What can we expect when the growth promoters are finally withdrawn on January 1st 2006?

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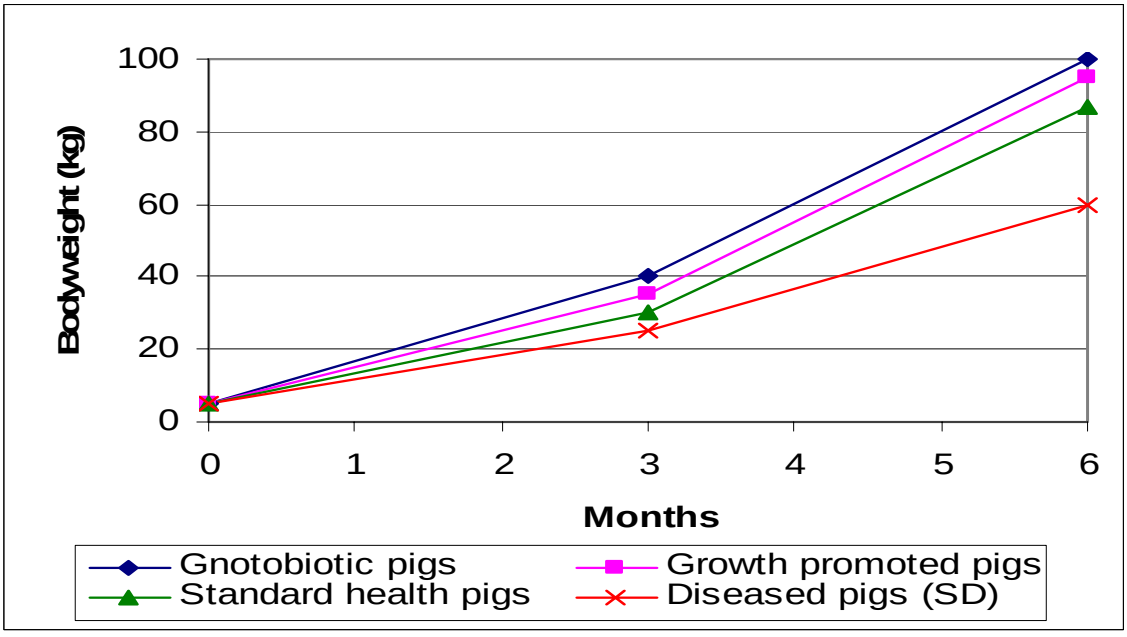
Metal-based feed additives such as copper sulphate and zinc oxide have already had there inclusion levels restricted to nutritional levels only, from January 1st 2004 and the use of copper as a growth promoter has been effectively stopped. The remaining antibiotic growth promoters will be withdrawn from use in the EU from January 1st 2006. Will their loss have a major impact on UK pig production and will we see the same level of disease surge as the Danes did, when they stopped in March 1998?

What did antimicrobial growth promoters do? Primarily their main effect was to inhibit the growth of the 'bad' bacteria in the gut and allowed the pig to utilise the feed more efficiently and thus improve its nutrition and grow faster. In especially reared animals with no microbial gut flora (gnotobiotics), antimicrobial growth promoters had no activity. So they need bacteria to be present to have an affect. (See Figure 1)

An additional effect was noted with some growth promoters, when disease was present on the farm e.g. swine dysentery or *Escherichia coli* (post-weaning diarrhoeas). When these products were included at prevention levels (often the same as the growth promotion levels or slightly higher) they also prevented the diseases and gave larger numerical production improvements in so-called 'dirty pigs' over controls, which received no growth promoters. This is where growth promotion and disease prevention overlap and why several growth promoters, which were prescription free, became very popular.

Figure 1. Comparison of growth rates between gnotobiotic, growth promoted, standard health and diseased (swine dysentery – SD) pigs



So what were the growth promoters doing, other than growth promoting? (See Table 1.)

Table 1. Growth promoters – comparative activity and disease controlling effects

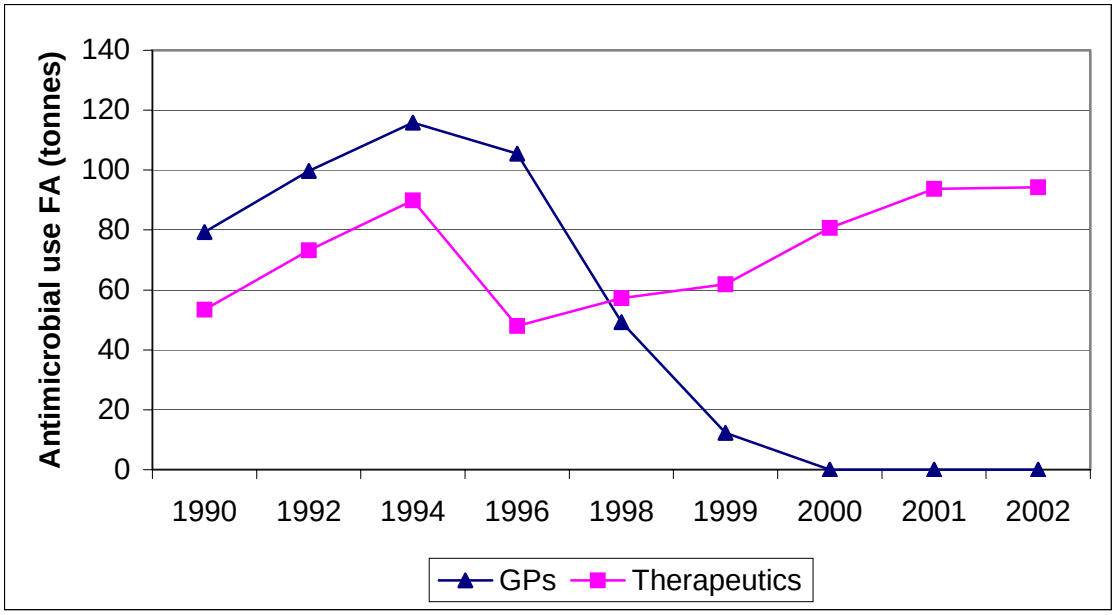
Antimicrobial	Clostridium perfringens	Swine dysentery	Colitis	Ileitis	Salmonella	E. coli	Enzootic pneumonia
Current GPs							
Flavomycin	-	-	-	-	-	+/-	-
Avilamycin	+	-	-	-	-	+/-	-
Salinomycin	+	+	+	+	-	+/-	-
Withdrawn GPs							
Avoparcin	+	-	-	-	-	+/-	-
Bacitracin	+	-	-	-	-	+/-	-
Virginiamycin	+	-	-	-	-	+/-	-
Carbadox	+	+	+	+	+	+	-
Olaquindox	+	+	+	+	+/-	+	-
Tylosin	+	+	+	+	-	+/-	+
Spiramycin	+	+	+	+	-	+/-	+

Key: - = no activity; +/- = indirect activity; + = direct activity

Most growth promoters have an indirect effect on post-weaning scours, although they are not specifically active against *E. coli* and would not control it if the environmental conditions were challenging. Olaquindox and carbadox were very useful for *E. coli* control and carbadox is indicated for salmonella control in the US. All of the withdrawn antimicrobial products were very active against *Clostridium perfringens*, which can cause diarrhoeas in young pigs but is more of a problem in broilers. Copper sulphate had an antibacterial effect as well as an antifungal activity and may still be used at 170ppm in young pigs, upto 12 weeks of age but at 25ppm in all other ages. Zinc oxide can be used at 150 ppm for nutritional purposes (Commission Regulation (EC) No 1334/2003) but zinc oxide's medicinal use under veterinary MFS prescription (Pigzin – DSM, formerly Roche) is still retained in the UK and can be used in young pigs, upto 10 weeks of age at 3100ppm (2500ppm of zinc) for the treatment and control of diarrhoea. This is very important as the Danes tried to stop its use at the same time as growth promoters were withdrawn and this had a large part to play in the increase in diarrhoeas in young pigs.

So what did happen in Denmark when they removed all of the growth promoters? (See figure 2)

Figure 2. Growth promoter and therapeutic antimicrobial use in food-producing animals in Denmark

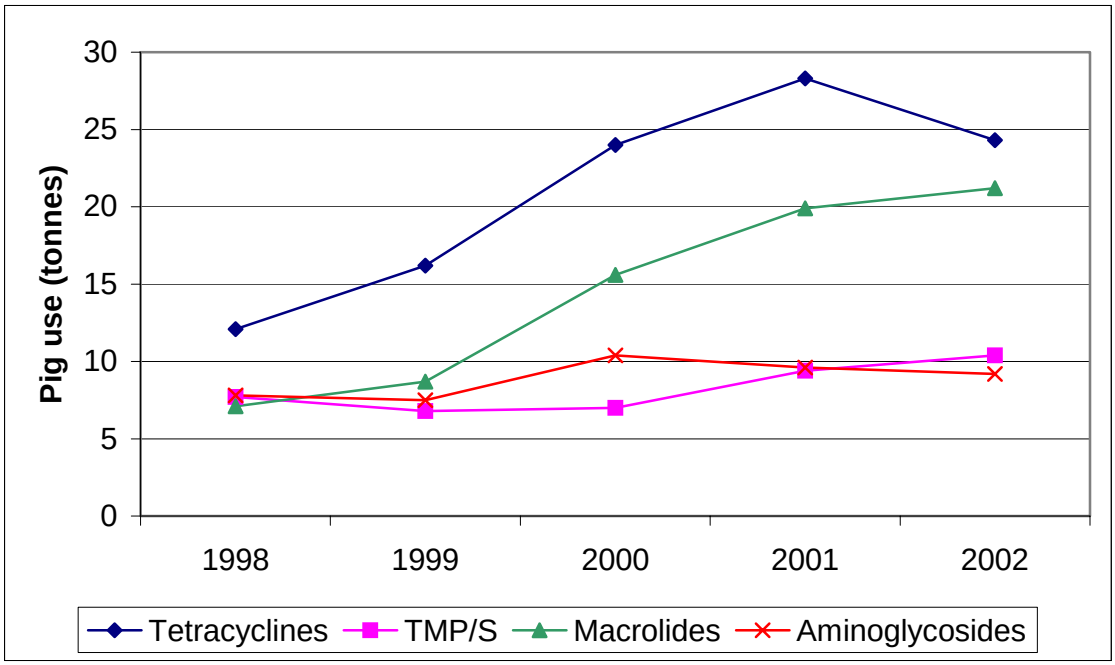


Ref: Danmap, 2003

There was a cut off in growth promoter consumption and a steady rise in therapeutic antimicrobial use. Both had been very high during the early 1990's but the therapeutic use was dropping until the ban and it has now risen to its original usage level. Pigs account for 70% of antimicrobial use in food-producing animals in Denmark.

What were the major antimicrobial product groups that were used instead? (See Figure 3)

Figure 3. Therapeutic antimicrobial use in Danish pigs



Ref: Danmap, 2003

Tetracyclines grew dramatically (doubling) but trimethoprim/sulphas less so initially. These are the two major broad-spectrum antimicrobials used for enteric and respiratory disease in the UK. Aminoglycosides (neomycin and apramycin) for controlling *E. coli* scours also increased substantially, probably as a result of the removal of the high level use of zinc oxide. Subsequently this was re-introduced at a farm level, by top dressing feed illicitly but recently (May 2004) its use has been approved by the Danish Authorities on a restricted basis. The use of 'macrolides' almost trebled. This grouping includes tylosin, spiramycin (real macrolides), the lincosamide, lincomycin and the pleuromutilins tiamulin and valnemulin, which all have activity against enzootic pneumonia but more importantly swine dysentery, colitis and ileitis, the main causes of diarrhoea in grower pigs. As the growth promoters with prevention effects against these three enteric infections were removed, there was a major switch to prescription products especially to tylosin, which was formerly used as a growth promoter.

What will happen when growth promoters are withdrawn in the UK? For growth promotion alone there are already new products such as potassium diformate (Formi – BASF), other acidifiers and enzymes, which will help compensate. As long as zinc oxide's medicinal claim is retained, then post-weaning scours should be controlled without an increase in aminoglycoside or trimethoprim/sulpha use. Withdrawal of salinomycin will cause an increase in grower pig diarrhoeas (See Table 1). Therefore the use of tylosin (Tylan – Elanco) for ileitis is likely to continue to increase, as well as lincomycin and lincomycin/spectinomycin (Lincocin and Lincospectin – Pfizer). Tiamulin and valnemulin (Tiamutin and Econor – Novartis), the most effective therapeutics for spirochaetal infections such as swine dysentery and colitis, should also increase, especially due to the removal of the risk of ionophore interaction from inadvertent salinomycin co-inclusion. A new macrolide Aivlosin (acetylisovaleryl tylosin) is also expected to be introduced later in 2004 by Schering-Plough. Use of this whole group of products has already almost doubled from 1998-2002 in the UK, in spite of the continuing drop in pig numbers here.

Overall, it is considered likely that the withdrawal of antimicrobial growth promoters on 1st January 2006 will have a relatively minor impact on pig production in the UK and only minor changes in the patterns of use of therapeutic antimicrobials by the time it is introduced. Research efforts, however, should continue to improve our understanding of pig disease problems and control, their nutrition, management, hygiene and biosecurity, to minimize any potential impact once the withdrawal is in place.