

1.5 Sometimes it is easier to grow viruses in eggs

Welcome. We have already seen that viruses need to grow in living cells. Initially experimental animals were used. We saw that in the previous video. But in 1931 Goodpasture discovered that viruses could also grow in eggs with chicken embryos. This meant a breakthrough, because it is much easier to handle eggs than handle animals, even if they are as small as mice. Since this discovery, embryonated eggs have been used with different objectives. It is important to note, that, similar to cell cultures or even to experimental animals, not all eggs may be used for all viruses. The most widely used are those of hens, but they may also come from doves, quails and other species. Ideally, the eggs must be 7 to 12 days of age.

In the eggs, we can identify different areas with different characteristics. The various viruses have preference for specific locations.

Chorioallantoic membrane

The chorioallantoic membrane is the preferred place to inoculate poxvirus. After a few days, we may observe in this membrane some spots, called pocks, which are like white spots in the transparent tissue. The inoculation of poxvirus in the allantoic membrane can be used to quantify the concentration of viruses, as it is considered that each pock is caused by one virus. Also we can inoculate here the herpes simplex virus and the Rous sarcoma virus.

Allantoic cavity

Another location is the allantoic cavity. The majority of avian viruses can be isolated by inoculating the sample in this cavity. Some of these viruses are avian adenovirus, or Newcastle disease virus. In addition, it is used for vaccine production against influenza, yellow fever, rabies, or mumps.

Amniotic sac

The amniotic sac is used for the primary isolation of influenza virus or of mumps virus. Since these viruses have haemagglutinins they can be detected because they produce haemagglutination.

Yolk sac

Finally, the inoculation in the yolk sac is the simplest method for the multiplication of viruses, although there may be mechanisms of interference in the majority of avian viruses. In the yolk sac, which is nothing else than the egg yolk, we can grow the herpes simplex virus.

Advantages

Embryonated eggs have many advantages. Some of them are the following:

- They are inexpensive to obtain and are readily available.
- They are easy to handle, and their manipulation does not require much staff or that they are specially trained, as happened in the case of experimental animals.
- They are sterile and free of bacterial contamination and even of many viruses that can be latent in birds or mammals.
- The cells of embryos are very undifferentiated, and, therefore, many viruses can grow in them.

- As we have seen, there are different locations with different characteristics, for example, of pH, amount of fat, etc. This allows a variety of possibilities to choose the most suitable site for each virus.
- They lack immune response that would eliminate the virus.

Disadvantages

Despite the advantages, embryonated eggs have some disadvantages. For example:

- The site of the inoculation and the age of the embryo varies with the different viruses, and when working with viruses in which this circumstance is not known, it is necessary to do different tests.
- There is also individual variability.

Uses

As we have mentioned before, embryonated eggs are widely used for the isolation of many avian and some mammal viruses, which can adapt to grow in bird embryos. Through this process, they can be attenuated, acquiring mutations that make them less pathogenic.

Currently, influenza vaccines are obtained in chicken embryos.

Signs of viral growth

During or at the end of the incubation period we must determine if any of the following has happened in the inoculated egg, always comparing it to control eggs:

- Atrophy: that is when the embryo is smaller than the control.
- Death: which is characterized because the embryo stops moving.
- Pocks which are the lesions in the egg membranes that I mentioned previously and that you can observe here in this photograph.
- Bleeding in the embryo or in the membranes which would also be indicative of viral growth.

Therefore, in this step we have seen from which bird species the eggs used to grow viruses come. The membranes and egg cavities where various viruses can be inoculated. What are the advantages and disadvantages of growing viruses in embryos. The applications and the consequences of viral infection.

Thank you very much for your attention and don't forget to check the additional material where we give more indications on the growth in bird embryo, and you should also make the activities that we propose.