digital World Congress in Veterinary Dermatology 2020 (WCVD) focuses on two exciting therapies: biological therapy and bacteriophage therapy. They are old therapies but with a tremendous and developing future in managing complex diseases including resistant bacterial, atopic dermatitis, pruritus and cancer.
Below are some summary points from the talk by Dr Douglas DeBoer on the subject of “Biological therapies in dermatology” and the lecture “Bacteriophage therapy for challenging bacterial infections” from Dr Richard Squires.

Biological Therapy:

What is biological therapy?

Biological therapy is the use of a biological compound, not a chemical, to treat disease. It is designed to stimulate or restore the ability of the body’s immune (natural internal defence) system to fight infection and disease. It is also called biological response modifier therapy (BRM), biotherapy or immunotherapy.
The therapeutic substances may occur naturally in the body or be made in laboratory cultures rather than chemical synthesis. BRMs are not metabolised like a drug, don’t pass through the liver or kidneys, have a long-lasting action in the body and are very targeted.

Which kind of biological therapy and biological response modifiers (BRM) exist?

Biological therapy or immunotherapy can be active (where the immune system has to react) or passive (administration of an immunologic molecule like an antibody (Ab) or something similar).

BRM for active immunotherapy
- Vaccines
- Allergen-Specific Immunotherapy
- Recombinant cytokine molecules such as interferons
  (recombinant canine interferon-gamma/ recombinant feline interferon-omega)

BRM for passive immunotherapy
- Immunoglobulin for severe immunosuppression in humans
- Serum from recovered patients for Ebola, rabies, coronavirus
- Monoclonal antibodies (mAbs)

Allergen-Specific Immunotherapy

Further information on Why recommend ASIT to our atopic patients?
can be found on the BattLab website
https://battlab.com/wp-content/uploads/why-recommend-asit-to-our-atopic-patients.pdf

What are monoclonal antibodies (mAb or moAb)?

They are antibodies made by cloning a unique white blood cell, so all of the Abs are the same, and are directed to bind to a single part of the antigen (epitope).

Why must mAbs be species specific?

Speciation is a key step to decreasing the potential immunogenicity of a therapeutic antibody and avoid rejection.
MAbs are produced from murine cells, they are then engineered and adapted to the species in which they will be used. Always they have a minimal murine portion.

Lokivetmab (Cytopoint®) is a “Caninised” mAb against IL-31 for treatment of pruritus. Adalimumab (Humira®), Omalizumab (Xolair®) are “humanised” mAbs. They can’t be used in other species.

Are there be adverse effects with mAbs?

There are no concerns about specific organ toxicity, as they are degraded into amino acids which are reused by the body.

It is a rare possibility for the formation of Abs against the mAb. If they are produced, the efficacy of the mAb will be reduced or eliminated. Allergic reactions to additional injections are possible, but they are very rare and not severe.

Warning: Never use in species other than which the preparation was designed. They are species-specific, in any other specie they are a foreign protein.

Bacteriophage therapy

What are bacteriophages?

Bacteriophages or phages are viruses that infect and can kill bacteria. Since time immemorial the phages -the viral parasite of bacteria- have been protecting Earth’s biosphere against bacterial overgrowth.
They are ubiquitous, astronomically numerous, highly diverse, harmless to humans and animals and exquisitely host strain-specific (selective). They infect only their targeted bacterial strains.

How do they act?

Bacteriophages have a head with genetic material (DNA), a tail (midsection) and several legs (tail fibres). The legs attach to the bacteria, and they inject their genetic material into the bacteria through the membrane cell.

There are virulent and temperate bacteriophages. Therapeutic phages are virulent, as they replicate/ multiplicate in the bacterias cells. When they kill the bacteria, multiple phages are released and infect other bacterias.
Temperate or lysogenic bacteriophages mixed their DNA with that of the bacteria and can result in resistance, so they are not useful as therapy.

When were bacteriophages discovered and used?

They were discovered in the early 20th century by Frederick W. Twort and Felix d'Herell.
They are older than the antibiotics and were used to treat bacillary dysentery and bubonic plague in humans.

In Western countries their use was stopped and recently there is growing interest and research activity in this therapy due to antibiotic resistance.

The interest of bacteriophages in the 21st century

Acquisition of antimicrobial resistance is an inevitable natural process and is developing faster than the develoment of new antibiotics. Resistant bacteria are no more resistant to phages than are ordinary bacteria.

Bacteriophages are already in use within the food industry.

- Several phage-based products have gone into commercial use to control some of the leading food-borne pathogens including *Listeria monocytogenes, Escherichia coli and Salmonella* serovars.
- The use of phage cocktails to reduce *Campylobacter jejuni* in broiler chickens has been demonstrated.

In veterinary medicine, the efficacy of bacteriophages in the treatment of *Pseudomonas* otitis with bacteriophages has been reported.

Future

Phages could help address the antibiotic resistance crisis that affects the world. The most significant hurdle to phage therapy in Western medicine is the lack of an appropriate legal and regulatory framework.

Some groups engineer phages to kill bacteria, but they are difficult to commercialise and exploit. The best bacteriophage therapy is one that is customised to the individual patient's need.

Belgium is now implementing a pragmatic phage therapy legal framework that centres on tailor-made phage medicines magistral preparation.