Effects of camel whey protein supplementation on some immune organs integrity in heat-stressed male mice

A THESIS

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Summary

Heat stress occurs when an animal cannot dissipate an adequate quantity of heat**,** whether it is produced or absorbed by the body, to maintain body thermal balance. This may prompt physiological and behavioral responses, leading to physiological disorders that negatively affect the productive and reproductive performance of farm animals.

In the present study, experimental model of HS, was used to find out the effects of HS on the immune organs and testis, in addition to find out treatment can reduces these effects. The objective of this study is to know the role of CWP to alleviate the harmful effects caused by heat stress in male mice.

Therefore, this study was conducted in order to evaluate the effect of heat stress on the immune and other organs and the role of CWP in the treatment of these negative influences.
In this study, 45 male albino mice were purchased from Theodore Bilharz Institute in Cairo were divided into three groups, 15 mice each. The first was used as control and the other two groups were subjected to heat stress temperature of 40.0°C for 2 hr daily for one month; the HS mice in the third group were orally supplemented with CWP (200 mg/kg body weight dissolved in 250 µl distilled water/day for one month) through oral gavage. After the expiration of the treatment, all mice were anesthetized with pentobarbital and dissected for collection of blood samples and organs (spleen, testis, thymus and bone marrow) for biochemical analysis and histological observation.

The study concluded the following results:

1- HS mice showed increase in the levels of pro-inflammatory cytokines (IL-6, IL1β and TNF-α), CRP, caspase-3 and caspase-9, while other cytokines (IL-2, and IL-4) and testosterone showed decrease in comparison with the control group.

2- Also, HS mice showed increase in ROS in blood and testis while TAC and other antioxidants (GSH, GSHPx, MnSOD and catalase) showed decrease.

3- Additionally, HS mice showed decease in body weight, food consumption, testis weight, sperms count and motility, while increase in water consumption and Leydig cells count.

4- Western blot analysis showed significant increase in the expression of ATF-3, Bax, Bim, cytochrome C, HSP-70, HSP-90, Nrf-2, P53 and 3β-HSD while showed significant decrease in phosphorylation of AKT and IκB-α, Bcl-2, survivin and PPAR-γ in blood and testis homogenate.

5- Flow cytometry analysis showed an increase in apoptosis percent of lymphocytes.

6- Treatment of HS mice with CWP results in improvement in all the biochemical changes in the blood and testis, with improvement in histological tissue of testis, spleen, thymus and bone marrow. In addition, CWP restored the expression of ATF-3, AKT, IκB-α, Bax, Bim, Bcl-2, P53, cytochrome C, HSP-70, HSP-90, Nrf-2, P53, survivin, PPAR-γ and 3β-HSD in blood and testis.

7- Additionally, CWP improved body and testis weight, sperm count and motility, food and water consumption, Leydig cells count, apoptosis in lymphocytes. It also improved ROS, TAC, CRP, caspase-3, caspase-9, testosterone, inflammatory cytokines and antioxidants parameters.

8- Microscopic examination by light microscope and electron microscope revealed pathological changes in HS mice as follows:

- Appearance of incomplete spermatogenesis in testis.
- Shortage in the constituent cells of the blood cells in the BM.
- EM showed degeneration, pyknosis, apoptosis and necrosis of haematopoetic stem cells in BM.
- Immunohistochemical staining showed increase in HSP-70 and YAP expression in lymphocytes and testis respectively.
- Immunohistochemical staining showed aberrant distribution of CD3+ T cells and CD20+ B cells in the thymus and spleen.
- Additionally, pathological alterations were seen such as necrosis, thrombosis, congestion and lymphocytic depletion in the architecture of the lymphoid organs (bone marrow, thymus, and spleen).

9- In conclusion our obtained results find the ability of CWP to reduce the inflammation, oxidative stress, and immune dysfunction due to HS.