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Review Article

The unique medicinal properties of camel products: A review of the scientific evidence



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المخلص

استُخدمت ألبان وأبول الإبل كعلاجات في مناطق معينة من آسيا وأفريقيا منذ أزمنة قديمة، ولكن حديثاً فقط أبدى العلماء اهتماماً باستكشاف تلك المزاعم العلاجية لمنتجات الإبل. يشير عدد من الأدلة المخبرية وبعض الدراسات السريرية إلى أن ألبان الإبل وحدها، وفي بعض الحالات ممزوجة مع أبوال الإبل فعالة في علاج حالات سريرية متنوعة مثل داء السكري، والسرطان، وحساسية الأطعمة، ومرض التوحد، والتهاب الكبد الفيروسي ومجموعة أخرى من الإصابات الفيروسية والبكتيرية والطفيلية. بالإضافة إلى ذلك، تم اكتشاف عدد من الآثار العلاجية المحتملة لألبان وأبول الإبل على جهاز القلب والأوعية الدموية، وبخاصة عملها المضاد للصفائح الدموية والمذيب للفايبرين. العرض الحالي يمثل ملخصاً موجزاً للأدلة العلمية المساندة لهذه الآثار العلاجية.

الكلمات المفتاحية: ألبان الإبل؛ لبن الإبل والسكري؛ لبن الإبل والسرطان؛ غلوبولين الإبل المناعي؛ لاكتوفيرين

Abstract

Camel milk and urine have been used as medicines in certain parts of Asia and Africa since ancient times, but only recently have scientists shown interest in exploring the claimed therapeutic benefits of camel products. Significant evidence, drawn from laboratory and limited clinical studies, has shown that camel milk on its own and

occasionally mixed with camel urine is effective in the management of diverse clinical conditions such as diabetes mellitus, cancer, food allergy, autism, viral hepatitis and a host of other viral, bacterial and parasitic infections. In addition, a number of potential benefits of camel milk and urine on the cardiovascular system, particularly their antiplatelet and fibrinolytic actions, have been demonstrated. The current review presents a concise summary of the scientific evidence to support these therapeutic actions.

Keywords: Camel immunoglobulins; Camel lactoferrin; Camel milk and cancer; Camel milk and diabetes

Abbreviations: CM, camel milk; DM, diabetes mellitus; HEPG2, hepatocellular carcinoma cell line; HCT 116, colon carcinoma cell line; U251, human glioma cell line; Cyp1a1, cytochrome P450 1a1 gene; LF, lactoferrin; HCV, hepatitis C virus

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Introduction

The one-humped camel (*Camelus dromedaries*) is a unique animal that survives and reproduces under severe climatic conditions of heat and drought that do not suit the survival of other species of domestic mammals. For desert dwellers in Asia and Africa, the camel continues to be vital to daily life as a source of food and a means of transportation, and just as importantly, its milk and urine have been used as medicines for diverse ailments since ancient times.^{1,2} However,

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beginning in the early 1980s, more orthodox publications began identifying specific diseases and medical conditions that have been treated by camel milk or urine, including cancer,³ chronic hepatitis,⁴ hepatitis C infection^{5,6} and peptic ulcers.⁷ Even more recently, it has been reported that camel milk has cured severe food allergies in children who were unresponsive to conventional treatments⁸ and diabetes mellitus.⁹ Furthermore, camel milk is endowed with anti-malignant,¹⁰ antiplatelet¹¹ and anti-thrombotic properties¹² in addition to a host of anti-bacterial and viral properties,^{13,14} suggesting, among other things, the existence of a very strong immune system, which was recently shown to be equipped with unique light-chain-only antibodies.¹⁵

These claimed therapeutic actions have recently been the subject of numerous studies, and there is now mounting scientific information detailing the constituents of camel milk and urine as well as their therapeutic components. These revelations lend scientific evidence to support the current practice of using these camel products for their therapeutic benefits. The following review summarizes the current knowledge in these areas.

Anti-diabetic action of camel milk

Diabetes mellitus (DM) is characterized by abnormally high blood glucose levels, resulting from low insulin secretion and/or increased insulin resistance.¹⁶ DM and its complications have become a main focus of interest for researchers worldwide due to their close association with the risk of cerebrovascular and cardiovascular disorders, which were noted in 68% of diabetes-related deaths among patients aged 65 years or older.^{17,18} Today, the management of DM remains a great challenge for treating physicians.

In addition to the conventional diabetic management strategies of diet, insulin, oral hypoglycaemic drugs, and exercise, diabetes has also received attention because of the current wide interest in alternative therapies for chronic incurable diseases. In this respect, there is mounting evidence that camel milk (CM) consumption is effective in the control of DM in both humans^{9,19–21} and experimental animals.^{22,23} Strong support for this notion comes from camel breeders in India who consume CM regularly and who have zero incidence of DM compared to 5.5 percent in other communities in which CM is not consumed.²⁰ Additional support comes from the more recent finding that the consumption of CM by type I diabetic patients resulted in a 30–35% reduction in the daily insulin requirements, with significant decreases in both blood glucose levels and micro-albuminuria.⁹

These benefits can be related in part to the unique composition of CM, which is rich in insulin, insulin-like proteins,²⁴ minerals, immunoglobulins²⁵ and trace elements with anti-inflammatory properties. Additionally, CM possesses antioxidants and free radical scavengers.^{26–28} Further, camel insulin possesses unique features that make it different from human and other animal insulin and more effective when orally administered. Camel insulin, unlike the insulin contained within other animal and human milks, is contained within micelles and is thus protected from digestion and proteolysis in the upper gastrointestinal tract; it has also been proposed that camel insulin is encapsulated

in nanoparticles that facilitate its absorption and easy passing to the blood stream.²⁴ An added advantage of camel milk consumption by diabetic patients was discovered in recent renal functional and genetic studies in diabetic animals showing that camel milk has renal protection actions that prevent the renal damage associated with diabetes, as it attenuates the biochemical and morphological features of diabetic nephropathy in these diabetic animals.²⁶ It is also plausible that the antioxidant action of CM prevents the manifestations of metabolic syndrome, including hyperglycaemia, hyperlipidaemia, and insulin resistance. This, in turn, would inhibit the pathophysiological processes underlying the microvascular complications of DM, including retinopathy, nephropathy or cardiovascular complications that heighten the mortality and morbidity of the disease.^{9,21,28}

The above findings lend strong support to the beneficial effect of CM as a nutritional supplement and therapeutic adjuvant in the management of DM. In addition to the established hypoglycaemic benefit, CM treatment is expected to achieve the nephrologists' goal of renal protection.

Anti-cancer action of camel milk

The claimed anti-cancer action of camel products is widely accepted by local healers who use of a mixture of camel milk and urine in the treatment of patients suffering from a variety of cancers, including breast, nasopharyngeal, lung and others. This, in addition to the difficulties faced by modern medicine in finding a lasting cure for cancer, prompted the current flurry of studies attempting to find evidence to support these claimed anti-cancer actions of camel milk and urine and eventually succeed in identifying the anti-malignant component in camel milk or urine that could ultimately lead to the discovery of an effective anti-cancer drug.

In a series of *in vitro* experiments, a research group led by Dr Fatin Khorshid succeeded in demonstrating that lyophilized camel urine stopped the growth of tumour cells implanted into experimental animals and the growth of malignant cell lines including hepatocellular carcinoma (HEPG2), colon carcinoma (HCT 116), human glioma (U251) cells, lung cancer cells and leukaemic cells. She suggested that this anti-cancer action could be both a direct cell cytotoxicity and cutting blood supply to tumour cells, i.e., anti-angiogenic action.^{29–32} The latter action of camel urine was recently confirmed by our group. In a series of recent experiments we have demonstrated that both camel urine³³ and milk,³⁴ each on its own, inhibited inflammatory angiogenesis in the murine sponge implant angiogenesis model. Further support for the anti-cancer action of camel urine comes from the observations of Alhaider et al.³⁵ that camel urine causes significant inhibition of the expression of the gene encoding carcinogen-activating enzyme Cyp1a1 at the mRNA level in cancerous liver cells. Similar, apoptotic anti-cancer action has also been demonstrated in camel milk.³⁶ To date, the exact nature of the anti-malignant constituents in camel milk or urine have not been identified, although the iron binding, multi-tasking and multi-functional protein lactoferrin (LF) is believed to be a possible candidate.³⁷

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