

Disinfection: Newton or Pascal

Chick quality is largely dependent on the hygiene of the eggs. If eggs are contaminated, not only the hatchability will be reduced but also the quality of the day old chicks, resulting in a higher first week mortality on the farm.

Bacteria can penetrate the pores of an egg during the process of cooling down after the egg is laid. When the egg cools its content shrinks, but the egg shell will maintain its initial size. This creates a negative pressure inside the egg, and air will be sucked into the egg, forming the air cell. When bacteria are present, these will penetrate into the pores and will form a potential risk for the embryo.

This means that it is beneficial to disinfect the eggs as early as possible. Ideally directly after lay, as this will help to keep the bacteria out of the pores. For practical reasons the earliest we can disinfect is after collection of the eggs, at the farm. At that moment part of the damage is already done, so disinfection can never replace nest maintenance and nest hygiene, but it will at least help to limit the damage.

If we want to disinfect eggs at the farm, it is important to do it correct and that the system is quite robust and forgiving. If the disinfection is not done correct, it might cause damage to the embryo, but it also can lead to for instance wet eggs which might even have more bacterial contamination then when the eggs were not disinfected at the farm at all.

Traditionally we use formaldehyde for disinfection. Formaldehyde flakes are heated up or formalin is mixed with potassium permanganate, and in this way a gas is formed that has the potential to kill micro-organisms as bacteria, viruses and fungus. As formaldehyde is applied as a gas, it obeys the laws of Mr Pascal, a French scientist that lived in the 17th century who stated that pressure is distributed in all directions evenly. This means that the gas will distribute itself through the room and penetrate into the pores of the egg shell as well, so it has the potential to kill organisms that are in the pores.

Although formaldehyde is effective, relatively easy to use and cheap, the downside is that you need a closed, gas tight room with a good ventilation system to remove the formaldehyde after the disinfection. If this is not done correct, or when the fumes stay in between the eggs when they are for instance stored on cardboard trays, the formaldehyde might penetrate the egg itself and damage the embryo. As formaldehyde also has a very unpleasant smell and is suspected to be carcinogen, we normally want to avoid using it.

An alternative for formaldehyde is hydrogen peroxide. This is a liquid that needs to be mixed with other ingredients for stabilization. Like any other product, it has its positive and negative points, and one of the negative points is that it will easily corrode materials. Hydrogen peroxide is sold under different names and in different combinations. Although hydrogen peroxide is the disinfectant, the other ingredients determine to a large extent its effectiveness and with it the success of the commercial product.

Usually we apply hydrogen peroxide as a foam or a spray during or directly after egg collection. It is important that the eggs are allowed to dry before they are packed, so things like temperature, amount, solution, package procedure and storage method needs to be controlled. If this is not done correct we can create problems as we wet the eggs. Another method is to spray the hydrogen peroxide as a mist in a disinfection or storage room.

No matter how we apply the hydrogen peroxide, it will always be as a liquid. Even if we fog it as a very fine mist with an ultrafogger, it will stay a liquid. This means that it doesn't obey the laws of Pascal, but the laws of Newton. Newton lived in more or less the same period as Pascal, and he developed the laws of gravity. As a fluid obeys gravity, it means that we have to actively move the air with the droplets through the room, in order to reach all the eggs. If we do not do this, we will see that for instance the center eggs and trays in a trolley or container will not be disinfected. Droplets tend to move from top to bottom, and eggs that are deeper in the trolley will not be reached. It is also difficult to reach the inside of the pores with hydrogen peroxide, as the droplets will tend to stick to the surface and the side of the pores, and will not go all the way to the membrane.

Disinfection of hatching eggs on the farm is a good practice, and there are many ways of doing it correct. However, we have to pay attention to the characteristics of the product that we work with, and accept that each product has its limitations.