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Reduction of antimicrobial use and resistance in veal calf fattening through improvement of animal health and welfare: the novel »outdoor veal calf« concept

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Summary

Introduction

To meet the demand for milk and dairy products (butter, yogurt, etc.), cows are milked. High-yielding cows produce up to about 50 kg of milk per day. As it is typical for mammals, milk production in cows starts only after the birth of a calf and decreases continuously during the following year. The goal of producers is therefore to obtain one calf per cow per year so that the highest possible milk quantities are produced on a permanent basis.

This results in a large amount of calves that are considered surplus. On the one hand, more female calves are produced than need to be raised to replace aging dairy cows. On the other hand, most male calves are surplus as, due to their male gender, they will never produce milk, and most will not be used for breeding purposes. The situation is intensified by the fact that all calves from high-yielding dairy cows inherited variable proportions of dairy cattle genetics, which results in a slim physique which is not optimal for meat production.

These surplus calves are often sold to specialized calf fattening farms, where they are fattened intensively for about five months. The feed used is mainly milk, by-products of cheese production (e.g. whey) and milk powder. Veal is classically used to prepare dishes such as bratwurst, vitello tonnato, and pâtés.

From the dairy farm, calves are transported to the calf fattening farm at a young age. At that time, their immune system has not yet fully developed. The transportation to such calf fattening farms, mixing with calves from other origins, and housing in barns with suboptimal space and barn climate are among the reasons why diseases often develop and spread rapidly. Mortality can be around 5%, which means that one in 20 calves dies during fattening. To prevent the loss of animals, antibiotics are administered frequently (BLV, 2022). Furthermore, in Switzerland there is no sector of animal husbandry besides veal production where more highest priority critically important antibiotics are administered (BLV, 2022). This is not only done therapeutically, but also prophylactically or metaphylactically, and is primarily used to control diseases of the bovine respiratory disease complex (BRD) and diseases of the digestive system (Schnyder et al., 2019). Routine use of antibiotics is associated with the emergence of resistance and significantly degrades antibiotic efficacy in the medium to long term (WHO, 2018).

New concept: improved animal welfare and reduced mortality in veal calves

In the novel housing and management concept ‘outdoor veal calf', known risk factors (from former studies) associated with increased antibiotic use and mortality were systematically mitigated or eliminated. Animal welfare was assessed comparatively in 900 veal calves reared in the new housing system and 1005 veal calves reared in the conventional housing system on 38 farms using a variety of

parameters. This represents approximatively 1% of the annual domestic production volume in Switzerland. Significantly better animal welfare was observed in ‘outdoor veal’ calves. Mortality differed by 2-fold (-50%) with significantly fewer deaths in calves fattened according to the new housing system ‘outdoor veal’. Further data collection was based on, among others, i) two important symptoms of pneumonia (significantly less coughing in young and older ‘outdoor veal’ calves, significantly less nasal discharge in older ‘outdoor veal’ calves), ii) signs of diarrhea (significantly cleaner coat, significantly less diarrheal feces on the floor, and iii) signs of pneumonia after slaughter (significantly less lung lesions and adhesions of the pleura). In addition, barns were evaluated for animal friendliness (significantly less slippery floors and thus less susceptibility to injury because the entire floor space was thickly straw-bedded).

Use of antibiotics drastically reduced

Due to better animal health, antibiotic use was lowered 5-fold (-80%) in 'outdoor veal' calves. The reason for the lower use was a lower disease prevalence at both the individual animal and group level. Thus, 85% of the ‘outdoor veal’ calves were never treated with antibiotics. When comparing calves of the different housing systems, it was also observed that, if antibiotic were administerd, treatments lasted a shorter time in ‘outdoor veal’ calves.

Lower prevalence of antibiotic-resistant bacteria

The fact that antibiotic use is related to the presence of antibiotic-resistant bacteria has been described extensively (WHO, 2018). Resistant bacteria circulate in the environment as well as between and within human and animal populations. Much less frequently investigated and much less trivial is the relationship of reducing antibiotics on the prevalence of resistant pathogens. Bacteria are not expected to 'lose' their resistance mechanisms. It is likely that in the absence of antibiotic use, resistance mechanisms do not any longer represent a fitness advantage. This way, resistant bacteria are ‘diluted’ within a population of non-resistant bacteria. To work on a corresponding hypothesis, detailed data of antibiotic treatments of 1905 fattening calves as well as the results of resistance testing of pathogens (of the respiratory tract and the normal flora of the intestine) were used. The data sets were outstandingly expensive to obtain due to the high laboratory costs and man/woman-power needed, and contained over 1850 treatments recorded and over 7000 swab samples results (susceptibility testing using microdilution). These data sets are larger than most other studies in the field (Gay et al., 2019). Analyses showed that ‘outdoor veal’ calves carried *Escherichia (E.) coli* bacteria with significantly less resistance at the end of fattening, and the prevalence of multidrug-resistant *E. coli* and the prevalence of resistant respiratory pathogens (*Pasteurella multocida*) were significantly lower.

This indicates that by implementing targeted measures, better animal welfare leads to lower antibiotic use and to an improved resistance situation, subsequently.

Economic equivalence in comparison with conventional calf fattening

The above-mentioned results of the implementation of a new management and housing system in calf fattening speak in favour of its dissemination. Additionally, economic interests of the livestock farmers should be taken into account. Due to the design of the study, higher labour costs were observed in the new system (semi-automatic feeding on ‘outdoor veal’ calf farms vs. fully automatic feeding on conventional farms). Implementation of fully automatic feeding is conceivable in the future. The comparative profitability analysis (analysis of the gross margin per working-hour (gm/wh), i.e. the revenues of on particular production branch of the farm minus the costs of the same production branch on the same farm (i.e., calf fattening) per gm/wh) showed equivalence of the conventional and

the new housing system. This was mainly due to the comparable daily fattening performance. Being at ~10 CHF/wh (~10 USD/wh), the gross margin is low. There is a strong market dependence, since rising or falling sales prices of carcasses had a large influence on the contribution margin.

Briefly, in the frame of this study, resistances at the beginning of the fattening period were investigated, as it is usually only done at slaughter and also resistances to disinfectants were investigated; a novel gene conferring resistance to trimethoprim was discovered; and emerging cattle-adapted influenza D virus was isolated from Swiss bovines for the first time.

Conclusion

The novel 'outdoor veal' concept is the solution to a real problem. Through adequate management and outdoor housing environment, young calves are exposed to significantly lower disease pressure. This results in improved animal welfare through reduced pain and suffering, halved mortality, 5-fold fewer treatments, economic equivalency, and lower prevalence of resistant bacteria.

The new husbandry system is more animal friendly, reduces the risk of antibiotic resistance and allows for veal production at approximatively the same cost.

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