SOME HORMONAL EFFECTS OF ROYAL JELLY

(Cortisol and Dehydroepiandrosterone-s)

THESIS

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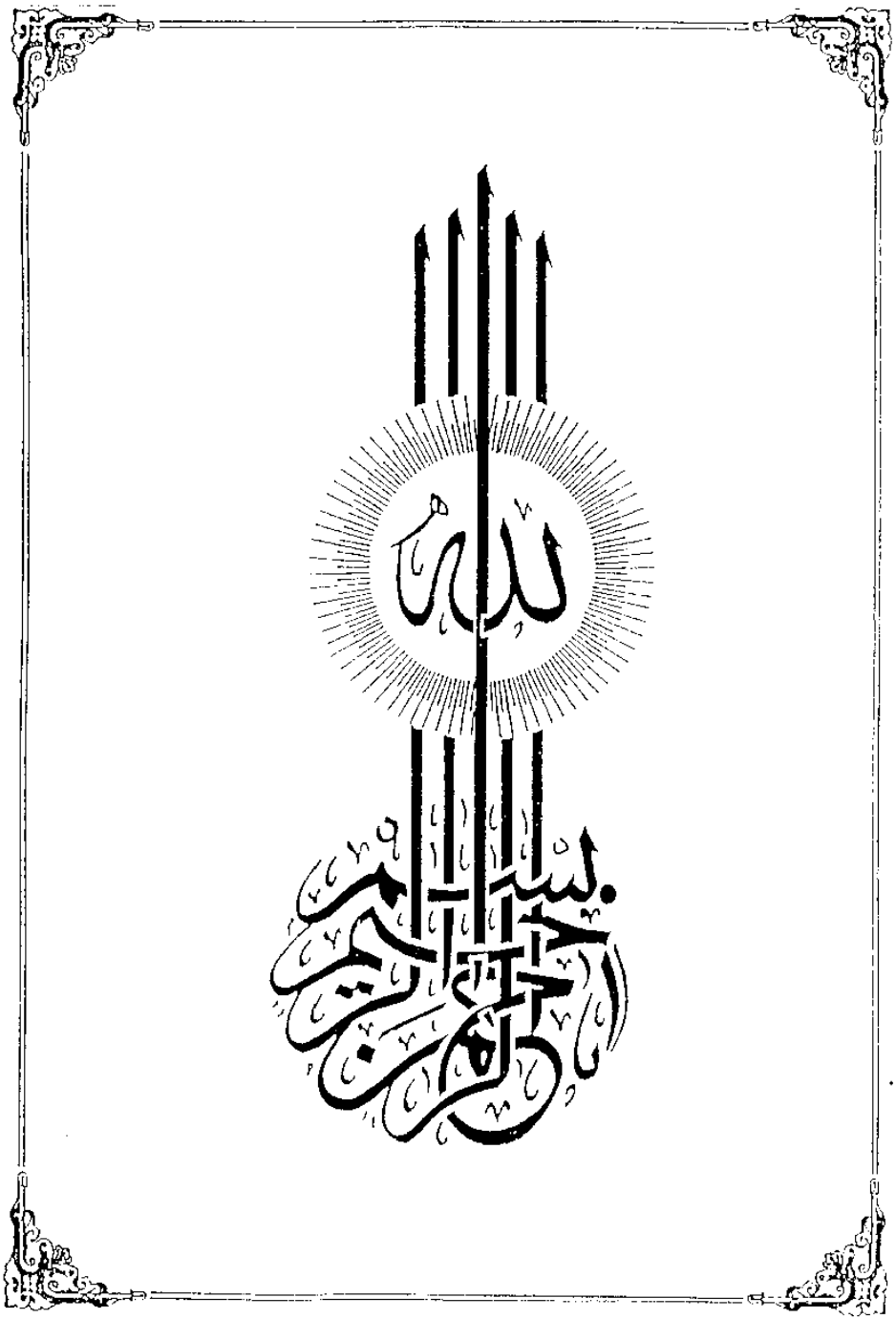

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Dexit and Patel (1964), repoted that royal jelly, a secretion of the hypo-pharyngeal, postcerebral, post mandibular glands of the honey bee, contains apeptide promoting glucose oxidation in vertebrate a dispose tissue. More recently, Vittek et al.,(1984) succeeded in isolation of steroid hormone mimiking human testosterone from royal jelly.

In human being, the following symptoms have been reported to be improved: climating suffering, physiological unfavorability, lumbago , arthritis, asthma, constipation recovery of general fatigue (Inquet, 1985).

In Egypt, some hormonal levels were studied after royal jelly treatment in rats, where changes in thyroxine, T_3 level, cortisol, testosterone and progesterone have been recorded (El-Banby, 1985).

The aim of the present work is to study the effect of royal jelly on the serum level of cortisol and dehydroepiandrosterone-sulfate. The study will be conducted on clinically healthy subjects through two different routes of administration (Oral and rectal).

REVIEW OF LITERATURE

PART (I)

ROYAL JELLY

Secretion and its effect on honey bee:

Royal jelly is athick milky material which is generally believed to be a secretion of apair of long glands at the sides of the head of worker honey bees(Apis mellifera L.). These glands are called the hypopharyngeal glands. All worker bees are capable for producing royal jelly with varying efficiency according to their age and life conditions. (Soudek, 1927; Beams and King, 1933; Snodgress, 1956; and Beams and Anderson, 1957).

For aproper appreciation of the significance of royal jelly, the following facts about the natural history of bees should be recalled.

A colony of bees consists of one queen, several hundred drones or males and from 25,000 to 100,000 worker bees, sexually undeveloped females, at the height of season queens have been known to lay more than 2,000 eggs in one day, two types of eggs are laid by the queen:

a) Unfertilized egges which give rise only to drones (male bee).

b) Fertile egges which give rise to female either

workers or queens. All female larvae feed on royal jelly for the first 2-3 days after hatching and during this period their anatomical development are similar. Any larva from a fertile egg,if is given royal jelly throughout its larval period, will develop sexually, so that, it becomes a perfect or true female bee or what is called a queen, otherwise the larva will develop into sexually immature worker (Townsed and Lucas, 1940a).

Thus, as a result of feeding on royal jelly (a) The transformation of young worker larvae to fully developed queen bees in only 16 instead of 21 days needed for worker bees (b) The prolongation of the life of the queen to as much as seven years while this is no more than three months in the case of the workers (c) Enabling the queen to lay mor than her own weight in egg (up to 2,000) in one day during the peak of season. (Melampy and Jones, 1939).

Considerable efforts had been done to explain the physiological factors responsible for this development of the queen and since royal jelly is believed to be responsible for the above remarkable development of the queen, a knowledge of its chemical composition and nutritional properties is important.

General composition of royal jelly:

The different components of royal jelly were studied by many investigators, the average composition of royal jelly was 66.05% moisture, 12.34% protein, 5.45% total lipids, 12.49% total reducing substance, 0.82% ash and 2.84% undetermined matter (Aeppler, 1922; Elser, 1929; Melampy and Jones, 1939; Townsed and Lucas, 1940; Haydak, 1943; Rovesti; and Mitsue et al., 1973).

Yoirish (1977) reported that royal jelly contains 45.15% protein , 13.55% fat and 20-39% invert sugar (glucose and levulose). This report added that royal jelly contains all known amino acids.

More recently it was found crude protein 11.9% . crude moisture 67.1% and crude lipid 4.3%. Amino acid analysis showed 17 standard amino acids and 5 unidentified. Aspartic acid was the major amino acid, equal 16.1% of the protein content. The major fatty acid 10-hdyroxy -2- decenoic acid was present at an average concentration of 50.8% of total fatty acid content. (Howe et al., 1985).

The composition of royal jelly is affected by the age of the bee producing it, the time of year and the variation in food sources of the bees (Lercker et al., 1982).

There is an agreement that the nurse worker bees up to 15 days are the best age to produce a large amount of royal jelly. Also, the largest amount of royal jelly is obtained in spring followed by summer and the lesser amount is collected in winter (Hanna, 1963).

The lipids and fatty acids contents of royal jelly:

Royal jelly contain 26 or more free fatty acids, 12 of them were identified as nonanoic, capric, undecenoic, lauric, tridecenoic, myristic, myristoleic, palmitic, palmitoleic, stearic, linoleic and arachidic acid (Osman et al.,1977). Oleic, linolenic, nonadecenoic, behenic, erucic, lignoceric, nervoric acids were also identified (Robinson and Nation, 1970).

10-Hydroxy-2- decenoic acid is the major fatty acid present in royal jelly (Mohamed, 1980). 80 mgs of it were isolated from 6 gram of royal jelly (Brown et al.,1962), it is absent in honey and pollen grains and is secreted only by mandibular glands of worker bees (Barrker et al. 1959). It is responsible for the antimicrobial activity of royal jelly (Robinson, 1966; Yaisunamiand et al.,1985) 10-hydroxy -2-decenoic acid and 10-hydroxydecenoic acid together represent 60-80% of the organic acids present in royal jelly (Lercker et al.,1982).

Three different hydroxy fatty acids were idetified as 8-hydroxyoctanoic 3-hydroxydecenoic and dextrorotatory isomer of 3,10-dihydroxy decenoic acid (Weaver and Benjamin 1968) also esters of 10-hydroxy -2-decenoic acid with myristic, palmatic, stearic and sebaric, adipic, pimelic and suberic acid were identified (Bogdanovsky, 1963).

Thin-layer chromatography of royal jelly showed that it contained the following components: 7-9 sterols, 4-phospholipids and 5 glycolipids in the first group cholesterol, sistosterol and stigmasterol were identified, in the second group sphingomyelin and phosphatidyle thanolamine and in the third group three gangliosides were identified the other constituents could not be identified (Matsuyama et al.,1972).

Cardbohydrate content of royal jelly:

The sugar content of royal jelly was classified into threee classes. Non reducing sugars such as sucrose and raffinose, mono-saccharides such as glucose, levulose and xylose and reducing disaccharides such as lactose and maltose (Frederick, 1942).

By using a thin-layer chromatography for quantitative analysis of carbohydrates in royal jelly it was found

that 5.5% fructose, 6.13% glucose, 1.45% sucrose, 0.12% citric acid and 0.003% malic (Town et al.,1979). Also isolation of glycopeptide from royal jelly was done and its structure was studied (Siddique and Furgala,1966).

Amino acids and proteins contents of royal jelly:

Chemical analysis of royal jelly has shown that it is a complex-mixture of substances having a protein content of 11-18% of the fresh material, the proteins were found to consist of an albumin and probably a globulin in the ratio 2:1. Electrophoretic analysis showed the presence of albumin and alpha,beta and gamma globulin. (Abbott and French,1945).

Paper chromatographic analysis of amino acids in royal jelly indicated the presence of 17 amino acids including all essential ones, proline and lysin were present in the greates quantities while arginine, histidine, tryptophan, serine and cystine were present in moderate quantities (Osman and Ismail, 1977).

The amino acids composition of royal jelly extract (as μ mol/ml) were found to be,proline(2.52),lysine(0.835), glutamic acid (0.20) aspartic acid (0.138), arginine (0.138) phenylalanine(0.056), serine (0.036), histidine (0.033),

valine (0.028), glyceine (0.023), alanine (0.022),and leucine (0.01). The acids of threonine, methionine,isoleucine and tyrosine were found as traces (Barker et al.,1972).

Adenosine diphosphate(ADP)and adenosine triphosphate (ATP) were separated from royal jelly, the quantities were ADP (185.2) and ATP (302.1) µg/gram dry weight (Jacoli and Sanguinett, 1959).

The nucleic acids RNA and DNA were identified in fresh natural and fresh lysophilysed royal jelly (Mel-Nichenko and Vavilov, 1970).

Vitamins contents of royal jelly:

1. Water soluble vitamins:

a) Ascorbic acid:

Royal jelly contains small amounts of ascorbic acid (Melampy and Jones 1939). This due to the presence of vitamin C oidase enzyme which causes destruction of vitamin C (Gontarski, 1948).

b) Vitamin B group:

Aeppler (1922) was the first to conclude that royal jelly contains considerable quantities of water soluble