Welfare of dromedary camels: what do we know?

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Introduction

Welfare is a term that describes the quality of living of an animal and animal welfare science focuses on measurable indicators that can be used to determine the welfare of animals at any given point in time. The assessment of welfare requires a multi-dimensional approach and aims to determine the actual welfare of animals, including considerations of both physical and mental states, using environmental- (EBM) and animal-based (ABM) measures. The Dromedary camel (*Camelus dromedarius*) is one of the most important natural resources in Africa and the arid lands of the Middle East and Western Asia (El Harrak et al., 2011; FAO, 2020). In these countries, the dromedary camel plays a role of great economic and social importance, as it is used for transport, racing, tourism, and perhaps most importantly provides food of high nutritional value (meat and dairy products), as well as wool and leather in a region where other common ruminant livestock species cannot be reared efficiently (El Harrak et al., 2011). However, the farming systems of these animals is shifting from pastoralism to intensive and semi-intensive breeding systems, and potential welfare concerns are rising. Currently, no comprehensive welfare standards for this species exist worldwide. Our aim in this report was to critically review the literature and present the latest updates on dromedary camel welfare.

Material and Methods

The literature search was performed using PubMed, Web of Science, and Google Scholar (consulted up to April 2022). Only English language papers were considered.

*Scientific tool to assess welfare on farm*
To date, the only protocol that has been proposed for the assessment of welfare in dromedary camels, that applies a multi-dimensional approach was developed by Padalino and Menchetti (2021). This protocol revisited the protocols used to assess the welfare of livestock in Europe, i.e. AWIN and Welfare Quality® protocols (AWIN, 2015; Welfare Quality Network, 2009) and adapted them for use in dromedary camels. It therefore foresees the on-farm collection of both ABMs and EBMs relating to the four fundamental welfare principles (Good feeding, Good housing, Good health, and Appropriate behaviour). However, it was inspired by Mellor's recommendations (Mellor et al., 2020) and as such, includes indicators of positive states and human-animal relationships. For each welfare principle, ABMs and EBMs are collected at three levels of assessment: Caretaker, Herd, and Animal (Figure 1), for a total of 105 measures.

**Figure 1:** An example of the data collection of the protocol for camel welfare assessment proposed by Padalino and Menchetti (2021). Modified by Padalino and Menchetti (2021) and AWIN (2015).

![Diagram](image)

Applications on a market

Padalino’s method has so far only been applied to evaluate the welfare of dromedary camels kept at a market in Qatar (Menchetti et al., 2021a, 2021b). A questionnaire was filled out by 49 caretakers; collecting information related to their background and how they manage the camels. A total of 76 pens holding 528 camels were evaluated; pen dimensions and the presence of shelter or other equipment (water and feeding points) were recorded. The body condition as well as health, and behavioural...
parameters were also recorded from 2 animals randomly selected from each pen (n=132). Models used to calculate overall welfare indices and to classify pens were developed (Menchetti et al., 2021b). The evaluated parameters were scored using a 0–2 scale, and scores were aggregated through a 4-step process to obtain overall assessment indices. Based on these overall indices, most of the pens were classified as “unsatisfactory” (61.8%) and none as “excellent”. Using this type of classification, it was possible to identify welfare issues and give recommendations to improve management and consequently camel welfare. Some of the recommendations have already been put in place in Doha.

Another way to identify welfare consequences and their hazards, in order to formulate preventive and corrective measures, is to apply the risk analysis in animal welfare as suggested by EFSA (2012). Data that were collected at the market in Doha were used to develop statistical models and identify possible associations between ABMs and EBMs for risk characterization (Figure 2) (Menchetti et al. (2021a)).

**Figure 2:** Selected environmental- (EBM) and animal-based (ABM) measures from Padalino’s protocol for the characterization of risk analysis for camel welfare according to the EFSA approach (2012). Modified by Menchetti et al. (2021b). BCS= Body Condition Score.

Space allowance, the presence of shaded space, cleanliness of bedding and water management were the major welfare hazards identified for dromedary camels kept on the market. Consequently, a minimum space allowance of at least 19 m$^2$/camel and the provision of adequate shaded areas, were recommended in order to prevent heat stress and enhance dromedary camel welfare in this setting (Menchetti et al., 2021a).
Welfare concerns and gaps of knowledge

Interest in camel breeding has grown recently and this has led to an increase in research regarding camel health and breeding practices (Faraz et al., 2021; Hussen and Al-Sukruwah, 2022; Pastrana et al., 2021; Zappaterra et al., 2021). However, properly defined welfare standards for this species still seem a long way off. The method proposed by Padalino and Menchetti (2021) was the first attempt to develop a tool for camel welfare assessment in line with the protocols used for other livestock species, but it is applicable only for dromedary camels kept in semi-intensive and intensive farming scenarios, and the tool still requires much refinement and must undergo a thorough validation process. Even within intensive systems, the fine tuning of specific protocols would indeed be necessary for assessing the welfare of dromedary camels bred for specific purposes, such as dairy farming and racing. Dioli (2022) recently reviewed the major welfare concerns for camels reared under a variety of systems and emphasized the need to contextualize the assessment of animal welfare in pastoral areas, taking into account the unique environmental, cultural, ecological and economic settings. Despite these advances, to date, there exists no specific recommendations concerning the welfare of farmed dromedary camels within European legislation (Previti et al., 2016). Furthermore, it is important to highlight that there are still no guidelines for the welfare of dromedary camels during transport and slaughter. In conclusion, the development and application of protocols for the assessment of dromedary camel welfare from ‘farm to fork’ and from bird to death, within environmental and farming contexts is therefore urgently needed.

Conclusions

Overall, the number of studies on dromedary camel welfare remains limited and more research is urgently required in order to suggest welfare standards for this species.

References

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