The Significance of *Lawsonia intracellularis* as a Key Enteric Pathogen after the Danish Ban of Antibiotic Growth Promoters; Experiences in my Practise

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**Summary**

During the late nineties, all use of antibiotic growth promoters for food-animals was gradually banned in Denmark. At the same time, the legislation on prescription of medicine was tightened and registration of usage became mandatory. Following the ban, the prevalence of diarrhoea – often caused by *Lawsonia intracellularis* – increased leading to an (expected) increased use of therapeutic antibiotics. However, the consumption never reached the amounts of antibiotics distributed before the ban. During 2001 a total amount of 91,450 kg of antibiotics was dispensed from Danish pharmacies, of this 78% for pigs. By now the consumption seems to be at a rather stable level and for some groups of antibiotics even decreasing. After the ban daily weight gain decreased by 50 g in the weaning period and mortality raised 1-2% in the same period.

It has become a challenge for Danish veterinarians to deal with the increased paperwork and the health problems following the ban. In LVK all reports are handled electronically from a central office. The LVK strategy for reducing the prevalence of intestinal pathogens (or at least minimize the symptoms) is based on individual and thorough advisory service. As a result of this strategy, the use of antibiotics in LVK (serving 20% of the Danish pig production of approximately 23 million pigs per year) is low (12% of the total) compared with the overall Danish consumption.

**History**

Before 1995, the Danish legislation of veterinary drug use for food-animals was limited. It included regular herd visits to check health status according to Specific Pathogen Free (SPF) demands. There were some limitations in prescription duration but the rules were not complied with and there were no limitations on the veterinarian’s right to dispense, hence; practice economy was partly based on the sale of medicine. There was no registration, neither national nor on farm basis. However, the political point of view was that the veterinarian’s interest in medicine sale was unfortunate and might lead to a higher use than necessary and a reduced interest of changing health status. Therefore, the authorities demanded more registration of medicine use on farm level, practice level and on the national level.

**Changes of legislation**

During the nineties the increasing use of antimicrobials in food-animal production (for growth promotion, prevention and treatment) became a concern in Denmark. The possibility of increasing bacteriological resistance was worrying since it could jeopardize the treatment of infected animals and

**Use of antibiotics in Denmark (after 1999 pigs only)**

![Graph showing the use of antibiotics in Denmark](image_url)

*Figure 1. Kilograms of antibiotics used in Denmark in the period 1994-2003. From 2001-2003 only the consumption for pigs is included. The graph (second y-axis) illustrates the use of antibiotics calculated as grams per produced slaughter pig (19.5-24 million pigs are slaughtered per year). (DANMAP, VetStat, 2003-2004)*
constitute a risk for human health – especially if multi-resistance was induced. By then, an association between antibiotic growth promoters and bacterial resistance was already established. The Danish government had funded studies of the use (and the consequences of the use) of antimicrobial growth promoters (e.g. avoparcin and virginiamycin) since 1995 (Bager et al., 1997; Aarestrup and Carstensen, 1998). As a result of these studies, the use of avoparcin and virginiamycin was banned in Denmark, and the pig industry decided voluntarily to ban all use of antimicrobial growth promoters, starting first in finishers then in weaners and growers. Beside these changes, the legislation regarding health contracts (advising agreements) was tightened and now included visits on the farm every month, prescription based on actual incidence of disease, prescribed medicine delivered by pharmacy, written instructions on medicine use, written description of actions taken to avoid disease, reports of visits and daily and monthly registration of used medicine by farm staff.

The total use of antibiotics for Danish production animals (until 2000) and pigs exclusively (2001–2003) is presented in figure 1. During the 3-year period where data from VetStat (Stege et al., 2002) has been available, the total consumption of antibiotics for pigs has been very stable. When looking at the different therapeutic groups of antibiotics, the use of tetracyclines has decreased, the use of fluoroquinolones is minimized, the use of aminoglycosides has increased while the use of other therapeutic groups for pigs remain unchanged (Figure 2).

Intestinal pathogens in Denmark (before the ban)

At the time of the ban (mid-to-late nineties), the prevalence of intestinal pathogens in Danish pig herds was low, except for (usually subclinical) infection with *Lawsonia intracellularis* (Stege et al., 2000). *Lawsonia intracellularis* may cause proliferative enteropathy in pigs, especially among growers and finishers and although the infection may evolve without causing diarrhoea or other clinical symptoms, it may be responsible for reduced growth and welfare of pigs, hence, financial loss for producers (Harris et al., 1999). However, apart from the occasional *Escherichia coli* weaning diarrhoea, most Danish pig herds had no or only mild symptoms and although the prevalence was almost 100%, *Lawsonia intracellularis* was not considered a serious problem at that time. This was to change rapidly.

Effects of the ban

After the total ban in 2000 there was an increase in diarrhoea. The problem was often caused by infections with haemolytic *Escherichia coli* and *Lawsonia intracellularis* and resulted in an increased use of therapeutic antibiotics (Johansen and Jørgensen, 2003; Larsen, 2002). There is some evidence that infection with *Lawsonia intracellularis* may cause a reduction in the daily weight gain of approximately 50 grams or additional 7 days from weaning to 30 kg (efficiency control – clients records at the herd level). A study (Stege et al., 2004) indicated that *Lawsonia intracellularis* infected pigs had a decreased growth rate compared with non-infected pigs (Figure 3).
In praxis we see in almost every herd more and more porridge-like-diarrhoea in the late weaning period which, untreated, leads to a lot of unthriving pigs. Mortality is low. A similar picture is seen in both SPF and conventional herds, with or without PRRS or PMWS. A few nucleus herds have tried medical eradication of *Lawsonia intracellularis* without any success.

### Weapons

In praxis the diagnosis is based on clinical symptoms, post mortem findings and – in some cases – PCR. The treatment may vary but several studies have shown the importance of feed, hygiene and stocking density. Hence, our (LVK) strategy for reducing the prevalence of intestinal pathogens (or at least minimize the symptoms) is based on individual and thorough advisory service. In our experience the feeding should be restricted, the feed should contain barley, possibly acids and sufficient animal protein and the structure should be coarse. The production system should facilitate sectioning with cleaning and disinfection between batches (preferably all-in-all-out), and unnecessary mixing of pigs should be avoided. Finally the stocking density should be low with smaller pens where littermates are kept together the entire fattening period. This strategy is combined with therapeutic antibiotic treatment as necessary. As a result of the advisory strategy, the use of antibiotics in LVK (serving 20% of the Danish pig production) is low (12% of the total) compared with the overall Danish consumption. But we urgently need a “silver bullet “, and the “silver” must not be antibiotics.

### Conclusions

The ban and legislation have increased the amount of paperwork and administration. The prevalence of certain diseases especially *Escherichia coli* weaning diarrhoea and *Lawsonia* diarrhoea has increased and the situation is a professional challenge in the daily work. But the overall use of antibiotics has decreased and apart from the increase of oral therapeutic antibiotics following the ban, the usage is now stable and – for some antibiotic groups – decreasing. The rest-concentration of antibiotics in Danish pork is very low, (and so is the prevalence of Salmonella DT104). The situation is constantly being monitored. Further investigations of *Lawsonia intracellularis’* role in late post weaning diarrhoea in praxis after the ban is called for in the future.
References


