PROTECTION AND IMMUNITY OBTAINED WITH A GEL-ADJUVANT BACTERIN OF HAEMOPHILUS PLEUROPNEUMONIAE

Pijoan, C*, Cruz, G.; Martinez, H. and Arizpe, H.
Facultad de Estudios Superiores "Cuautitlan"
Apartado Postal 25, Cuautitlan - Izcalli
Edo. de Mexico

Bacterins against H. pleuropneumoniae infections are usually ineffective in controlling the disease, especially if prepared with an aqueous gel adjuvant (Nielsen, 1976). Oil-adjuvant vaccines can prevent death loss, but seem to have little effect on daily gain (Henry, 1981). Also, these vaccines give undesirable secondary reactions at the injection site. Similarly to H. influenzae infections in man, pleuropneumonia of pigs is best prevented with young (6 hr.) cultures of the organism. This seems to depend on the presence of capsular material, which can be regarded as the protective antigen (Pijoan, 1982). However, virulence seems to depend on the production of toxins by the organism (Bendixen et. al.). These toxins are produced by older cultures, which suggests that they do not constitute the protective antigen.

Recently a number of claims have been made for success with gel-adjuvant bacterins. Because of this, it was decided to study the protection conferred by these immunogens as well as the humoral and cellular response of vaccinated animals.

Materials and Methods

The experimental bacterin was prepared with a field isolate of H. pleuropneumoniae serotype 5. The organism was grown for 6 hrs. which yielded cultures of $2x10^9$ organisms/ml inactivated with 0.2% formalin, and precipitated with aluminum hydroxide.

Experiment 1: Five piglets (6 wks. old) were vaccinated with 5 ml of the bacterin and revaccinated 15 days later. Another 5 animals were left as unvaccinated controls. Five days after revaccination, all the animals were challenged intranasally with 2 ml of the homologous strain. All animals were killed 11 days later. The lesions in the lung were measured and weighed, and the results compared by a T-test.

Experiment 2: Ten piglets were vaccinated and revaccinated 30 days later, and another 10 piglets were kept as unvaccinated controls. Four days after revaccination, all the animals were challenged as described above, and killed 15 days later. All the animals were bled at regular intervals, and their antibody response was measured by a plate-agglutination test using the homologous strain as antigen. Also, the white cells were obtained with a Ficoll-Hypaque gradient, and used for a migration-inhibition test (MIF) by conventional methods using the sonicated homologous strain as antigen. This test measures the inhibition of macrophage migration by antigen, and considered to indicate a cellular immune response. The percentage of MIF activity was calculated by projecting the shadows of the migrating cells unto tracing paper, cutting them out and weighing the pieces of paper.

Results

Experiment 1: All animals had lesions at slaughter, characterized by marked congestion, friability, haemorrhage and fibrinous pleuritis. However, the lesions were smaller (21.0 cm^2) in vaccinates than in the controls (31.8 cm^2); they also weighed less (33.25 g in vaccinated animals and 77.0 g in controls). The differences were statistically different at $P<0.05$.

Experiment 2: The vaccinated animals had average titers of 1:60 at 7 days post-inoculation (PI), increasing to 1:220 until revaccination. At this time, titers of 1:3870 were found, 7 days after revaccination. Control animals had no titers until challenge-exposed, when they rapidly (11 days PI) developed a titer of 1:2300.

Cellular immunity was detected in vaccinated animals as early as 7 days PI with 53% inhibition. This rose to 60% at 13 days PI, and stayed there until revaccination, when the titer rose to 82.9%. Control animals had 40% inhibition 5 days after challenge, which rose to 77.3% at 9 days PI.

Discussion

There is little doubt that vaccination confers some degree of protection to the animals. However, it is doubtful if gel-adjuvant vaccines are economically beneficial in an intensive swine operation. Henry (1982) only found oil-adjuvant vaccines to be economically worthwhile. However, because death loss is decreased, in farms with numerous confirmed haemophilus deaths (probably 15-20% or more), the vaccine may prove useful. Our results corroborated Henry's field findings in that all animals, vaccinated or not, had lesions.

The vaccine produced a very strong immune response, both humoral and cellular, especially after revaccination. However, some of the revaccination titer might also be attributed to the challenge exposure, which was given 48 hrs. before the first post-revaccination bleeding (7 days after revaccination).

Similar high titers were shown by the challenged control animals. This finding suggests that vaccination does not confer a protective titer because both titers are similar. Also, the high cellular immune response detected shows that cellular immunity plays a role in the protection against this infection. This may be the reason why oil-adjuvant vaccines give better results. It also suggests that immunization with live attenuated strains should be investigated.

References:
Bendixen P.; Shewen P.; Rosendal S. and Wilkie B. (1981): Infect. Immun. 33(3):673-676.
Henry S. (1981): Proc. Swine Hlth. Manag. Course, U of Minnesota, USA.
Henry S. (1982): Proc. A.A.S.P. Mtg., Des Moines, Iowa, USA.
Nielsen R. (1976): Nord. Vet. Med. 28:337-348.
Pijoan C. (1982): Proc. A.A.S.P. Mtg., Des Moines, Iowa, USA.

Este trabajo se realizo para determinar la efectivadad de las bacterinas contra Hp usando un adyuvante de hidroxido de aluminio. Los animales fueron vacunados 2 veces y despues desafiados. Todos los animales, vacunados y controles, presentaron lesiones a la necropsia. Las lesiones fueron significativamente menores en los vacunados En otro experimento, los animales vacunados mostraron una fuerte respuesta inmune, tanto humoral como celular. Sin embargo los controles infectados experimentalmente dieron una respuesta similar. Los resultados sugieren que estas vacunas no son adecuadas contra la infeccion.