



The Dromedary Camel; A Review on the Aspects of History, Physical Description, Adaptations, Behavior/Lifecycle, Diet, Reproduction, Uses, Genetics and Diseases

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SUMMARY

Some aspects of the life of the dromedary camel were examined based on available literature. The camel was said to be domesticated in the present day Oman about 4000 yrs ago. Two dominant species were named, the *Camelus dromedary* and *Camelus bactrainus*. Its name the “ship of the desert” was said to be given because of its usefulness to the desert nomads to whom the camel serves as beast of burden, draft animal and also a source of milk, meat, hides, hair and wool. Their ability to stay for long periods without water is one of the characteristics that make the camel of great importance due to the emergence of environmental challenges such as desert encroachment and global warming. The fast developing sport of camel racing has the potential of becoming an industry that will further enrich the economy and promote tourism in some Arab countries. The camel is also known to be susceptible to diseases like anthrax, surra, helminthosis, salmonellosis, brucellosis, tuberculosis, pasturellosis, paratuberculosis, black quarter, pneumonia, and tetanus.

Key words: Camel, dromedary, origin, genus, uses, products.

INTRODUCTION

The word camel is said to have been derived from a Greek word “kremal” or from a Sankrit word “Kreluk” which means “throw away legs” and it makes sense since the camel seems to throw away its legs during movement (Barht *et al.*, 2003).

The *camelus* genus has little direct evidence of the precise time of domestication, since most of the owners were nomads, they left

few permanent monuments of their presence. However the most likely time of domestication is about 4000 years before present BP (Before Present) around the present day Oman (Barht *et al.*, 2003).

Camels are divided into old world camels which are in the genus *Camelus* and the new world camels or Southern American Camels which are in the genus *Lama*. The *Camelus*

genus has two species *camelus dromedaries* or Arabian Camels or one-humped camel or dromedary and *Camelus bactrianus* or two humped camel. *Lama pacus*, *L. glama*, *L. guanicoe*, and *L. vicugna* are the four species constituting the Lama genus with the first two being domestic and the others wild but they are all humpless (Mason, 1979; Payne and Wilson, 1999; Barht et al., 2003).

With the current trend of global warming, desert encroachment, drought, low rain fall, the camel stands to be one of the animals that can withstand these adverse environmental conditions (Barht et al., 2003) Among other importance the camel (dromedary) can be used for milk, which averagely a lactating female can be milked for a year, it also produces meat, hair, wool, hides, serves as beast of burden, used for riding and draft animal for short distance journey and agriculture. Camels are currently being used for a lucrative developing racing industry especially in the Middle East (Cockril, 1979, Payne and Wilson, 1999).

In Nigeria camels are mostly found in the arid zone and Sudan savannah area with an estimated population of 87,830 with Sokoto and Borno having 43,960 and 26,682 respectively. Niger state has 496 making the three states the highest in that order (NLRs, 1992).

Amongst one of the best and the most adopted species of animals to the desert is the camel that can be used for meat, wool, milk etc (Kamal, 2008; Meiloud et al., 2011). The old and new world camels belongs to the order artiodactyla, of the family Camelidae and of the ruminant sub order tylopoda. The camelidase differs from order ruminants in that it doesn't possess horns and antlers. The camels are even toed ungulates (Payne and Wilson, 1999).

The Camel is a polygastric animal and a psuedoruminant having three stomach

compartments (Barht et al., 2003). The camel possess the ability to travel across a long hot desert with little food and water. Camels are divided into two, the old world camel which are of the genus camelus and the new world camels which are of the genus Llama. The genus camelus consists of two species which are *Camelus domedarius* or dromedary camel or Arabian camel or one humped camel and *Camelus bacterianus* or the two humped camel. The new world camel consist of *Llama glama* mainly used as park animals and the alpaca (*L.pacos*), which produces mostly high fibre with the wild ones including guanaco (*L.guanicoe*) and vicuna (*L.vicuna*) (Onu and Hambolu, 2006). In this review we will be looking at the various aspects of the life of the dromedary camel and its impacts on the life of man based on available literature.

DROMEDARY CAMEL

The Arabian camel also called *Camelus dromedarius* or dromedary camel is an even-toed large ungulate with one hump on its back. Carl Linnaeus in 1798 was the first to describe this animal. The dromedary is the second largest member of the camelus family after the larger Bactrian camel (Groves et al., 2011). The term dromedary came from a French word *dromedaire* or latin word *dromedarius* which means 'swift'. It is based on the Greek word *Dromas*, the prefix 'dromad' meaning runner (Oxford Press, 2012).

British veterinarian Arnold Leese on the basis of habitat classified dromedaries into three, hill camels, plain camel and the intermediate between the two (Mukasa-Megerwa, 1981). Earlier Bactrian and dromedary camel were considered as one but this was differentiated by Macedonian philosopher Aristotle who described them as one hump and two hump camel in his book History of Animals (Lendering, 2004).

DOMESTICATION

The history and actual origin of the domesticated camel is elusive compared to other animals like donkey, pig and dog (Guffra *et al.*, 2000; Savolainen *et al.*, 2002; Beja-Pereira *et al.*, 2004). Dromedaries were first domesticated around Central or Southern Arabia. It is believed that it took place around the Arabian Peninsula around 4000 years ago (Peter, 1997).

The *camelus* genus was probably among the last to be put into use by man among domesticated animals. There exists little evidence of the actual time of domestication since the early owners were nomads whose migrational movements could not allow for permanent mementoes for archaeological studies. There is more evidence for the domestication of southern America camels as it said it was on the altitude of about 4000 to 5000 meters in the Andes of Southern Peru and western Bolivia (Barht *et al.*, 2003), while others suggest that the bactrian camel originated from the yellow river in North –Western China through Mongolia to Central Kazakhstan (Binnikov ,1976).

The domestication of camels like other animals have brought about a tremendous increase in economic ,cultural ,social, and educational development of human societies and has actually brought a “quantum jump” in human civilization (Schaller,1998; Nowak,1999).

PHYSICAL DESCRIPTION

The dromedary camel with the Bactrian camel are the largest camelids with the adult male of the dromedary weighing 400-600 kg and grows to a height of 1.8 -2 metres and the female dromedary weighs 300 – 540 kg and is 1.7 – 1.9 Metres when they are adults. In general the Bactrian is slightly larger in size than the dromedary camel. Very large mal dromedary can weigh as much as 1000kg (Groves, 2005).

A clear cut sexual dimorphism can be seen between male and female dromedary. The

male is usually taller and more heavily built than the female. The whiskers tend to be longer, the tushes more pronounced and there is a general overall better muscular development in the male dromedary than in the female. If a gelding is castrated before three years old it will attend normal height but will be deficient in weight as they will be light built with a high pitched voice, a reduced preputial sheath and a dulaa (soft palate) that cannot inflate (Barht *et al.*, 2003).

The camel’s real general description is that they possess long eyelashes, protruding eye ridge bone, thick eye brow and dark large eyes. Other descriptions are a third eye lid to protect the eyes from the sand, short round ears lined with thick fur, long curved neck, deep narrow chest and four long legs. The camel also have wide feet with two toes and hoof in front, a hump on the back, light brown or beige fur, a short tail among other descriptions (Desert USA, 2013).

Their coats ranges from black to a much lighter color with much hair concentration around the neck, shoulder and hump. The soft palate in the male is usually inflated to produce a pinkish sack which is often mistaken for tongue which always hangs out during mating seasons to attract females. The dromedary has two toes on each foot, appearing like flat leathery pads. The hump is actually tissue bound by fats and measures about 20cm or more (Ilse *et al.*, 1991). They show remarkable temperature adaptation from 34°C to 41.7°C, this adaptation is for water conservation (Nauman, 2012). They have sharp eyes and a good sense of smell (Nowak *et al.*, 1999).

Certain important conformation characteristics of the dromedary are well-developed prominent forequarters which appears higher than the weak appearing hind quarters. Joint angulation is wider in the forequarters compared to the hind quarters. The front legs appear straight and more in line than the hind limbs. A prominently

arched back is followed by a 15 to 20 degree horizontal inclined short loin. The rump is also quiet short with a down ward inclination of 45 to 50 degree from the horizontal plane resulting to what is called a goose rump. Rear feet are slightly cramped under and turned outward (Barht *et al.*, 2003).

PHYSIOLOGICAL AND ANATOMICAL ADAPTATIONS

Camels possess unique physiological systems that allow them to survive under rugged climate and extreme temperatures and weather. Physiologically the camel adapt well to high temperatures with volume of blood maintained partly by water being diverted from the skin to other parts of the body like tissues and organs (Onu and Hambolu, 2006). Fluid and water conservation is maintained by highly efficient renal mechanism which may be related to long nephrons found camels, nitrogen retention and re-use, production of dry faeces and very flexible diurnal temperature which can vary up to 60C in 24 hours. There is constant water recirculation from the duodenum and colon to the fore-stomach through the blood (Mukassa-Mugerwa, 1981).

The camel's exceptional ability to withstand feed and water deprivation are well known and admired (Payne and Wilson, 1999). This is associated with many aspects of individual and group behavior and anatomy majorly amongst which are the preference to feed at night and the early hours of the morning, coughing early in the morning before the sun warms the ground which helps reduce the heat they absorb from the ground. Bringing in both legs to limbs under the body to reduce contact with the ground and cluster together to reduce the amount of water lost by radiation. Anatomically the large pad – like feet which reduces pressure and allows easy walk on desert sand is a feature that is very useful for the existence

of the camel in the desert (Payne and Wilson, 1999).

Dromedary has 22 milk teeth which are later repositioned by 34 permanent teeth (Mukassa- Mugerwa, 1981). Their eye lenses constitute crystallin which has 8-13 % of the total amount of protein present there (Garland *et al.*, 1991). The epidermis is 0.038-0.064mm and the dermis is 2.2-4.7mm thick. They don't have gland on the face but males have occipital glands 5-6cm bellow the neck crest on both side of the neck's midline. The mammary gland measure 2.4cm in length and 1.5cm in diameter at the base is cone- shaped and four chambers. They can even lactate when dehydrated with milk water content exceeding 90% (Ilse *et al.*, 1991).

A double row of eye lashes and a unique ability of closing the nostrils helps protect against dust and assists during sand storm to keep the dust away from the came (Huffman, 2004). Dromedary can tolerate as much as 30% or more of water loss which is not applicable to any mammal. In the Sahara desert they can survive from October to April or May without water. In temperatures of 30 to 40C they need water every 10 to 15 days and only in the hottest weather do they need water every four to seven days. They drink at the speed of ten to twenty litres/minute (Ilse *et al.*, 1991). Interstitial and intracellular bodily fluid is where water is consumed. They can drink 100litres of water in 10minutes which is quite unique and a very thirsty camel can drink up to 110litre in 13minutes (Nauman, 2012).

BEHAVIOR AND LIFE CYCLE

Some of the behavioral traits include stamping feet to show displeasure and running, vomiting cud at a restrainer in a splashy fashion, snapping each other without biting. They always like moving in a single file and they take pleasure in scratching part of their body with their front or hind limbs

or with their incisors. They rub themselves against tree backs and are seen rolling on the sand. They are not usually aggressive with the exception of breeding males (Nauman, 2012).

During the reproductive season, males splash their urine on their tails, which is flicked up and down, sprinkling the back and surrounding area. Meanwhile, male dromedaries also extrude their soft palate, which hangs out of the side of their mouth like a red balloon. Copious saliva turns to foam as the male gurgles, covering the mouth (Klingel, 1990).

During the breeding season males become very aggressive towards each other, defending their groups of females from all rivals. Conflicts are often serious, consisting of snapping at each other while attempting to neck-wrestle the other to the ground. Suffocation of the loser may occur if a male succeeds in felling his opponent with the rival's head between the winner's leg and body. The main vocalizations include a sheep-like bleat used to locate individuals and the breeding gurgle of males, while a whistling noise is produced as a threat noise by males by grinding the teeth together (Kohlah- Rollefson, 1991).

When running, a camel can reach a speed up to 40 mph in short bursts, 25 mph for longer periods of time. Camels do not have hooves. The foot of a camel is made up of a large leathery pad, with two toes at the front, the bones of which are embedded in the foot. The padding makes the gait of a camel silent, and keeps it from sinking in the sand. The camel also has pads of thick leathery skin, on its leg joints, enabling it to kneel or lay in the hot sand. Similar to giraffes, camels move both legs together on each side of their body to walk (Desert USA, 2013).

The males within the flock seem to hinder interaction between bachelor males and the reproductive females by standing or walking between them and driving other males away. They seem to remember their habitat

especially females can easily remember where they gave birth or breast fed their young ones. They don't have a specific pattern they use to defecate and have marking attitudes (Ilse *et al.*, 1991). A study on the androgen level in the blood of male showed that it influences their behavior, when the androgens levels are high between April to May it is difficult to manage camels because they blow out a palate flap from their mouth, vocalize, and can throw urine at their back using the tail (Yagil *et al.*, 1980).

DIET AND HABITAT

The dry grasses of the desert, foliage and available desert vegetation which are mostly thorny plants consists the daily meal of the camel. These makes up about 70% of their diet in the summer and 90% in the winter (Sambraus, 1994). Their mouth inside is lined with very thick skin that allows them to chew up choky plants that other animals cannot eat. They can reach trees and limbs that are up to 11' high. The stiff hair on their nose allows them to forage in prickly or thorny plants. The diet of a camel needs salt, so the salty plants that grown in salt lakes and other places is a component of their normal diet. Camels like other ruminant feeders do not chew when they eat their food, but later regurgitate the cud and finish digesting it later (Desert USA, 2013).

Highly preferred grass species by dromedaries in the Sahara includes *Santalum acuminatu*, *S. lanceolatum*, *Acacia sessiliceps*, *Lawrencia*, *Pittosporum augustifolium*, *Erythrina vespertilio* (Camel facts sheet, 2009). The dromedary also feeds on *Salsola*, *Acacia* and *Atriplex* whenever available (Ilse *et al.*, 1991). These plants are also found to be palatable to dromedary camel in India *Eruca sativa*, *Trifolium* species, *Melilotus parvifloro*, *Brassica campestris*, *Vigna mongo*, *V. aconitifolia*, *Cymbosis tetragonolaba*, while Australian feral camels eat *Euphobia tannensis* and *Trichodesma zeylanicum* (Ilse *et al.*, 1991).

A study in Ethiopia proved that camels spent most of their day grazing with the younger ones eating more frequent than the adults who can rest or get involved in other activities mostly during the wet season. Over all grazing was increased during the dry season while other activities prevail at the wet season. It was also observed that *Acaciasia bresvispica* and *Opuntia* plant were eaten more in the wet and dry season respectively (Camel facts sheet, 2009).

Mostly camels live in desolate areas with sparse vegetation, rocky mountain massifs, to the flat pavement-like desert; and sand dunes. Poplar fringed oases; vast washed-out plains and high sand dunes. In some areas, no fresh water, it has adapted to drinking salt water (Camel facts sheet, 2009).

REPRODUCTION

The female reaches sexual maturity at 3 years and mate much later at 4 or 5 year while the male may start mating at 3years but attains sexual maturity at 6 years. Breeding takes place in the winters but becomes peak in the rainy season. Several factors contribute to the mating of dromedary like nutritional status and day-length. The follicle regresses once mating fails to take place which usually develops during estrus (Skidmore, 2005). The gestation period is 12 to 13 months they give birth to a single calf and rarely have twin births and wean after 1 to 2 years. The entire breeding season starts from January to May although most regions have a shorter and a more define spread (Huffman, 2004).

Once breeding starts a cow gives birth to calf every two to three years. They are seasonal breeders and have higher chances of mating when day light time increases. The length of the female cycle is 27 days. Calves are born with a thick fur and with their eyes opened. The humps don't develop until there is change of diet from milk to solid food. In captivity calves are weaned at one year but usually they stay longer with

the cow. Camels travel in herds and caravans constituting mostly females with their young ones and a dominant male. The other males move in a bachelor group. When resting the camels in a group will congregate to keep their temperature low. Their average life span is 40 to 50 years but they retire from active work at the age of 25 (Desert USA, 2013).

The calves grow slowly so to attain sexual maturity takes up to seven years in some instances. A camel can have as many as 15 calves at the age of 40 years. Actually a camel can calve every 3 years all things being equal. Males show signs of heat certain times when there is pleasant weather and lots of food. Rut is the time when males show keen interest in the female and fight it out stubbornly until a dominant male is found. At this mating time also males loose appetite and pass diarrhea there by making them to loss function in other activities that pattern to their functionality (Maurice, 2012).

Urine is splashed on the tail and nearer regions during mating season and their soft palate is extruded with copious saliva coming out of the mouth which covers the mouth (Nauman, 2012). Dominance attitude is exhibited in males by trying to stand taller than other males low noise is also made with lowering, bending and lifting of their neck backward. A male tries to defeat other male by biting and putting the opponent head in between the jaw. Necking marks the beginning of copulation. The male smells the female genital and attempts biting them or biting the hump. The female is made to sit by the male who grasp her with his fore leg. There are usually 3 to 4 ejaculations. Mostly the herd's men help get the penis into the vulva but the male can do this. The time for copulation is 7 to 35 minutes (Nauman, 2012).

About 99% of pregnancy in camels takes place in the left horn. Generally the incidence of twin pregnancy is only 14%. In

twin pregnancy the embryos develop at the same time but the one at the right horn dies when they are 2- 3 cm in size. There are no records of freemartinism in camels. The foetal growth is of linear pattern. The posterior presentation predominates (54-66%) from early pregnancy, in camels. There is no tendency in late pregnancy for the amnion to separate from the allantochorion as it may happen in the cows (Khanvilkar *et al.*, 2009)

Pregnancy diagnosis: There are many ways of pregnancy diagnosis in camel like:- Physical changes, which are most common like Cocking of tail, Increase in body weight, Dark yellow coloured urine, pH of urine becomes 3.10, Specific gravity – 1.038 to 1.086., Vaginal folds become very clear, Rectal palpation by 60 days. Chemical test which are two that are generally used in camels which are Cuboni test and Barium chloride test while Biologic test includes, detection of gonadotrophins and Vaginal cytology (Khanvilkar *et al.*, 2009).

In camels the normal signs of parturition are: Swollen vulva, Restlessness, Frequent urination, parturition site preparation, inappetence etc. Delivery occurs when the animal is sitting. The fore limb of the young animal is presented first then head. The duration of the labour is more pronounced. Navel cord generally breaks by itself when the camel licks her young and the placenta is expelled soon after parturition. Securing of animal as soon as the symptoms are seen is advisable. The labour pains continue for 5 to 10 hours. She camel remains in recumbent position for few minutes after parturition. Camel calf stands on its own within 6-8 hrs after birth. The female generally produces one calf at a time (Khan *et al.*, 2003).

USES

The camel has been an important part of the ecosystem in the desert for centuries and has been given names like “ship of the desert”. The dependence of human beings on this

animal is not just for meat, milk and hide but it is said to be the most vital source of transportation in the desert (Khanvilkar *et al.*, 2009).

a) Meat

The dromedary camel carcass can provide a substantial amount of meat for human consumption as averagely the carcass of male camel can weigh 400kg or more. The carcass of the female weighs averagely between 250 to 350kg which is lower than that of the male. The briskets, rib cage, loins are some meat parts people prefer. The hump which is hypothesized to carry water is in real sense a chunk of fatty tissue which is preserved as meat that is called khli which can also be made from mutton and beef (Sarif, 2003). Meat is usually a by-product of a camel system and the demand for camel meat appears to be increasing among societies not herding camels that come mainly from old males and females that have served usefully in other functions in earlier life. Only a limited number of castrated males are raised especially for slaughter. The camel meat annually produced in Pakistan is 50,000 tons valued at Rs. 250 million (Khan *et al.*, 2003).

It has also become a well-known fact that wealthy Islamic people slaughter camel during notable festivals and eat the meat. Many now raise camels for their sacrificial slaughter during some of the notable Islamic festivals. Camel meat is a lucrative export opportunity in countries like Egypt, Libya, Tunisia, Algeria and the rich Arab Gulf States. In the Arab states it is said that camel meat taste better than beef and outside the Arab states it is known that young camel meat tastes as primed beef. In most countries the camel meat is usually the small amount of meat consumed compared to the meat of other animals like cattle, sheep, goat, pig, etc. (Ahmed *et al.*, 2010).

The meat is usually eaten fresh, cooked in pieces or minced and sometime air dried.

Sausages can be made from camel meat so that when cooked it looks more like beef (Khan *et al.*, 2003). Using standard butchery procedure the fore quarter comprises 34% while the hind quarter comprises 25% of the total carcass. The liver, heart and lungs are 5% the head is 3.6% while the feet is 4.3% of the total carcass. The hide is equivalent to about 10% of the live weight and the blood about 3% (Khan *et al.*, 2003). Reports of live weight gain vary greatly among different camel groups. In Egypt an addition of 1kg/day has been reported under open range condition. Well feed young camels have added 0.58kg/day under intensive conditions (Khan *et al.*, 2003). This reported variation in weight gain shows that there is opportunity for genetic manipulation to enhance meat quality and quantity in the camel (Manefield and Tinson, 1997).

In Australia, The Central Australian Camel Industry Association is currently looking at a medium to large camel meat production that will become a viable enterprise commercially. The consideration is based on the largely existing feral camel population initially. The market expectancy for local and export trade is valued at \$A 15million (Manefield and Tinson, 1997).

b) Milk

The dromedary has an excellent capacity for milk production. The milk is a stable source of food for the desert nomads and has a good duration of lactation of about 240 to 540 days. The total milk yield is about 1300 to about 4200 liters. The total milk yield per day of a well feed camel can be 10 to 15 litres. The daily average yield is about 4litres (Yasin and Wahed 1957). A heavy Pakistan breed can produce up to 35litres of milk per day (Aujla *et al.*, 1998). With adequate fodder and other provisions the dromedary can maintain a daily production of milk for up a year unlike the cattle (Ahmed *et al.*, 2010). Camel's milk is much more nutritious than that from a cow. It is

lower in fat and lactose, and higher in potassium, iron and Vitamin C. It is normally drunk fresh, and the warm frothy liquid, heavy and sweet, is usually an acquired taste for the Western palate. Most Saudi Arabian camels are females reared for their milk in dairy herds (Marisa, 2011).

Camel milk also has a higher keeping quality than cow milk due to superior protein it contains that makes it resistant to bacteria this makes fresh camel milk marketable commodity under basic hygienic conditions (Yakoob and Nawaz, 2007). Development of the camel milk to the point of commercialization is the challenge for most scientist and camel owners in most desert parts and range lands (Aujla *et al.*, 1998). Camel milk is either consumed fresh or converted to yogurts (Abu- Raquaie, 1986). Milk production alone can become the only reason why the production of camel should be encouraged. There is a vast recorded potential in the camel that could be exploited from its different breeds for human benefits. It was recorded that the average camel can produce 4.5 litres/day in Pakistan (Baluch, 2001). The camel has more milk per/kg than the Sahiwal cow, Friesian / Sahiwal cross and the Buffalo (Knoess *et al.*, 1986).

In a similar environment with even less feed the camel were found to produce more milk than any other specie for a longer period (Wilson, 1998). A well feed dromedary produces more milk than most exotic cows and their crosses (Knoess *et al.*, 1986). The camel thrives in areas where fodder is scarcely available and can survive on the feed other animals have rejected. The dromedary should be respected in terms of its resistance to harsh environmental conditions, the quality and sustainability of its products and its accessibility to people living in marginal lands (Knoess, 1977; Yagil, 1994).

It has been reported that camel milk was converted into ice cream in a camel farm in

the Netherlands (BBC, 2011). Camel meat cannot be made into butter by the traditional churning method. It can be made if left to be sour and a clarifying agent added or if churned at 24 to 25o C but time really matters in achieving results. In recent years it was not possible to coagulate camel milk into cheese because rennet was unable to coagulate the protein in the milk into curds. Calcium Phosphate was discovered to be effective when added with vegetable rennet to form cuds. The cheese so produced is better because it has low level of cholesterol and it is easy to digest and to eat even to those that are lactose intolerant. Camel cheese is on the contrary hard to get due to import restriction on the zone where they are produced (FAO, 2001).

c) Hide and hairs

Hair is an important resource from the camel which is used for making ropes, bags, mats, carpets blankets etc. About 1 to 3 kg of hair is produced from a camel annually. Saddles and shoes are made conveniently out of camel hide. The hide of bactrian is said to be of high economic importance as it has good export value and is said to be costly but the hide of the dromedary is not of good quality and is mainly used for other products like whips, container for milk and water etc (Khan *et al.*, 2003).

d) Beast of burden

Camels (dromedary) serve human being in diverse ways that have improved the normal pleasant lively hood of many especially their keepers and it has been said to be a constant part of the of the normal daily living of the African nomad who earns his living from raising them (dromedary). The camel serves as a source of power for drawing water from the well, mini oil extraction (from seeds that contain oil) mills, grinding of wheat, corn, grains and sugarcane crushing. They are used as an energy source for ploughing land, pulling cart for goods transportation as well

as people for distant transportation of up to 30km/day. It is in record that a baggage camel can carry goods of up to 300kg to a distant place and move at the speed 30km/day successfully. They are thus cheaper source of energy for various agricultural operations and to meet allied transportation needs of small, medium farmers and nomads. They are used for leveling land, transports salts, house hold products, and agricultural products (Bakht *et al.*, 2003; Iqbal, 1999; Raziq, 2009).

e) Sports/ Entertainment

In the wealthy Gulf States especially in UAE and Qatar a thriving camel industry exist which is based on racing. The amount of money being turn over and the number of people involved, many of them expatriates justifies the use of the term “camel racing industry”. The values of the trophies given at annual events include classic Mercedes Benz, Range Rover etc that could worth up to US \$ 3 million. These trophies are handed over to the trainers who are in turn expected to show gratitude to other support staff (khan *et al.*, 2003).

Many people have the desire to ride camel, a few in reality have pet riding camels. Some just want to ride for a short distance while others need that caravan experience of riding long distances into the desert. In central Australia and in the desert of Cholistan, Tharparkar, Rajistan, and the beach of Karachi where camels is used is a source of recreation, the visitors are made to believe that camel riding is not less comfortable. Visitors to various zoos enjoy the mere sight of the dromedary camel kept there for animal show. Racing camels has become a national event as we have 15000 racing camels in UAE alone as well as a thousand camel owners, staff and spectators. It is therefore not only a source of recreation but a means of lively hood for a large number of people (Chaudhary and Akbar, 2000).

Apart from organizing racing there are camel races throughout the camel range which are quiet natural and spontaneous in nature. The camel is seriously also involved in local and international tourism. Camel troops take part in festivals and exhibitions where dancing camels attract large crowd. In Pakistan and India the camel trooper of the ranger and the Border Security Force perform elaborate musical ride and other entertaining parades. Camel wrestling has also been another entertaining event that has attracted a lot of people. Trained bull camels wrestle in a ring of spectators. It is not doubtful their fore that the camel participate in diverse activities in different regions (Manefield and Tinson, 1997).

GENETICS

The karyotype of different camelid groups where earlier studied by different groups of people but they did not come to an agreement as to the camel genome nomenclature. The most recent study used a flow sorted camel chromosome building which showed the camel karyotype to be (2n=74) that consisted of one metacentric, three submetacentric, and thirty-two acrocentric autosomes. The Y is a smaller metacentric chromosome while the X is a larger metacentric chromosome (Di Berardino *et al.*, 2006; O'Brien *et al.*, 2006; Balmos *et al.*, 2007).

DNA analysis confirmed that *C. ferus* should be considered a separate species from the domestic Bactrian camel (Silbermayr, 2006). Unclear evolutionary relationship between *C. bactrianus*, *C. dromedarius*, and *C. ferus* DNA studies show wild Bactrian Camel not ancestor of two domesticated species as previously thought *C. ferus* is separate lineage and not direct progenitor of *C. bactrianus* (Ji *et al.*, 2009). Bactrian camels and dromedaries diverged about 5-8 million years ago (Cui *et al.*, 2007). No evidence to indicate that Bactrian camels

were ancestor of dromedaries (Kinne *et al.*, 2010).

In Kazakhstan a cross between Bactrian and dromedary that is a female hybrid was re-crossed with Bactrian, the progeny known as F2 Bactrian is used as a riding camel. It has two humps with 75% Bactrian genes but less robust than the pure breed Bactrian. These progenies are stronger than dromedary and faster than Bactrian and are called bukhts (Abu - Zidane *et al.*, 2011).

ZOONOSIS

In 2005 a report issued jointly by the Saudi Ministry of Health and United States Centers for Disease Control and Prevention indicated cases of human Bubonic Plaque resulting from the eating of raw camel liver. Five people were affected in all four of which had severe pharyngitis and submandibular lymphadenitis that had consumed the raw camel liver. *Yersinia pestis* was isolated from the camel bone marrow and the jird (*Meriones libycus*) and fleas (*Xenopsylla cheopis*) that were found on the camels corral (Bin Saeed *et al.*, 2005).

DISEASES

There are several diseases that are a problem to the camelid specie chief among which is Trypanosomosis a protozoan disease caused by *Trypanosoma evansi*, *T. brucei*, *T. congolense* and *T. simiae*. These are being transmitted by flies like Glossina and other biting flies like *Stomoxys*, *Hippoboscas*, *Tabanids*, *Lyperossa*, *Heamatobia* flies (Kohler-Rollefson, 1991; Scot, 1973).

The dromedary is affected by diseases of diverse etiologies among which are bacterial disease like Salmonellosis, Antrax, Brucellosis, Tuberculosis, Pasturellosis, Paratuberculosis, Black Quarter, Pneumonia, Tetanus etc (Leese, 1969; Richards, 1979; Cheyne *et al.*, 1977). The diseases of viral origin includes rabies, Foot and Mouth Disease (FMD), Rinderpest, camel pox

which mostly affects young dromedary of between 6 to 2years while antibodies of Bovine viral diarrhoea, Bovine Rhinotracheitis and Parainfluenza has been isolated from the dromedary camel (Fazil, 1977; Richard, 1976; Burgemeister *et al.*, 1975). Apart from trypanosomiasis other protozoan disease that affects the dromedary camel includes Toxoplasmosis, Leishmaniasis, Anaplasmosis, Coccidiosis, Theileriosis, Sacrosporidiasis (Gath-Rutter, 1967; Richards, 1979).

Camels are also infested with both internal and external parasites which include Mange, which is considered as the most important camel disease after Trypanosomiasis. Camels are only affected by Sarcoptic Mange. Camels don't suffer much from tick borne diseases never the less a few ticks have been isolated that infests the camel which includes *Rhipicephalus pulchellus*, *R. pravus*, *R. simus*, *Hyalomma* Species and *Ambyomma* species (Richards, 1979; Bremaud, 1969). The internal parasites are a combination of various helminthes which includes *Strogylodes* spp, *Tricuris* spp, *Monezia* spp, *Heamonchus* spp, Cysticercosis and Hydatidiosis, *Oestrus cameli* (camel bot), *Distomer* spp, *Faciola* spp, Echinococcosis, Filariasis etc (Micheal and Saleh, 1977; Magzub and Kassim, 1978; Leese 1979; Dada, 1978). Other disease and conditions saddle burns, Nosepeg tears, inflammation of the soft palate, Bloat, Sand impaction, surgical conditions, lameness etc (Leese, 1979; Currason, 1947)

CONCLUSION

With the current trend of global warming, desert encroachment and many unfavorable trends that are really against the survival of many animals, the dromedary camel stands out with qualities that can withstand all those challenges and give a firm resistance to many of the environmental conditions and still be productive. It is here recommended that more researches should be carried out to

improve this breed in the aspects of weight gain in a shorter period of time, increased milk yield for a longer period of time and higher quantity. The population of this specie is also dwindling fastly as there is increased consumption and less production, therefore ways of increasing the population of this animal should be scientifically exploited to avoid the extinction of the specie.

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