The importance of deep cleaning in the fight against ASF

The recent outbreak of African Swine Fever (ASF) in Asia has turned into a devastating worldwide crisis. The president of the World Organization for Animal Health, Mark Schipp, declared that around a quarter of the world's pigs are expected to die from African Swine Fever.

by Cheng Lee, DVM and Gerwen Lammers, PhD, independent research conducted by Acura Analytical, Intracare BV, Veghel, The Netherlands. www.intracare.nl

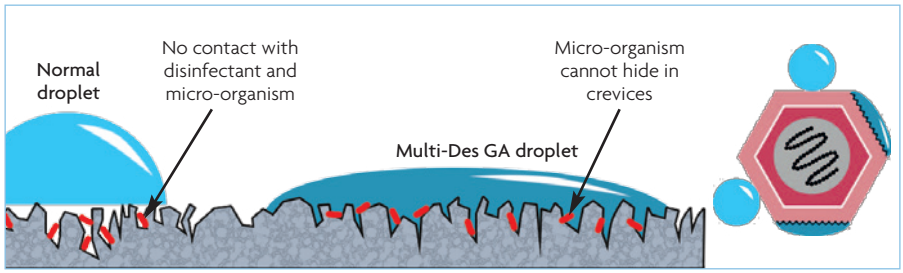


Fig. 1. Visual representation of the difference between a normal droplet (light blue), and a droplet of Intra Multi-Des GA (dark blue) with an optimised surface tension, resulting in coverage of a much larger area and reaching each spot on irregular surfaces. The same mechanism takes place on a microscopic level (right).

With no vaccine currently available, this deadly swine disease with high mortality rates is easily spread and gains entry into unaffected farms often on fomites and vehicles.

Thus, the application of strict biosecurity measures specific to the different swine producing sectors, including thorough cleaning and disinfection protocols for all surfaces in contact with animals and their excretions, are the only solution to prevent entry of the virus into susceptible farms.

However, especially at the typical Asian small-scale backyard farm with an open housing system, it may be challenging to obtain a sufficient level of biosecurity.

Effective cleaning and disinfection

To disinfect without cleaning is a Sisyphean task. ASF virus (ASFv) has been shown to survive in faeces for up to five days at room temperature and disinfectant potencies are highly reduced by organic soiling. For optimal disinfection, it is recommended to always begin with cleaning, starting with the mechanical removal of rough organic material and followed by the use of a strong cleaning agent to dissolve and remove dried, greasy, and strongly adhered organic material.

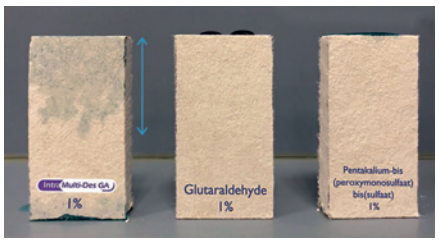
Pre-soaking and softening of caked faeces prior to using a cleaning agent helps to improve cleaning efficiencies. Being an enveloped virus, the lipid bilayer ASFv can already be disrupted by detergents like those present in Intra Foam Cleaner. This not only potentially reduces viral loads, but also weakens the virus by providing better access for a subsequent disinfectant.

For terminal disinfection, it is vital to choose the most effective virucidal product. Intra Multi-Des GA is a highly concentrated formulation of the active ingredients glutaraldehyde (125g/l), and the quarternary ammonium compounds (QACs) didecyldimethylammonium chloride (DDAC, 100g/l) and alkyldimethylbenzylammonium chloride (ADBAC, 150g/l).

Glutaraldehyde has been shown to inactivate ASFv by destroying viral membranes via protein denaturation, interfering with protein-DNA interactions required for metabolism, and inducing changes of the viral capsid (protein shell).

QACs are hydrophobic molecules that cause detachment of enveloped viruses and inactivate viruses by interaction with intraviral targets and binding to the viral DNA. This explains why QAC concentrations of as low as 0.003% have been proven effective against ASF virus.

Fig. 2. Droplet dispersion and penetration properties of 1% Intra Multi-Des GA, 1% glutaraldehyde and 1% of the control product into a porous material. The blue arrow indicates the large penetration distance of Intra Multi-Des GA.



Optimal functionality by secondary properties

It is important to realise that these excellent virucidal properties are only useful when a product is able to reach every single viral particle. Therefore, the formulation of Intra Multi-Des GA is optimised with supporting excipients to reduce its surface tension, resulting in a quadruple benefit:

- Coverage of increased surface area (Fig. 1).
- The contact between the product and the outer surface of the virus is increased, resulting in a maximum efficacy in practice (Fig. 1).
- The product is better able to penetrate rough/irregular surfaces to reach hidden virus particles (Fig. 1 and 2).
- Long-term residual activity even after evaporation of the product (Fig. 3).

During application of a disinfectant by spraying or fogging it is important to create a small droplet size to reach all corners and cracks of the surface to be treated. The finer the droplet size, the longer the disinfectant remains dispersed in the room, increasing the contact time and surface area that is reached. Upon touching the surface, a droplet has to flow homogeneously to reach a maximum surface per droplet and run freely into any cracks to reach all hidden spots (Fig. 1).

The pictures in Fig. 2 clearly show that a

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bigger surface and deeper penetration is reached with Intra Multi-Des GA compared to glutaraldehyde and a control product.

Long-term residual action

Disinfectants may rapidly lose their activity upon drying, thereby reducing the contact time and allowing surface recontamination. This is of particular importance in areas with hot climates, since at 40°C, up to two thirds of a sprayed liquid can evaporate within a short amount of time.

The residual activity of Intra Multi-Des GA was compared with a control product using a stamp test on a bacterial culture plate inoculated with Pseudomonas aeruginosa as a model organism.

A 0.5% product solution was dried at room temperature on steel surfaces and stamped for two seconds on the bacteria culture plates. After 24 hours incubation, the culture plates were completely covered with bacteria, except in the area stamped with dried Intra Multi-Des GA (Fig. 3). This effect lasted for at least 72 hours.

This clearly shows that even after evaporation Intra Multi-Des GA is able to prevent bacterial growth for the duration of at least three days, in contrast to a control product that showed no residual activity after drying.

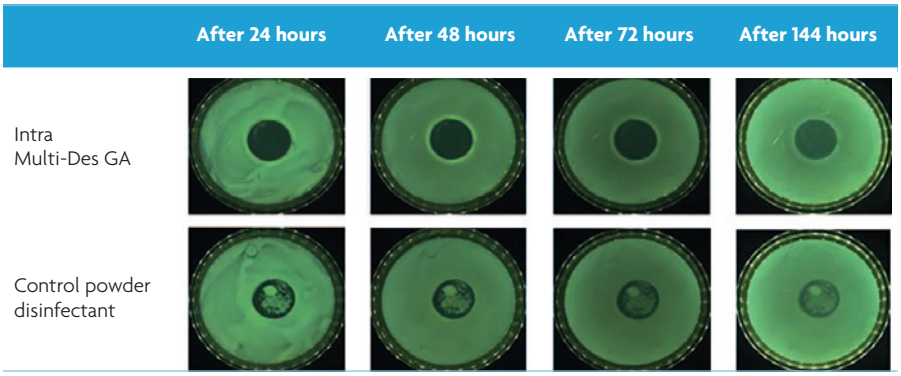

Fig. 3. Bacterial culture plates covered with Pseudomonas aeruginosa after stamp test clearly showing the strong residual activity of Intra Multi- Des GA.

Proven efficacy against ASF virus

According to the latest European Biocidal Product Regulations (BPR), a disinfectant is allowed to claim general virucidal efficacy when it is able to achieve a 10,000-fold reduction in the most difficult to kill Enteric Cytopathic Bovine Orphan virus (ECBO).

This virus was chosen by the BPR as the reference virus for determination of biocidal virucidal efficacies based on not only in-vitro tenacity of the viruses to disinfection, but also on the principles established by Noll and Youngner (1959), classifying viruses into groups based on their increasing susceptibility to disinfection. This allows an end consumer to conclude that a biocide has full virucidal efficacy for all veterinary viruses when it is able to show efficacy against ECBO virus. Intra Multi-Des GA was able to reach this 10,000-fold reduction within 30 minutes at a concentration of only 0.75% under the prescribed low temperature of 10°C and in the presence of soiling. The ability of Intra Multi-Des GA to inactivate the most resistant virus also demonstrates the ability of this biocide to inactivate the weaker, lipid enveloped virus of ASFv. In conclusion, Intra Multi-Des GA is the biocide of choice for protection of your farm against African Swine Fever. ■

References are available from the authors on request