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Invited review: Animal-based indicators for on-farm welfare assessment for dairy goats

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ABSTRACT

This paper reviews animal-based welfare indicators to develop a valid, reliable, and feasible on-farm welfare assessment protocol for dairy goats. The indicators were considered in the light of the 4 accepted principles (good feeding, good housing, good health, appropriate behavior) subdivided into 12 criteria developed by the European Welfare Quality program. We will only examine the practical indicators to be used on-farm, excluding those requiring the use of specific instruments or laboratory analysis and those that are recorded at the slaughterhouse. Body condition score, hair coat condition, and queuing at the feed barrier or at the drinker seem the most promising indicators for the assessment of the “good feeding” principle. As to “good housing,” some indicators were considered promising for assessing “comfort around resting” (e.g., resting in contact with a wall) or “thermal comfort” (e.g., panting score for the detection of heat stress and shivering score for the detection of cold stress). Several indicators related to “good health,” such as lameness, claw overgrowth, presence of external abscesses, and hair coat condition, were identified. As to the “appropriate behavior” principle, different criteria have been identified: agonistic behavior is largely used as the “expression of social behavior” criterion, but it is often not feasible for on-farm assessment. Latency to first contact and the avoidance distance test can be used as criteria for assessing the quality of the human–animal relationship. Qualitative behavior assessment seems to be a promising indicator for addressing the “positive emotional state” criterion. Promising indicators were identified for most of the considered criteria; however, no valid indicator has been identified for “expression of other behaviors.” Interobserver reliability has rarely been assessed and warrants further attention; in contrast, short-term intraobserver reliability is frequently assessed and some studies consider mid- and long-term

reliability. The feasibility of most of the reviewed indicators in commercial farms still needs to be carefully evaluated, as several studies were performed under experimental conditions. Our review highlights some aspects of goat welfare that have been widely studied, but some indicators need to be investigated further and drafted before being included in a valid, reliable, and feasible welfare assessment protocol. The indicators selected and examined may be an invaluable starting point for the development of an on-farm welfare assessment protocol for dairy goats.

Key words: animal-based indicator, welfare assessment, dairy goat, on-farm protocol

INTRODUCTION

Consumer demand for assurance schemes of high-quality animal products, in terms of health, safety, and respect of animal welfare, has been increasing over the last few decades. In response to this demand, the assessment of animal welfare at the farm level has become one of the most debated issues in the field of animal husbandry. This topic has been widely discussed at the international level, and species-specific protocols for on-farm welfare assessment are presently a major concern worldwide and for European Union (EU) agricultural policy (Blokhuis et al., 2013).

Welfare assessment requires a multidimensional approach (Mason and Mendl, 1993), corresponding to a multi-criteria evaluation issue, and it should aim to determine the actual welfare of animals, including both their physical and mental state (EFSA, 2012). Different indicators need to be included in efficient welfare assessment schemes, as all are important and they cannot compensate for each other (Blokhuis et al., 2010).

In 2008, the EU Welfare Quality project re-elaborated the concept of the “Five Freedoms” of animals (Brambell Committee, 1965) and defined 4 main areas of animal needs (“Welfare Principles”), which were then split into 12 independent criteria (Blokhuis et al., 2010; Rushen et al., 2011), each of which corresponded to a key welfare question. Welfare principles and criteria are as follows:

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1. Good feeding: absence of prolonged hunger, absence of prolonged thirst;
2. Good housing: comfort around resting, thermal comfort, ease of movement;
3. Good health: absence of injuries, absence of disease, absence of pain induced by management procedures;
4. Appropriate behavior: expression of social behaviors, expression of other behaviors, good human-animal relationship, positive emotional state.

Each criterion includes specific indicators that may be used to assess each component of welfare (Rushen et al., 2011). Although the same indicator may provide information related to different welfare concerns, criteria are independent of each other and form a basic but complete list (Blokhuis et al., 2010).

Two broad categories of indicators can be used to assess animal welfare at the farm level: animal-based and resource-based indicators (Main et al., 2003). The need to focus on animal-based indicators emerged clearly from the EU Welfare Quality project (Blokhuis et al., 2010); however, few available indicators are centered directly on the animals (Johnsen et al., 2001) and they rarely target small ruminants. A recent review on the monitoring of on-farm welfare in small ruminants points out only a few animal-based candidate indicators and most deal with sheep (Caroprese et al., 2009). Resource-based indicators have been more frequently adopted in welfare assessment protocols, because measurements taken are usually quick and easy [e.g., the Animal Needs Index TGI 35L developed by Bartussek (1999) for several species]. Nevertheless, good management and environmental resources do not necessarily result in a high standard of welfare (Winckler, 2006). An animal-based approach seems more appropriate for measuring the actual welfare state of the animals. This represents a considerable change in perspective, a shift from a scheme that mainly measured environmental aspects (which may show high variation from country to country due to different housing and management conditions) toward one that measures the way in which the animal itself responds to such an environment (EFSA, 2012). Furthermore, individuals with different genetic backgrounds (e.g., different breeds) may, in fact, respond differently to the same environment. Although specific examples for goats are not currently available, this has been observed in other ruminant species. For example, in dairy cattle, Mattiello et al. (2011) pointed out that individuals with different genetic backgrounds showed different levels of welfare under similar environmental conditions. This supports the decision to

focus mainly on animal-based indicators rather than exclusively on resource-based ones.

The aim of this paper was to review promising animal-based indicators that could be used to set up a valid, reliable, feasible, and practical on-farm welfare assessment protocol for dairy goats, centered on the evaluation of lactating animals.

METHODOLOGY

This review is part of the Animal Welfare Indicators (**AWIN**) integrated 7FP project, funded by the European Commission, which is aimed at developing practical on-farm welfare assessment protocols for several species, including goats. Studies carried out for pinpointing animal-based indicators to be included in the protocols are still underway.

A review of the scientific literature to date was the starting point for identifying promising indicators. Databases (Web of Science, CAB Abstracts, PubMed, and Scopus) were searched for English language studies addressing animal-based goat welfare indicators as of (and including) 1990. Key words such as “welfare,” “measure,” “indicator,” “assessment,” “disease,” “pain,” “human-animal relationship,” “body condition,” and “lameness” were used as major descriptors combined with “goat” or “small ruminant.” Most of the reviewed literature dealt with dairy goats; however, although lactating dairy goats are our main target, papers considering other productive categories (e.g., kids, dry goats) and goats farmed for different purposes, or even other species, were taken into account whenever they provided evidence to support the use of indicators that could be included in a nonfarm welfare assessment protocol for lactating dairy goats.

In this review, we refer specifically to the most widespread management system for dairy goats in Europe and North America, which consists of intensive housing systems where goats are kept indoors with occasional access to pasture on some farms. In these systems, dairy goats are usually housed on straw litter, receive a TMR or forage (mainly hay) and concentrate feed once or twice per day, and are milked twice a day in a milking parlor. Kids are usually separated from their mothers early after birth.

We excluded indicators that focus exclusively on resources and management, as well as animal-based indicators that require further laboratory analysis (e.g., metabolic profiling), may be time consuming (e.g., observations performed by video-recording), or may require the use of specific instruments (e.g., stethoscope, thermometer, heart rate monitor, or automatic devices to record behavior; Desnoyers et al., 2009; Mononen et

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