Thermoregulation in Camel

Physiological adaptation defined by biologists as the physiological processes involved in adjustments by the individual to climatic changes and changes in food quality …… etc. The requirements for survival in hot arid areas are very important . Temperature must be maintained and water must be conserved . The camel losses body heat by sweating more efficiently than other mammals .Adaptation of camel to desert environment are listed below

1- Thermoregulation

a. In most mammals fat is spread over the body surface just under the skin . In the camel , the fat is concentrated in the hump which enables sweat to be evaporated easily over the rest of the body surface and this is adaptation to heat transmission .

b. The skin is supple , covered with short fine hairs (waber) , which act as insulating medium and may be longer in cooler climates or during the cool seasons in hot areas (thermoregulation)

c. The poll glands which are situated towards the top of the back of the neck behind ears and cover an area of about 6x4 cm in both sexes . It is more active under condition of heat and fatigue than that at any other time except when the male is in rut , so it act as modified sweat gland to help in the evapration .

d. Also , the coat of the camel is fairly sparse which allows sweat to evaporate at the surface of the skin. In mammals with very thick coats evaporation occurs at the ends of the hair a less efficient process .

e. The body temperature can vary over a wide range under condition of dehydration . The large mass of the camel acts as a heat buffer .

f. The camel can lose 25% of its body weight over a period of time without losing its appetite for food and can then make up this amount in just 10 minutes by drinking . While in other animals , water lost is drawn from the body tissues and the blood plasma .As a result the blood becomes viscous and the heart can no longer pump and explosive heat death then occurs . In camels, very little water is drawn from the blood, which remains fluid and can thus cotinue its function of heat transfer.

Anatomical adaptation

a- Head and neck

The head of the camel is small in comparison to that of other domestic animals . It bears no horns and has small bluntly erected ears to hear the minimal sound vibration and hear for long distance in the desert . Also , the ear contains small hairs to filter and warm the air entered the ears in sandy environment .

i. The eyes are large and prominent enable the camel to see in different directions and for long distances . The massive supraorbital fossa or processes give some protection with the long lashes against the sandy environment of the desert in windy day .

ii. Also , the nostrils of the camel are long slit- like appearance having wing , so the camel is the only animal who can close its nostril as protection against sand and winds .

iii. The upper lip is split and hairy , extensible and slightly prehensile , it is very sensitive . This modification help the camel to select its food (selective feeding) and avoid the thorny plants .

iv. The camel has a long arched neck helping him to manipulate the high tree plants and to explore the enemy from long distances .

b- Trunk and tail

i. Most of the fatty tissues of camel is stored in the hump than being diffused throughout the body . The hump acts as food (fat) storage which will be converted to energy and water in case of starvation in the desert .

ii. Skin of camel is attached rather tightly to the underlying tissues and has short fine hairs (weber) which help in thermoregulation .

iii. Prepuce of camel is normally directed posteriorally , it is possible that this elevated position keeps the organ from touching the hot sand when the camel squats on the ground and avoiding its contamination with sand .

iv. Placenta of she camel is simple diffuse smooth type as in mare with no cotyledons so the retention of placenta is rare.

c- Limbs

The legs are relatively long and slender , an adaptation , perhaps to a long easy gait in sandy environment , and to adaptive cooling , and terminate in large disk -like feet .More than 65% of the camel's total weight is supported by the front limbs . the chest is deep and narrow which allows the balance to be shifted easily , so that it is directly over the weight bearing foreleg during locomotion .

The foot of the camel is well designed to cops with the loose sandy soils of the desert . The bearing surface of the foot is like a large plate , this plate is able to maintain flat contact with the ground throughout the duration of the stride due to exception rotation at the first digital joint . The foot stays out on taking the weight of the camel and thus act as a firm base for levering the weight forward to the next stride . the camel foot is excellent for movements on sand. It is less suitable for traversing stony desert althought some hardening occurs in animals habituated to this kind of country .The presence of the peculiar horny pads on the elbows , stifle and chest prevent more injuries to camel from the stony desert .

Energy balance

The camel is able to save considerable amounts of energy by allowing its body temperature to rise during the day , thus absorbing heat would be dissipated by some form of cooling . The variations in the camel's temperature were formerly thought to be an indication of poor thermoregulation . It is now realised that the rises in temperature indicate a sophisticated control mechanism rather than poor regulation .