

Site of injection

By Ron Meijerhof

The injection of especially Marek's vaccin in incubated eggs has become very popular. The method saves time and labour, is very accurate and it delivers the vaccine while the embryo is still in the egg, allowing the immune system to build up an adequate response before a field virus becomes a threat.

However, the process of administration is very critical and determines for a large extent the effectiveness of the method. This effectiveness is related with the technique of administration itself and with the development of the embryo.

Where to deliver the vaccine

For an effective vaccination, the actual place of injection is of utmost importance. To fully understand that, we have to look at the way the embryo is positioned in the egg. The embryo floats in the egg in the amnion fluid. This amnion is the inner sac of the egg, and functions as a protective shelter and a source of nutrients for the embryo. The embryo actually drinks the fluid in the amnion during its development. Between the amnion and the shell there is another fluid sac, the allantois. This allantois functions as a sort of waste bag. It stores the waste products that are formed during the growing of the embryo, including the metabolic water that is formed. This metabolic water needs to be evaporated during incubation, and this is possible as the allantois sac forms the layer right under the shell, and is positioned between the shell and the amnion.

The vaccine must be injected deep enough into the egg to be delivered into the amnion fluid. In this way, the embryo will drink the fluid with the vaccine. If the vaccine is injected too deep, the needle will hit the embryo itself, either in the chest or in the neck. The embryo will be vaccinated, but there is an increased risk that the needle will damage the embryo itself. If the vaccine is not injected deep enough, it will be delivered in the allantois fluid. As this waste fluid is not used by the embryo anymore but is actually evaporated, the vaccine will not be utilised by the embryo and the vaccination will be ineffective.

Injection

With in-ovo injection we bring the needle at a fixed depth under the shell, positioned for every egg individually. If the embryo is then in the right position, it will be injected correctly. However, we can easily see that the position of the embryo depends on its stage of development. If the embryo is too small, it will be not high enough in the egg, the needle will not penetrate through the allantoic and the vaccine will be wasted in the allantoic fluid. If the embryo is too big, the needle will go through the amnion and hit the embryo itself.

Size of the embryo

The size of the embryo depends mainly on the speed of its development and time since incubation has started. The egg size by itself has an influence as well, but that influence is more limited, as the embryo doesn't realize that it is in a big egg until the end of incubation. If we want to inject the embryos at a certain size, we have to correct the moment of vaccination for the speed of the development. If the embryo develops more slow, we have to simply wait longer before we vaccinate. The speed of development depends on the temperature inside the egg, and we must realize that this temperature is not even for each machine, each breed, each egg size and each egg within a machine. The normal procedure is to inject eggs with a dye at different moments of incubation, and then check where the dye is

delivered. We can also adjust the moment of vaccination by measuring the length of the embryo at 18 days of incubation. Long, well developed embryos will be injected more in the chest and neck while short, under developed embryos will be injected more often in the allantoic fluid.

Uniformity of protection

However, we often see that the temperature inside the egg (the so-called embryo temperature) is not equal at every spot in the machine as it not only depends on air temperature, but also on air velocity, amount and place of water spray etc. If we have a spread in embryo temperature, we will have a spread in development and with that, a certain percentage of the embryos will not be vaccinated correctly and will have no protection when placed in the field, especially when injection is done relatively early.