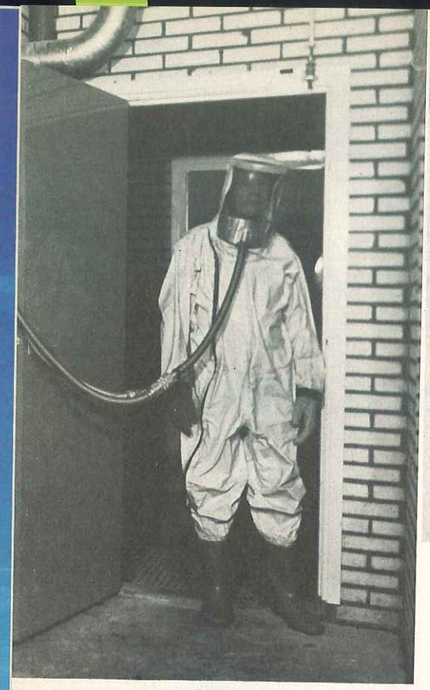

PHOTO 1

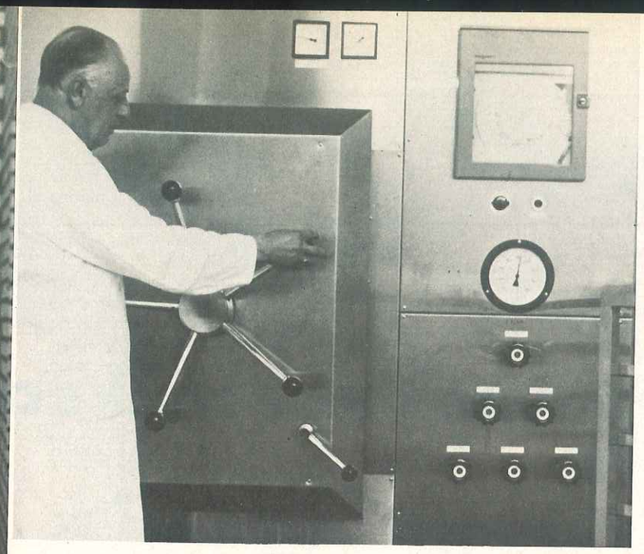

PHOTO 2

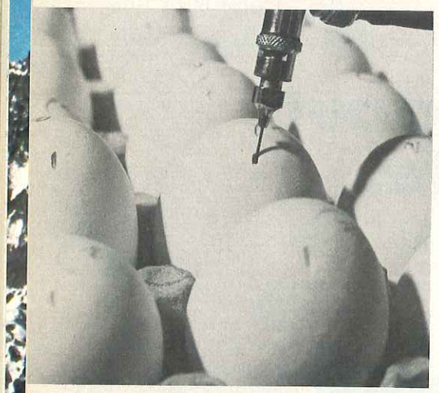

PHOTO 3

PHOTO 4

Birth Of A Vaccine

SPECIFIC pathogen free (SPF) eggs or more precisely the embryos from such eggs, are used to provide the living host cells needed for the multiplication of viruses.

SPF eggs are produced on specialised farms where the birds are kept in isolation throughout their lives, the farm even breeding its own replacements.

Inside the buildings the workers (see pic 1) wear protective clothing, rather like a space suit, with an air-supplying 'umbilical' cord, connected to a rail to allow movement.

The buildings are supplied with filtered air and are kept under positive air pressure to prevent the introduction of pathogenic microorganisms.

The SPF eggs produced on the farm are taken to the vaccine manufacturer's laboratory where they are sterilised by fumigation.

The laboratory has to work to stringent hygiene standards to ensure sterility. All goods and materials used in the sterile area of the laboratory have to pass through autoclave locks in which they are sterilised either by using steam at +120°C or hot air at +160°C (Pic 2).

Staff must shower and change into sterilised clothing before entering the air-conditioned pressurised laboratories where both in-coming and outgoing air is filtered.

Different vaccines are produced in separate parts of the laboratory. After being used for part of the production process, all areas are thoroughly cleansed and disinfected.

The SPF eggs are set in incubators for a variable number of days depending on the type of virus to be produced e.g. six days for Gumboro and Epidemic Tremor virus but 10 days for IB virus.

During incubation the blood vessels of the embryo develop, the eggs then being inspected by candling, to determine the precise site for inoculation. Only white eggs are used as it is easier to see through the shells.

The eggs are inoculated with an attenuated (weakened) strain of the virus. The injection site and the method of inoculation is dependent on the type of virus used. Injection may be into the yolk, the allantoic cavity or the chorio-allantoic membrane. Afterwards, the hole in the shell is closed with a drop of paraffin wax (Pic 3). The eggs are then returned to the incubator, during which time, virus multiplication takes place in the embryos cells. When the virus multiplication has reached its peak, the eggs are opened and those parts of the contents in which the majority of the virus is produced are removed by suction (Pic 4).

The fluid is collected in sterile bottles.

In an alternative method of virus production, only certain organs of the chick embryos are used. The embryonic tissues are treated with enzymes to dissolve the connective tissue between the cells which can then flow freely in the fluid. Given optimal conditions, the tissue cells stay alive and stick to the glass wall where they are allowed to grow until the wall is covered by a layer, one cell thick, this being inocu-

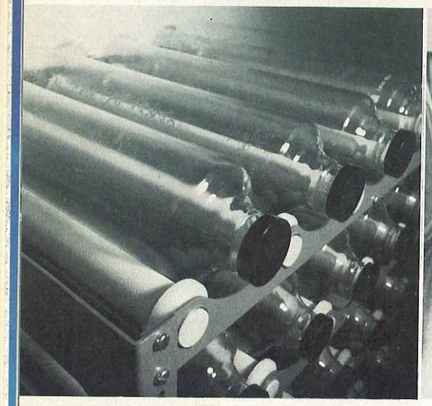

PHOTO 5

PHOTO 6

PHOTO 7

PHOTO 8

lated with the virus. For this process, long glass roller bottles are preferred because, when stacked on their sides, they can be carefully turned to produce a layer of cells over the total surface area (Pic 5). The growth of the virus is monitored under a microscope to determine the time of maximum virus content. Harvesting then follows.

Another type of fermentation vessel consists of a large flask filled with plastic beads which provide an even greater surface area and consequently a higher virus yield.

The virus materials are purified by centrifugal force (Pic 6) and stabilisers are added. One of three methods is used to produce the final vaccine, the most common being freeze-drying in a vial. The rubber stoppers in the vials are positioned in such a way that a small opening is left through which water vapour escapes during the freeze-drying process. The vials and contents are then frozen to −45°C under vacuum. At the end of the process, the vials are sealed.

In another method, the virus material is freeze-dried in bulk. The remaining dry powder is then placed into the vials, residual moisture being removed by further drying and the vials closed under vacuum.

And lastly, cell associated vaccine is deep frozen by a carefully controlled fully-automated process. The freezing has to be done in such a way as to ensure that the cells are not destroyed and the virus remains alive. The ampoules are stored under liquid nitrogen at −196°C (Pic 7).

Laboratory quality control includes a test for residual moisture content and to ensure that undesired viruses are not present. The Cofal test is used to determine the presence of Avian Leukosis virus.

The vaccines are also tested for stability, activity and specificity by serum plate agar gel precipitation, haemoglutination inhibition or virus tests.

Tests on live birds are an important part of the quality control process. Using special gloves, the birds in isolators can be handled for inoculation or blood sampling (Pic 8). At the end of the test, a post-mortem examination is performed to check on eventual changes in the organs.

Only when all these tests are completed are the vaccines passed for use to protect flocks against viral infections.

The photographs used to illustrate this article were kindly supplied by Gist-Brocades NV's Animal Health and Care Division.