



Section	Fields (of activity)
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Economic evaluation of the control program for *Staphylococcus aureus* genotype B in dairy farms in canton Ticino

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Key words

Eradication program, mastitis, benefit-cost analysis, profitability

Aim of the study

The aim of this study was to assess the economic profitability of the eradication program for *Staphylococcus aureus* genotype B (SAGB) in the Canton of Ticino and to estimate the economic impact of the implemented program at the farm and regional levels. Findings from this study should serve as input for evidence-based and optimized planning for a potential nationwide control program.

Material and methods

The effects of the eradication on different production parameters were assessed in a multilevel mixed-effects model, using empirical data from the breeding association over the first three years of the eradication (2018 – 2020). Production models were used for gross margin (GM) analysis to estimate the financial benefit of the intervention for disease free herds compared to affected herds (baseline). Three different production types and intensities were modeled to account for the diversity of Ticinese dairy farms. Disease, production and financial parameters were obtained from either empirical data, scientific literature or Swiss agriculture statistics. For the baseline scenario, a SAGB herd-level prevalence of 35% was assumed based on data from an epidemiologic study conducted prior to the start of the control program. In a benefit-cost-analysis (BCA) the total benefits and eradication costs were compared over a period of 10 years (2018-2028). The outcomes are based on a stochastic simulation model using @Risk for Excel. To report program costs excluding expenses related to research character, a scenario with partial exclusion of academic staff costs was estimated (100% of doctoral student salary and 50% of postdoc salary).

Results and significance

Epidemiological results showed that the control program was highly effective and that SAGB infections have mostly been successfully eliminated from Ticinese dairy farms. Herd-level prevalence was reduced to 0% after the first year of the program and only very few individual cows tested SAGB positive afterwards, mostly originating from other Cantons and being compulsorily tested before the alpine pasturing period.

The analysis of the production data has revealed an increase in milk production and an improvement of milk quality for initially SAGB positive farms from 2018 to 2020 compared to SAGB negative farms during the same period. However, these effects were not statistically significant. The average milk yield (geometric mean per test day) of cows in SAGB positive farms has relatively increased by 0.42kg while the bulk milk somatic cell count (BMSCC) was only slightly reduced with no economic effects on milk price and therefore this parameter was not included in economic model.

Annual farm-level financial benefits obtained by eradicating SAGB in initially positive farms were CHF 1'365, 1'954 and 2'358 for small, medium and large farms, respectively. At the animal level, benefits ranged from CHF 91 – 98 per cow and year. At cantonal level, SAGB infections caused median disease costs of CHF 120'000 (90% central range: 65'000 – 160'000) per year at the initial herd-level prevalence of 35% before the start of the eradication program. These disease costs also represent the potential annual benefits if SAGB prevalence is

reduced to zero. The losses are mainly caused by forgone revenue due to reduced milk production and to a smaller extent by increased veterinary costs.

The discounted cumulative total costs of the SAGB eradication program over the 10-year period were estimated at CHF 2'035'000 while the cumulative benefits for the same time span were estimated at CHF 1'164'000. The largest expenditures were for laboratory analyses and the technical direction of the program, which accounted for 37% and 34% of the total costs, respectively. The median net present value (NPV) obtained was CHF -871'000 (90%CR: -481'000 to -1'404'000) with a benefit-cost ratio of 0.57. If academic staff expenses were partially excluded from the program cost, the NPV increased to CHF -504'000, but was still negative. Sensitivity analyses showed, that outcomes were most sensitive to changes in the variable "reduced milk yield", which was based on the analysis of empirical data.

Overall, these outcomes imply that from an economic point of view the SAGB control program in the Canton Ticino is not profitable. This was despite the fact that initially SAGB positive farms could generate considerable financial benefits after the elimination of SAGB positive cows. These farm-level benefits are in line with financial benefits generated through other Swiss control programs in dairy herds (e.g. BVD control program). However, the costs of the control program were too high compared to the benefits obtained to result in a net benefit at the cantonal level. Although the costs of the first phase of the control program were significantly lower than originally anticipated (mainly due to lower expenses for laboratory analyses and compensation for culling cows, which are related to the success of the control strategy applied), these funds are being used for intensive monitoring of the now almost SAGB-free population and its protection against reinfections.

In the perspective of planning a potential nationwide control program, it has to be considered that SAGB herd-level prevalence in many regions of Switzerland is lower than in Ticino and thus fewer farms would contribute to the economic benefit of the program. Therefore, control costs are crucial for an economically profitable nationwide program. We therefore recommend focusing on the two largest cost factors of the program, laboratory analyses and personnel costs, of which the latter can partially also be considered as in kind contribution if they are state employees.

Publications, posters and presentations

Thomann; et al. 2018. Economic evaluation of the control program for *Staphylococcus aureus* genotype B in dairy farms in canton Ticino, Switzerland. Poster - ISVEE, 12 - 16 November 2018, Chiang Mai, Thailand

Pont; et al. 2020. Economic evaluation of the eradication program for *Staphylococcus aureus* genotype B in dairy cattle in canton Ticino, Switzerland. Poster - ISESSAH, 11 – 13 November 2020, Copenhagen (online), Denmark

Pont; et al. 2021. Ökonomische Evaluation des Eradikationsprogramms für *Staphylococcus aureus* Genotyp B in Milchviehbetrieben im Kanton Tessin, Schweiz. Presentation – DACH Epidemiologietagung, 1 – 3 September 2021, Bern, Switzerland

Project 1.18.06

Project duration June 2018 - September 2021