

What is a biosecurity measure? A definition proposal for farms and linked processing operations.

Main author: Nikolaus Huber (University of Veterinary Medicine, Vienna)

Co-authors: Veir Zoche-Golob, Elena L. Sassu, Christopher Prigge, Annemarie Käsbohrer, Mathieu Andraud, Daniela D'Angelantonio, Arvo Viltrop, Tarmo Niine, Pachka Hammami, Jacek Żmudzki, Hannah Jones, Elke Burow

INTRODUCTION

Increasing demand for animal protein and the diversification of food supply chains are driving foodborne zoonotic diseases responsible for morbidity, mortality, and economic loss worldwide. This trend towards intensive farming requires improved biosecurity to control and prevent zoonotic infections in animals and humans. As part of the One Health European Joint Programme, the 'Biosecurity practices for pig farming across Europe' (BIOPIGEE) project aims to establish a protocol of relevant biosecurity measures (BSMs) to reduce the occurrence of Salmonella, Hepatitis E Virus (HEV) and pathogenic *E. coli* in pig production within the EU. While 'biosecurity' is well defined, no harmonised definition of BSM exists. This, combined with the question of which measures can be counted as BSM, affects the understanding, acceptance, and broad, effective implementation of the concept from farm to policy level. Therefore, the BIOPIGEE task group i) evaluated potentially relevant inclusion and exclusion criteria in the context of biosecurity used within BIOPIGEE and ii) screened the scientific literature for existing definitions, with the aim of proposing a standard definition for the term BSM.

METHODOLOGY

Inclusion and exclusion criteria related to biosecurity were collected from five BIOPIGEE tasks studying the effectiveness of farm and slaughterhouse biosecurity practices. The significance of each criterion for defining the term BSM was discussed – relevant criteria were summarised to propose a working definition. Concurrently, a literature scoping review was conducted with the search terms 'biosecurity measures' AND swine (OR pig) in titles, abstracts, or keywords using Scopus, Pubmed, Web of Science and Google Scholar (GS) databases. As the GS search algorithm does not specify term locations, the first 300 articles sorted by relevance were selected. After removing duplicates, the remainder were processed using R-based bibliometric tools. From each database, ≤ 25 articles explicitly related to BSMs in pig operations were extracted. A bibliometric analysis was performed on the final record subset and full-text articles were extracted by text mining tools. The records containing one

of the 100 most frequent terms were included in a hierarchical cluster analysis. The outcome identified research clusters among the selected articles. These were modified after additional full-text reading.

RESULTS

Inclusion criteria were: association with pathogen occurrence in pig operations; application of procedures (goal, pre-/post-conditions, timing, physical requirements, rules) or physical processes; primary and secondary biosecurity. Exclusion criteria were: factors requiring major changes to the operation (location of the buildings, size); procedures for the monitoring of, compliance with, or effectiveness of BSMs; proficiency of personnel; description of pathogen status; tertiary biosecurity. From 926 identified records, 90 articles were retained after duplicates were removed and 34 articles remained due to considerable overlap between the databases. The scoping review did not reveal any existing definition for a BSM. Based on the final paper selection, six specific research themes were identified. We propose the following standard definition for the term BSM:

‘A biosecurity measure is the active implementation of any standardised segregation, hygiene, or management procedure explicitly aimed at reducing the probability of (i) the introduction of pathogens into a farm/operation (external biosecurity), or (ii) the spread of pathogens within or outside of a farm/operation (internal biosecurity).’

DISCUSSION

Two key aspects of the proposed definition are ‘active implementation’ and ‘standardised procedures’ (procedure = series of actions conducted in a particular order and way). The latter is linked to various factors such as geographical region/climate, species of pathogen/animal, production type, policy/law, and farm status (pathogen prevalence, existing biosecurity) as prerequisites. In addition, procedures are shaped by temporal conditions (short- vs. long-term effects for pathogen reduction), and are affected by human components related to compliance, knowledge and skills. ‘Active implementation’ emphasises the importance of the action itself. Assessments such as the evaluation of pathogen prevalence are often considered BSMs, but while indispensable, they cannot be considered to be BSMs independently as they form part of a procedure. Tertiary biosecurity measures (e.g. vaccination) were excluded in the context of BIOPIGEE, but remain essential biosecurity measures. Although the definition we proposed is based on expertise and scientific literature from the pig sector, it may benefit other species or production types, and improve research and communication on the best BSMs. (Fund OHEJP GA 773830)