A SYSTEMATIC REVIEW OF INDICATORS TO ASSESS PIG WELFARE AND THE SENSOR TECHNOLOGIES TO MONITOR THEM

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Pig production is considered one of the largest and most intensified production systems and raises major concerns regarding animal welfare. Animal welfare must be assessed using valid welfare indicators, which can be (a) animal-based, directly measuring the response of the animal (physical and mental) to the environment, and (b) resource-based, measuring the environment of the animal and estimating the risk for animal welfare. The aim of this systematic review is to elaborate a list of welfare indicators covering the five domains of pig welfare at all stages of the production cycle, from the farm to the slaughterhouse. A literature search was performed following the PRISMA systematic review guidelines to identify studies using valid indicators. The search was conducted using PubMed, Web of Science and Scopus databases including peer-review papers written in English and published from January 2000 to December 2022. From 1583 papers found, only 119 have been selected. In total 76 validated indicators were extracted: 27 indicators were measured on the farm, 10 in transport, and 39 at the slaughterhouse. Regarding the indicators assessed on farm, all five domains are covered: good feeding *(n=3)*, good housing *(n=5)*, good health *(n=9)*, appropriate behaviour *(n=3)*, and mental domain *(n=7).* The indicators more studied in this phase are the feeding and drinking behaviour, postural changes and movements, vocalisations, and lameness. In transport, only indicators of good housing *(n=4)*, good health *(n=1)*, and mental domains *(n=5)* were found, being environmental parameters, body temperature, and biomarkers the most frequently used. At the slaughterhouse, indicators related to good housing *(n=6)*, good health *(n=23)*, and mental domain *(n=10)* were identified, with skin lesions (including ear and tail lesions), and fear and stress behaviours as the most popular indicators. These indicators can be assessed either by a human observer or by precision livestock farming (PLF) sensors. The most frequent PLF sensors to monitor animal welfare indicators were, computer vision solutions, thermal cameras, infrared sensors, microphones, accelerometers, radio frequency identification (RFID), and environmental sensors, which can be used mainly on farms and, to a lesser extent, in transport. It is important to remark that there is a lack of validated technologies, mainly at the slaughterhouse, capable of assessing indicators related to the health domain such as lesions, signs of disease and the state of consciousness after stunning.