Chapter 7
Functional Properties of Camel Milk

Omar Amin Alhaj
King Saud University, Saudi Arabia

ABSTRACT

This chapter focuses on the potential health benefits of camel milk including angiotension I-converting enzyme-inhibitory, anti-cancer and antioxidant activities, antidiabetic, antimicrobial and hypoallergenicity effects. The bioactivity of oligosaccharide, conjugated linoleic acid and D-amino acid in camel milk is provided. The proposed mechanisms behind these bioactive components and potential health claims are explained. This chapter also describes camel milk composition, nutritional value, production and population. The current available information in the literature on camel milk is not abundant. More research is needed to give better understanding on functional properties of camel milk.

INTRODUCTION

The primary purpose of food including dairy products is to provide nutrients to fulfil the body's traditional requirements and other functions including cultural and social wellbeing. Although, in the recent decades life style has changed and become more complicated regarding life standard, hygiene, diet, use of antibiotics and other antimicrobial substances, hence a new concept of food need to be introduced. It has long been recognized that some non-traditional foods, for example camel milk, fortified food and beverages that provide particular health benefits and interestingly, in recent decades they have been modified to provide disease-preventive attributes, in addition to their particular functional health benefits. The concept of functional foods has also been developed and their types have been expanded to become one of the popular foods worldwide. The estimated growth rate of functional food in the global market is 15-20% per year, and the industry is claimed to be worth up to US$168 billion of the annual share (Euromonitor, 2010; Hilliam, 2003). However, there is no internationally accepted definition of functional foods exist, because it is a more of a concept rather than a well-defined group of food products (ILSI, 1999). So far, various definitions have been proposed by a number of researchers and/or foundations including International Food Information Council (IFIC) in 2011 as "food thought to provide benefits

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beyond basic nutrition and may play a role in reducing or minimizing the risk of certain diseases and other health conditions". The EU official directives have not given functional foods a firm definition, but the International Life Science Institute (ILSI) Europe in 1999 has proposed a working definition as food can be considered as 'functional' if it is "satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either an improved state of health and well-being and/or reduction of risk of disease".

Consumers are now more aware of functional foods than before, in 2013, 46% of consumers strongly agree that certain foods have health benefits beyond basic nutrition (IFIC, 2013). The recent information by IFIC showed that 91% of consumers are aware about the healthfulness of their food and beverages, furthermore, 88% knowledge a lot about food ingredients (IFIC, 2015).

According to the latest statistics of the Food and Agriculture Organization (FAO), the total heads of camels worldwide is estimated to be about 27 million, which mainly live in Africa (82.5%) and Asia (17.5%) (FAOSTAT, 2013). Camels are mainly classified into two species belonging to the genus *Camelus*; Dromedary camels having one- humped (*Camelus dromedarius*) are the dominant species which tend to live in the arid regions, whereas Bactrian camel having two-humped (*Camelus bactrianus*) mainly prefer living in the cooler regions (Al haj & Al Kanhal, 2010).The dairy camels in the world produce about 3 million ton of whole fresh milk per year distributed between Asia (8.7%) and Africa (91.3%), whereas Somalia is the biggest producer worldwide followed by Kenya, Mali, Ethiopia, and Saudi Arabia, respectively (FAOSTAT, 2013). Humans consume only 1.3 million tons per year while remaining amount are fed to calves (FAO, 2008). This is because most of the camel herds are located in the arid and desert regions which are far from the commercial markets. Recently very few camel milk products are available in the urban markets. Nowadays, there is a general need to launch a number of camel milk based functional products to the commercial market due to increasing demand in recent years (Al haj & Al Kanhal, 2010). These products have to be clinically proven and scientifically evident supported (Ghosh, 2009). This chapter focuses on the functional properties of camel milk components as well as proposed mechanism behind each health claim. The compositional and nutritional aspects of camel milk are also highlighted.

BACKGROUND

Camel Milk Composition

Camel milk has an important role in human nutrition in the arid regions; however camel milk is generally described as opaque-white, frothy, sweet and sharp but sometimes salty in taste (Al haj & Al Kanhal, 2010). These variations in taste are due to the type of fodder and unavailability of water (Farah, 1996). Although camel milk shows convergent gross chemical composition compared to other mammalian milks, on the other hand few differences were found in some sub-constituents for example absence of β-Lactoglobulin, high β-casein, and low αs-casein content (Table 1). These differences provide camel milk with some additional functional properties, for example, hypoallergenicity and higher digestibility in the gut of infants (El-Agamy *et al*., 2009; Abou-Soliman, 2005). Nevertheless, references data (Claeys *et al.*, 2014; Al haj & Al Kanhal, 2010; Konuspayeva *et al.*, 2009) have exhibited wide ranges