Novel mucosal antimicrobial functions associated with "in-feed" vaccination using Intagen (Unifeeds Ltd). A review of international trials evaluating environmental & production parameters in sows & piglets.

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Since the Intagen concept of "in-feed" vaccination was first proposed (Porter 1973) its application has been rigorously tested against E. coli infection in both experimental and farm trial situations. Studies in weaner pigs (Porter, Kenworthy & Allen 1974) and subsequently neonatal piglets, through exploiting the product in the sow to activate the immunologic gut-mammary axis (Chidlow & Porter 1978), gave clear indications of the efficiency of the mucosal antibody systems so generated to protect against E. coli infections.

The widespread use of Intagen for "in-feed" vaccination of sows and piglets has been continuously monitored by the Colworth Immunology Research Group. From an evaluation of veterinary practitioner experience, farmer opinion and results of trials conducted in 7 countries on 3 continents a new perspective is developing which indicates a wider spectrum of biological activities than expected. There are Production, Health & Environmental benefits deriving from the use of the product, which could not have been predicted from a model merely concerned with the control of intestinal E. coli infection. These are

1. In the sow-reduced mastitis & metritis, more piglets born and more piglets born alive.

2. In the piglet - greater viability, improved piglet vigour, superior growth to weaning, reduced need for medication and improved response to medication.

Clearly these benefits, added to the major achievement of controlling E. coli infection, represent a health production package with considerable impact on farm economics. It is therefore pertinent to examine some of these observations, establish their validity and seek to rationalise them scientifically in order that vaccination programmes can be logically developed.

It is relevant at this point to emphasize that Intagen and conventional E. coli vaccines are administered by different routes, i.e. oral and parenteral respectively and thereby activate different and separate immune systems, operated by distinctly different immunoglobulin isotypes. Consequently it could be expected that Intagen might provide benefits not attributable to injectable E. coli vaccines. The product was specifically devised to operate naturally via the mucosal surfaces which are normally confronted by E. coli infection, the gut and mammary gland.

In recent years basic research in secretory immunology has identified the gut as a target organ for mucosal immunity. Lymphocytes, activated in the intestine, traffic to other less accessible mucosal sites, mammary gland, urogenital tract, respiratory tract etc. where they are stimulated to proliferate, synthesise and secrete their protective antibodies locally. Hence it is conceivable that through gut immunization one might assist the control of mastitis and metritis. Furthermore, since the gut is a prime source of virulent organisms and environmental contamination, including possible infection of the mammary gland and urogenital tract, it is likely that "clean-up" of the intestineand extravasation of antibodies to these organisms will lead to the observed control of mastitis and metritis.

The benefits to the sow urogenital tract are also probably signalled by observations relating to the numbers of piglets born and born alive. To validate this we have examined data from several international locations (Table 1) in studies undertaken between 1978 & 1981.

Table 1 International Trials

Farm	Intagen Vaccinated		
Location	Number of Litters	Average pigs born/litter	Average pigs born alive/litter
S. Africa	20	12.15	11.40
Australia	224	-	10.58
Portugal	94	10.12	10.05
Spain	77	10.10	9.36
Farm	**Non-Vaccinated**		
Location	Number of Litters	Average pigs born/litter	Average pigs born alive/litter
S. Africa	20	10.30	9.55
Australia	224	-	9.66
Portugal	33	9.66	9.45
Spain	50	9.52	8.10

Re-examination of data from the major efficacy trial undertaken in the U.K. between 1975 and 1977 also revealed evidence of a similar reduction in the numbers of piglets born dead. (Table 2).

Table 2 U.K. Farm Trials

	Intagen Vaccinated	Non-Vaccinated
NUMBER OF LITTERS	86	74
AVERAGE PIGS BORN/LITTER	10.68	10.5
AVERAGE PIGS BORN ALIVE/LITTER	10.02	9.47

A rationalisation of such data is that oral immunization with Intagen is disrupting a cycle of infection in the sow affecting the reproductive tract. In addition it might be expected that the mucosal antibodies so generated block the uptake of toxins, reducing toxaemia and thereby preventing adverse effects on embryos allowing them to develop successfully to term.

To test this proposition we examined the impact of infection in the sow at various stages of pregnancy and its effect on birth weight, neonatal viability and growth rate. Oral dosing with pathogenic E. coli of gilts, for 2 days, some 3-4 weeks before parturition, resulted in markedly lowered birth weights and reduced piglet viability. If the live organism dose was given later, i.e. in the last two weeks of gestation, then lethal infection was transmitted to the piglet. Feeding Intagen to sows offset these detrimental effects on piglet vitality and vigour.

In addition it has been observed that Intagen fed animals confer a further significant environmental benefit by bringing about the elimination of the plasmid mediated virulence determinant K88, thereby harmless for the piglets. Further curing of the plasmid is also effected in the piglets intestines by Intagen mucosal antibodies generated in sow colostrum and milk.

References:- Chidlow J.W. & Porter P (1978) Res. Vet. Sci. 24, 254-257; Porter P. (1973) Vet. Rec. 92, 658-664; Porter P. Kenworthy R & Allen W.D. (1974) Vet. Rec. 95, 99-104.