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Camels Adaptation to Desert Biome

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Abstract: Camel is a unique animal and its remarkable characteristics have made it one of a kind and entrancing animal, whose fortunes are still not fully disclosed. It is very lamentably that such a well-habituated livestock like camel is disregarded particularly in the circumstances of desertification, environmental change and a worldwide temperature alteration situation. Heat shock proteins (Hsp) act as molecular chaperones that assist organisms to manage with environmental stress. The aim of this paper is to review versatile role of heat shock proteins in camel in comparison to other animals in adverse climates. Heat shock proteins are included in upholding cellular protein homeostasis and benefit to attain organism's responsiveness to stress insults including heat stress. The perspective presented here is to study of Heat Shock Protein contributes preponderant understanding of thermal biology in camels and for potential use in cull for preponderant heat resistant animals, as the world gets hotter.

Key words: Heat Shock Protein · Genes · Camel · Adaptation · Global Warming

INTRODUCTION

Camel is a precious and paramount animal of Pakistan which is very well adapted to extremely arid environments especially for southern regions of the country. The evolutionary history of camels may have their origins in desert habitats. They belong to the main group of animals called hoofed mammals. The Dromedary camel is an esteemed creature which is found southern Punjab and in Baluchistan where its population is highest (41%) as compared to other provinces of Pakistan. Camel is well adapted livestock specie, survives and produces in extreme climatic conditions and is generally acknowledged for its implication in the pastoral economy of the province [1]. Camel has a system to withstand drawn out water lack and can survive up to 14 days without water. The interesting characteristics in camel has made it novel and intriguing animal, whose fortunes are still not fully uncovered. Camel might be an exceptional animal which can be used as a tool in the worldwide natural modifier and can work ideally under nourishment instability scenario. Currently Pakistan has about 1 million camel [2]. In addition to mentioned qualities, camel is disregarded and has lost its relative worth in this decade. The potent reasons behind this are the lack of research and development on this important but neglected specie. A dangerous atmospheric deviation is one of the major issues this planet is confronting and it won't be wrong assuming that we say camel is reinforcement for upcoming predicament. The neglected species like camel will discover an improved place to flourish and transform even under barbarous climatic conditions [3].

Heat shock proteins are included in administering cell protein homeostasis and serve to accomplish life form's respond to stress insults including heat stress. Camel being a creature of more sizzling planet has accurate potential to battle the crawling desertification and worldwide warming in a better way.

Heat Shock Protein: The stress causing Heat Shock Proteins are the focus of this review. Heat shock, or stress, proteins (Hsps) are cell proteins affected according to conditions that reason protein denaturation and their actuation is fundamental for survival of such

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conditions [4]. In 1973, the heat shock response was discovered to correspond with synthesis of different new proteins [5]. Experiments on the effects of heat on the fruitfly Drosophila were performed in 1930s. Various examinations have affirmed the importance of Hsps in resistance towards heat and cold and an extent of different burdens incorporating bug sprays, overwhelming metals, parasites and inbreeding [6]. The genes and proteins got much consideration and, Heat stock proteins were discovered in cells under normal conditions. Factors like climbing in temperatures, modified PH and oxygen need, make it more troublesome for proteins to structure their proper structures and causes recently organized proteins unfold. Aggregates are formed because of mis-folded proteins that may ultimately kill the cell. Molecular chaperones function in an assortment of protein biosynthetic methods and guarantee proteins from the damaging effects of intense or incessant stretch by stabilizing protein-folding intermediates (Fig.1).

The misfolded proteins accumulation is one of the main issues to diseases of protein folding, including sickle cell haemoglobin, cystic fibrosis and prion diseases [7].Organic entities should survive an assortment of stressful conditions, incorporating sudden temperature increments that harm critical cell structures essential functions [8]. When prokaryotic or eukaryotic cells are submitted to a transient climb in temperature or to other proteotoxic treatments, the amalgamation of a set of proteins known as heat shock proteins (hsp) is impelled. The proteins structure has been exceedingly, saved throughout evolution [9]. Heat Shock Proteins tie to denatured proteins to counteract aggregation. Some HSPs, for instance Hsp104, can protect already accumulated proteins. Generally newly synthesized proteins inside a cell might neglect to overlap productively without the backing of additional "machines". These machines constitutes important components known as molecular chaperones and three most abundant classes of molecular chaperones are the Hsp40s, Hsp70s and Hsp90s [10]. Hsps plays a discriminating part in the improvement of thermotolerance and protection from cell harm connected with stresses, for example ischemia, cytokines. These perceptions propose that Hsps assume an imperative part in both animal cell homeostasis and the stress response [11].

Climate Change and Global Warming: A true mammoth of the current time is the environmental change. Atmosphere updates have unfriendly consequences for life which includes agribusiness, animals, natural way of life, environment and socio-cultural amicability. The results of environmental change are currently more visible than at any other time as droughts, heavy floods, desertification and prevalence of new diseases of all the living organisms [12].The most important tool to manage environmental change which is an upcoming difficulty is plants and livestock varieties. Different studies show that environmental change is influencing, straight or indirectly the flora and fauna. The competitiveness of distinctive species is influenced by altered climate [13]. Conceivably, environmental change will have extensive negative effects on the animals production in different nations, particularly when the animals used are not adjusts to the updated environmental conditions. This is an enormous test to confirm animal's reactions to environmental change. There is a need to select animals that are suitable in present climatic conditions and in addition the anticipated future conditions [14]. There is an urgent need to watch the impacts of environmental change on animal's execution and reaction to natural stressors. Local people, particularly pastoralists have adapted their own specific approaches to adapt to the environmental change, however not noticeable. The pastoralists in horn of

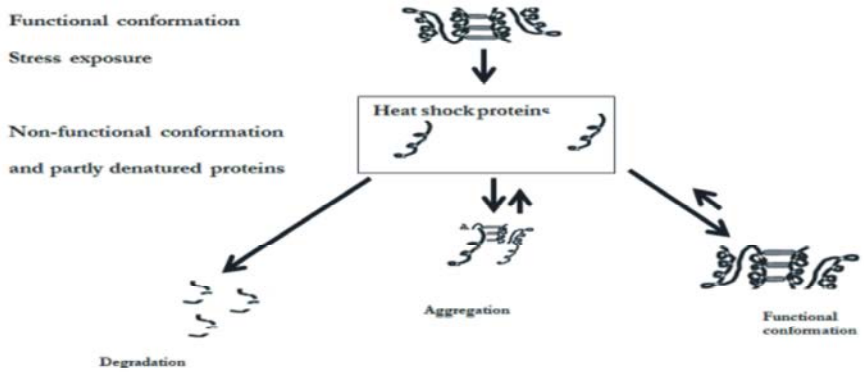

Fig. 1: Heat shock protein's cellular function. The fate of proteins with non-useful adaptations after stress exposure may be either to re-get functional conformation, form accumulations with other misfolded proteins or get debased.

Africa; particularly a far distance district had displaced dairy cattle with camel and sheep with goat. Camel is impervious to drought as survive without water and even encourage for more extended period than any possible local animals. Likewise camel and goat depend on hedges which survive for a long time of dry spells. The best way to combat climate change, droughts, desertification etc is to promote endogenous development and to make the local communities resilient to the situation.

Drought is an integral part of expected management cycle, which cannot be neglected. All makers may as well arrange ahead of time for seasonal changes and times when feed and water will run short. The administration of domesticated animals, stocking rates and sustenance are joined to health and welfare of animal. The welfare of animals is dependably absolutely important and in drought specific consideration must be paid to secure their welfare [15].

Camel: "A Ship of Desert": Camel is no more the creature of the old planet. The simultaneous dry season and the ecological unsteadiness once again has realized the importance of camel. Camel owns certain physiological characteristics that empower it to thrive in arid environment. Camels have correct potential to battle the crawling desertification and an Earth-wide temperature boost. In the Horn of Africa the camel is discovered in the dry and semi-arid rangelands in Ethiopia, Djibuti, Somalia and Kenya. In these territories water supplies go from bounteous in the riverine regions, to great aridity [16]. In these regions the occupants are for the most part pastoral and the camels wander as per the extent conditions. In the dry season the camels are watered once like clockwork, contrasted with every 3–8 days for sheep and goats. In Sudan, the biggest population of one-humped camels exists where the average rain fall is less than 350 mm per year [17].

It is a surety for safe quality sustenance for the nearing decades and hundreds of years [18]. Pakistan is blessed with 21 breeds of camel. The principle two sorts are riverine and mountainous. Pakistan overflows with dromedaries yet a couple of groups of two-humped camels (Bactrians) are likewise reproduced in the extreme northern ranges [19]. The camel population is unevenly distributed in four distinct ecologic zones of Pakistan, in sandy deserts, costal mangroves, mountainous tracts and irrigated plains [20]. The Estimated camel population in Pakistan is 1.2 million heads and ranks 3rd among major camel-raising countries after Sudan and Somalia [21]. Camel is the most patient of land animal. It is one of the common and the best embraced creatures of the desert that is fit to bear thirst and yearn for days.

Camel is a favorite partner, a wellspring of milk and meat, for desert migrants of Pakistani Cholistan. Therefore, it is assumed as a significant part in the socioeconomic exhilarate of the local community [22]. The unique features in camel has made it unique and fascinating creature, whose treasures are still not disclosed fully. It is quite strange that such a well-adapted animal is disregarded particularly in the circumstances of desertification, environmental change and an Earth-wide temperature boost situation. The camel role as food animal is being accepted globally. It is rightly stated that camel has great potential for fulfilling human's medicinal requirements and future dietary [23]. Camel has no doubt unfathomable characteristics, which permit it to change poor quality pasture into milk, meat, drought tolerance. Camel gives fundamental drought power in urban communities of small cities. Beside it camel has a great cultural, social, economic and esthetic attraction for certain communities in desert areas of Pakistan.

Camel Production and Management: The National Arid land Development and Research Institute (NADRI), Islamabad is endeavoring to archive the key socio-economic aspects of camel makers in different camel home tracts in Pakistan. Socio-economic essentialness of camel is nearly connected with existed preparation frameworks. These frameworks are to a great extent resolved by climatic conditions, geography of the area, plant development phenology, water sources, etc [24]. Camel can survive for more drawn out periods without drinking and can recharge the misfortune in an extremely brief time contrasted with different kinds of domesticated animals [25]. Camels have differential characteristics which ensure their survival in ungracious territories.

Camel as Milch Animal: Pakistani camel has fabulous potential for producing high quantity of milk specially Marecha, which is most likely the best milk yielder on the planet with a normal milk yield of 4,179 liters per lactation [26]. Camel milk has more elevated amounts of lactoferrin and lysozyme which assume a focal part in the determination of these properties. It holds 25-30 times to the extent that as bovine milk [27]. The iron holding protein Lactoferrin has been demonstrated to have antiviral, antifungal, mitigating, pain relieving and against cancer-causing impacts. Camel milk is use as aphrodisic,

particularly in the stressful states of the dry hot climate. Camel's encouraging conduct, tolerance to high salt substance and capacity to withstand without water, make it the best of ruminants for dry and numerous semiarid territories [28]. It is claimed that the most economical and efficient animal in the arid and semiarid range lands of Pakistan is camel [29]. With the assistance of cutting edge science, poor ranchers can raise camels for milk and can reinstate accurate dairy animals of the desert, which inspite of their flexibility to the region appear to have low potential for milk handling contrasted with the dromedaries [30]. Camel milk is healthy and has the accompanying points of interest in contrast to bovine milk: It might be transformed in a non-aerated and cooled environment. It constitutes five times higher vitamin C content, contains 50 % low fat, iron rich and reduces cholesterol [31].

Each product of camel is useful. Indeed, faceces and urine are of value. Camel faeces are utilized as natural fertilizer and fuel while urine is utilized for medicinal purposes. The camel raising groups have exceptionally firm interfaces with camel society, e.g. camel hustling and dancing are exceptionally normal. Camels are additionally occupied with the transport of salt, fuel wood, rural produce and family unit products. Likewise, a stuff camel carries stacks up to 300 Kg to far off spots at a rate of 30 Km/day. Hair production of grown-up animals goes yearly between 1 to 3 Kg and is utilized for making ropes, sacks, floor coverings and covers. Camel is a cheap source of power for drawing water from wells, ploughing, grinding wheat, leveling of area, for oil extraction, pulling trucks for the transportation of products and people [32].

Many projects are initiated in the world, working to fight against hunger and malnutrition due to drought, global warming etc. Feed the Future is a project started by the Obama administration that focuses on helping countries become self-sustainable through agriculture reforms and improvements. The objective of the Camel Milk Development venture is to enhance the production of camel milk and to make it more attractive and marketable in Ethiopian communities. When the undertaking is underway, nearby ranchers will be well versed on camel productivity, which incorporates reproducing, better food and improvement to the camels' health. Not just this, a camel milk project is launched by the U.S Government in Somali region. The task will enhance the processing and market competitiveness of camel milk products in the Somali region to enhance salaries and nourishment for up to 50,000 focused households in the Siti (Shinile) and Fafan (Jijiga).

Genetic Diversity of Camel: There is a need for exploration of genetic variability and diversity of this ship of the desert due to its outstanding potentials for conservation of animal genetic resources of this treasured creature. The unique features in camel has made it fascinating creature, whose treasures are still not disclosed. Less consideration is given to camel improvement for many years when planning national development. Camel ought to be a good tool in the global environmental changing scenario and food insecurity situation. It's known that Pakistan lacks much genetic diversity in camel. There are many untouched areas of research and development in this specie on that ground, it is suggested to single out distinct camel breeds using modern molecular biology technique. A powerful tool to modify animal growth rate and body composition is genetics and has been largely used to adapt animal production to the market requirements. Biotechnology and genomics have an incredible potential to combat diseases, increase productivity and help improve lives. The time has now come for Pakistan to take maximum advantage of such technological breakthroughs and advances. Pastoralist community has developed breed for their own breeding goals [33]. The camel evolved for the long traveling across the desert in caravans are at present good race animals. Camel breeds developed for the work thus now are good draught animals. Some other breeds were developed for the food production, especially milk in the climatic extremes and now these breeds are good milch animals [34]. Stress should be made on the diagnostic studies of common diseases among humans and animals and genetic manipulation to improve productivity in camel, study of the genetic diversity of camel breeds and molecular diagnosis of camel diseases should be the focus. Researchers in Dubai hope to create the first genetically modified camels capable of producing pharmaceutical proteins in their milk, which can then be processed to manufacture cheaper drugs for the region.

Heat Shock Proteins in Camel and Other Mammals: DNAJ/Hsp40 proteins have been saved all through development and are paramount for protein translation, folding, unfolding and translocation, principally by stimulating the ATPase activity of chaperone proteins, Hsp70s. Hsp70 chaperone proteins catalyze the biological procedures with the aid of Hsp40/dnaj proteins and co-chaperones. Hsp40/DNAJ proteins at first distinguish substrate polypeptides and exchange them to Hsp70s substrate-binding domain [35]. The genomic cluster of Camelus dromedaries had been sequenced holding three hsp70 family genes joined with major histocompatibility

complex (MHC) class III region from heat tolerant creature [36]. Comparison of the camel hsp70 cluster with the relating areas from several mammalian species was being carried out [37]. Heat shock proteins are ubiquitous, induced under a number of metabolic and environmental stresses. Camelus dromedaries domesticated under semi-desert environments, is well adapted to bear and survive against severe drought and climatic extremes for extended periods [38]. In buffalo (Buablus bubalis) Heat shock protein 70 (hsp70) is a predominant member of the HSP family of proteins, which are responsible for cytoprotection under stress conditions [39]. Temperature threshold for heat shock protein 70 (HSP70) induction in lymhpocytes of young and adult Murrah buffaloes was done to assess physiological changes, if any, in relation to HSP70 induction [40]. Bos taurus cattle breeds that have developed in mild situations unable to completely adjust to extreme heat conditions [41]. Articulation of hsp90, hsp70, hsp60 and UBQ in peripheral blood mononuclear cells (Pbmcs) throughout diverse seasons in three distinctive age groups of goats of tropical and mild regions indicated that HSP genes expressed higher expression throughout heat stress conditions [42].

Camel as the Animal of Future: The qualities of camel and its need in nearing years, power the specialists to safeguard and conserve camel. Camels not just sustain life on an everyday support for numerous individuals living on the edge of subsistence but additionally serve as depository of wealth and a security against obscure future [43]. Camel ought to be saved and advertised as a destiny creature because of shrinking water assets which undermine drought-like conditions. According to him, ensuring camel is the need of the hour especially in nations like Pakistan. Pakistan has incredible potential to save and promote camels as future animal. In the previous not many years, with dry season and the onset of desertification, generally accepted sorts of animals have suffered considerably. Camels endure slightest and they have survived the emergency without the overwhelming misfortunes that have happened in different species [44, 45]. It is well documented that camel is one of the best tools to combat the climate change and future food insecurity problem. Camel is a vital part of society and spine of the pastoral economy in the parched zones of the planet. Camel provides safe, sound and organically natural milk. Camel is strong, with extremely interesting natural characteristics, empowering him to devour water and bolster sources quite wisely. The unique characteristic of camel makes it excellent to battle the flying sun sparkle and high surrounding temperature. In numerous parts of the planet it is disregarded and hardly spaced in the exploration and strategy of governments.

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