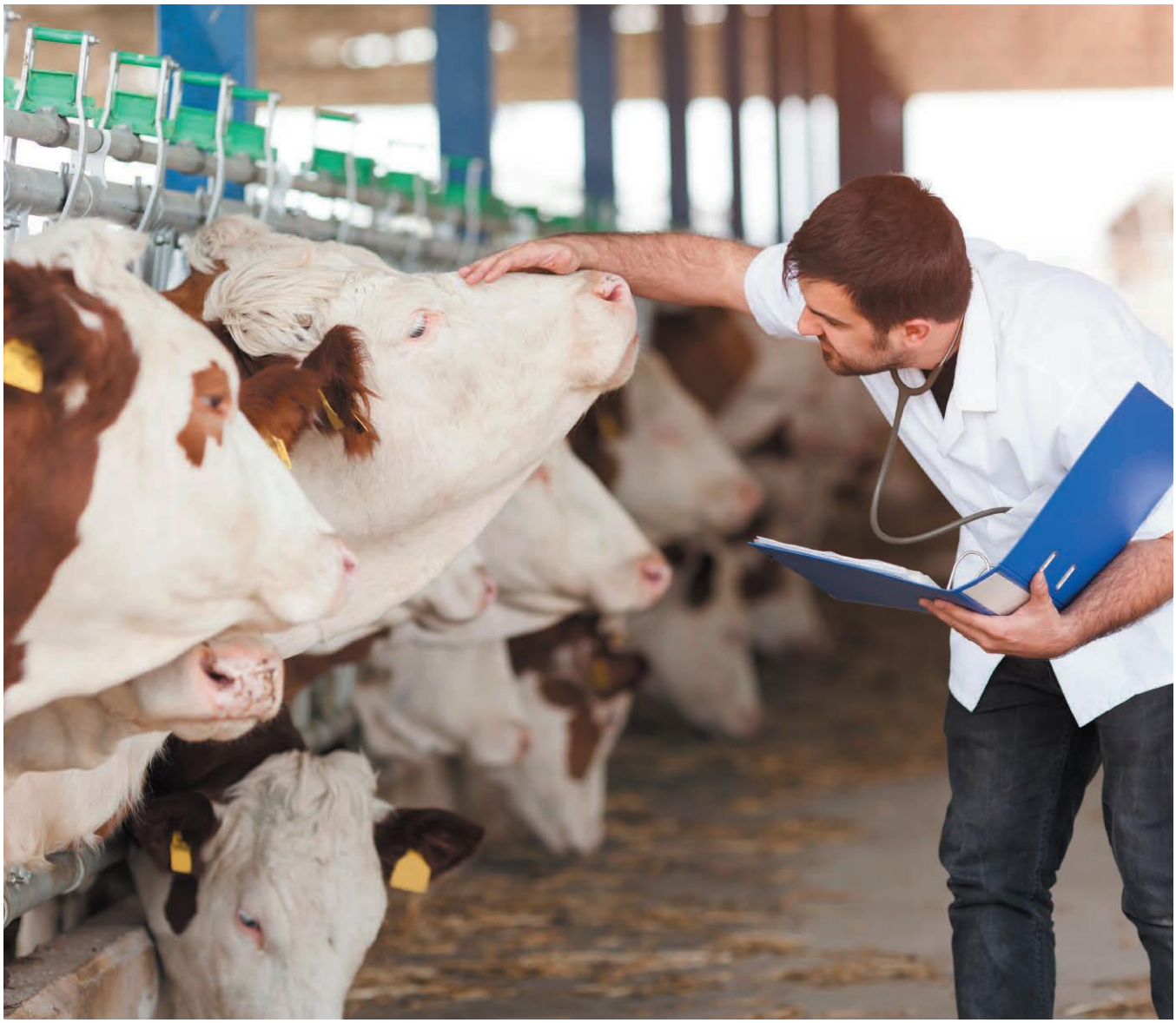

An education on autogenous vaccines

In this article, *New Food* hears about rapid veterinary microbiology and the production of autogenous vaccines for poultry, cattle and pigs.

IN THE VETERINARY industry, the monitoring of microorganisms in/on animals, or in environmental and hygiene samples is a very important task. The identification of microorganisms is also a basic requirement when selecting vaccines.

The need for vaccinations against certain diseases is undisputed among experts and an economic factor for livestock producers. In general, vaccinations can imitate an infection without causing the disease, stimulating the formation of antibodies within an animal. Vaccines are used for prophylaxis against animal diseases and for animal health.

After the vaccination shot, the body learns to form antibodies against these pathogens in the event it encounters them again, meaning the animal is protected against future infections.

Vaccinations are one of the most important pillars in animal health management, alongside general hygiene including housing conditions and feed. In addition to virus-directed vaccinations, those against bacterial and/or parasitic diseases are also gaining importance,

as these can also reduce the use of products for treatment in farm animals.

In Germany, the Standing Vaccination Commission for Veterinary Medicine (StIKo Vet) began work in 2015. The main aim of the StIKo Vet is to make recommendations specifically for the use of vaccines in the veterinary industry. Approved commercial vaccines are generally the first choice for vaccinations against known diseases, as their effectiveness and harmlessness have been proven during a dedicated approval process. In addition to the main commercial vaccines, group or flock-specific vaccines also offer protection against diseases for which approved vaccines are not available or have limited efficacy. In light of this, the StIKo Vet has recently published a booklet with recommendations for the use of herd-specific vaccines (as of 1 April, 2020). The wide use of autogenous vaccines and the movement of vaccinated animals across borders is currently common practice within Europe.

Autogenous vaccines

Frequent indications for autogenous vaccines in poultry are *E. coli* infections (the vaccines are mainly used during rearing), Pasteurellosis (mainly for turkeys and chickens) and Riemerellosis (mainly for 'breeder' ducks).

Autogenous vaccines are used less often in cattle. *E. coli* infections and the resulting diarrhoea that cannot be cured by standard vaccines are a target.

Cases of mastitis caused by gram-negative pathogens (eg, *E. coli* and *Klebsiella*) can be prevented using autogenous vaccines if approved vaccines fail. In addition, *Salmonella* outbreaks in cattle can be addressed with autogenous vaccines.

In the case of pig breeding, autogenous vaccines are used mainly against *Streptococcus suis* and *Glaesserella parasuis* infections.

Avicare+ reference libraries offer project and product related services and diagnostic services in cooperation with the veterinary laboratory of its partner lab MMT. We also work with specialised veterinary laboratories and universities across the globe, depending on the issue at hand.

"Vaccinations are one of the most important pillars in animal health management, alongside general hygiene including housing conditions and feed"

In general, autogenous vaccines are made from bacteria that have been isolated from infected animals in a specific group. In order to achieve an optimal protective effect of the vaccine, it is important to regularly examine the pathogen situation in the group of animals. Prior to the production of an autogenous vaccine in the lab, the pathogens are isolated from sick animals and characterised. Bacteria can be identified using cultural or biochemical methods, or in many cases with the MALDI Biotyper® based on rapid MALDI-TOF MS technology. The latest reference libraries of the MALDI Biotyper cover more than 4,300 different species, and identification is carried out in minutes, using colony material, in just a few steps.

Autogenous vaccines are always inactivated, so they do not contain any antigen capable of starting a real infection. These inactivated vaccines are used on healthy animals as a preventative measure and are only for use in animals belonging to a herd or from an epidemiological unit. Due to the time consuming manufacturing process, autogenous vaccines are helpful against recurring diseases with a specific range of pathogens.

EU Directive 2001/82/EC defined group-specific vaccines as inactivated immunological veterinary medicinal products which are produced on the basis of pathogenic organisms and antigens isolated from an animal or animals of the same animal group and are used for the treatment of this animal or herd type at the same location.

The wording of the directive does not reflect the current situation of integrated concepts of breeding/rearing/production of animals within Europe. In fact, current practices across Europe have been adapted over time and you can see an evolution of the application of the different specialised products. »

EXPERT VIEW

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Animal health: making life easier

Olaf Degen reveals how the health and microbial status of livestock and quality control of vaccines can be monitored in a single workflow.

Poultry is the most popular meat globally, followed by pig meat, beef, lamb and fish; and the monitoring of microorganisms is key to animal health and high quality food.

Many animals are known carriers of *Salmonella*, as well as *Streptococcus, Staphylococcus, Pasteurella, Riemerella, Klebsiella, Glaesserella, Campylobacter* and *E. coli*. The good news is that with the MALDI Biotyper® (MALDI-TOF mass spectrometry for microbiology) thousands of different bacteria and fungi can be detected in one easy-to-use workflow, using colony material or blood cultures. This means that veterinary laboratories can react more quickly to microbial findings.

MALDI Biotyper® in veterinary laboratories enables rapid identification of microorganisms and faster time-to-result in environmental monitoring and the analysis of animal tissue. But that's not all; animal pharmaceutical companies often need to perform accurate microbial tests under time pressure. Common test formats for microbial hygiene testing and control of cleaning routines include nutrient plates and non-selective agar plates, followed by using the MALDI Biotyper® for same-day identification of colonies in less than 15 minutes. The use of bacteria as a live vaccine implies quality control of strains that can be easily identified with the MALDI Biotyper® to guarantee high quality vaccines.

For many laboratories in the animal health industry, the identification of microorganisms is an increasingly important topic. Simple counting of colonies from non-selective agars is replaced by the identification of microorganisms – this particularly applies to in-process monitoring, analysis of ingredients, and/or water quality control.

As such, vaccine manufacturers, animal pharmaceutical companies, and probiotics or food and feed manufacturers now have the option of rapid quality control via the MALDI Biotyper®.

Autogenous vaccines are used in poultry to protect against *E. coli*, *Pasteurella* and/or *Riemerella* (in ducks)

Good to know

In Germany, young poultry can be vaccinated in the rearing house so that they are protected in the later fattening or laying stages. It is also possible to vaccinate suckling pigs on the farm with an autogenous vaccine that is based on an isolate from the rearing house, in order to protect the weaners from the pathogens circulating in the rearing house.

According to the EU Veterinary Medicines Regulation 2019/6, which is effective from 28 January 2022, group-specific vaccines may only be used if no vaccine is approved for the specific indication.

Licensing studies on efficacy and tolerability are not carried out, and even if autogenous vaccines do not require approval, all manufacturers need a manufacturing license from the responsible state authority.

Manufacturers are obliged to report the number and size of batches to the competent authority annually, stating the pathogen used (see 12 (2) TierGesG). All manufacturers must also ensure that the vaccine is "manufactured, tested and stored in such a way that cross-contamination, a health hazard or a risk to the implementation of animal health measures is excluded" (see 8 (2) Tierimpfstoffverord).

During the production workflow at Avicare+ in our clean room, the pathogen is first cultivated to reach high numbers of cells in pure culture. From this raw material, we produce high-quality autogenous vaccines for our customers, including the use of adjuvants to stimulate the immune response of the animal being vaccinated.

Avicare+ vaccine laboratories have rooms in clean room classes A, B and C. State-of-the-art microbiological techniques are used for the production and quality assurance of our vaccines, eg, the quality of the bacterial isolates used for the vaccines is checked by the MALDI Biotyper, or those microbes found during hygiene monitoring or before/after cleaning procedures.

The optimal effect of an autogenous vaccine is only guaranteed if it contains the correct pathogens that cause problems for the animals. A major prerequisite for optimal vaccine development is therefore a thorough diagnosis, for which representative sampling in the herd is necessary. In contrast to approved vaccines, autogenous vaccines cannot be tested in advance for their effectiveness and safety. However, Avicare+ works very closely with local veterinarians, such that they consult vets on the composition and combination of the pathogens used in the vaccine.

Avicare+ advises the supervising veterinarian, in accordance with the StIKo Vet, that before a new batch of a vaccine is given to all animals on site, it should first be administered to a small group (eg, cattle ≤ 5; pigs ≤ 10; poultry ≤ 100). Acute intolerance reactions should occur within a few hours.

The small starter group should ideally be monitored by the owner and examined on clinical effects the following day, before the whole batch is used across all animals on site.

Avicare+ has years of experience in the field of livestock and animal care, offers competent advice on site, precise diagnostics in its own laboratory, and provides its customer the option to serologically accompany the formation of antibodies in the animal.

Individually compiled vaccines produced by Avicare+ contribute to animal health; moreover, Avicare+ offers fast analysis of microbes by using the MALDI Biotyper® to identify microbes in a short turnaround time, always allowing a quick reaction to change in the microbiota at any time.

Dr med. vet. Matthias Todte

Matthias studied veterinary medicine at the Humboldt-University of Berlin. He gained his PhD at the poultry institute of the Freie Universitaet Berlin. He is Co-Founder of the veterinary practice MMT, and in 2015, founded the Avicare+ company for autogenous vaccine production and international distribution. Since 2017, Matthias has been a member of the European Manufacturers Group of Autogenous Vaccines (EMAV).

Dr Antje Gebler

Antje studied biology at the Humboldt-University Berlin, with a focus on microbiology, biochemistry and parasitology. She gained her PhD at Humboldt-University Berlin at the microbiology research group of Prof Dr B. Friedrich. Antje joined Avicare+ in 2012 and has been involved in the establishment of the vaccine laboratories. In 2017 she assumed the role of Production Manager Vaccine.

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The *sirius* Solution for Your Microbial Identifications

- Rapid food safety method: Recognized OMA by AOAC INTERNATIONAL and ISO 16140-part 6 validated by MicroVal for confirmation of *Salmonella* spp., *Cronobacter* spp., *Campylobacter* spp., *Listeria* spp. and *L. monocytogenes*
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- Covering >4,300 microorganisms, including organisms such as Enterococci and *Staphylococcus* spp. as well as less common species such as *Brachyspira*, *Prototheca* and *Mycoplasma*
- Facilitating ID/differentiation of mastitis-associated *Streptococcus* spp., and related species
- Enabling fast phenotypic resistance detection (using MBT STAR®-BL Kits)
- Enabling rapid colistin resistance detection (with the MBT Lipid Xtract™ Kit) using negative ion mode
- True benchtop system of 75 kg / 165 lbs only, with 200 Hz smartbeam™ lifetime laser and integrated ion source cleaning

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