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The Effect Of Hydrocortisone On The Spleen Of Albino Rats

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ABSTRACT

The study of the short-term effect of hydrocortisone on the spleen was conducted using thirty male Albino (Wistar) rats, which were separated at random into three groups (A,B and C). The first test group (A) was given 15mg/kg bodyweight of hydrocortisone daily intramuscularly (IM), while the second test group (B) was given 7.5mg/kg body weight of hydrocortisone daily intramuscularly. The third group (C) was used as the primary control group and as such was given normal saline through the same route. The administration of the drug lasted for 7 days. Histological examination of eh spleen showed changes in the lylymphoid tissue of the splenic nodules. These changes range from paleness of eh lymphoid nodules to disappearance of some germinal centers of eh spleen. These changes have been observed to be dose dependent and may be as a result of degeneration or mobilization of lymphocytes and monocytes from the lymphoid nodules of the spleen caused by hydrocortisone administration.

Key words: Hydrocortisone, spleen, lymphocytes, germinal centers, lymphoid nodules

Hydrocortisone is a steroid drug of the family of glucorticoids (Baxter and Forsham, 1972; Murray, et al; 1996). Hydrocortisone is a hormone but the synthetic form exist as drug (Bowman and Rand, 1985). This hormone is secreted by the adrenal cortex and has important effect on intermediary metabolism (Katzung, 1996). It has been shown hat there is widespread use of glucorticoids in clinical practice and by sportsmen and women because of which there is need for thorough understanding of their multiple action so that optimum effectiveness will be obtained with minimum undesirable effects (Azarnoff, 1975; Gill, 1972).

Due to the diverse action of dydrocortisone, it has been shown that it is generally toxic to many non-target tissues (Bowman and Rand, 1985). The administration of the drug is most often predicted on selecting the dosage and route of administration that will reduce its effect on non-target tissues (Katzung, 1996). Hydrocortisone is used in the treatment of acute rheumatoid arthritis or arthritic conditions unresponsive to other therapeutic measures (Andrew, et al; 1975). It inhibits or minimize the signs of inflammation (Edwards, et al; 1995).

It is among the most useful therapeutic agent in the treatment of leukemias (Kumar and Clark, 1991). It is used to relieve allergic manifestations, inflammatory conditions like chronic obstructive pulmonary disease and asthma where it reduces inflammation (Trounce and Gould, 1998). Glucocortisoids produce lysis of lymphoid tissues especially T-cells or the small lymphocytes derived from the thymus (Edwards, et al., 1995). Thus, it impairs cellular mediated immunity. Due to the widespread effects of hydrocortisone, this present work is aimed at studying the effect of hydrocortisone on the spleen of albino rats, because spleen has been known to participate in the maturation and storage of lymphocytes and monocytes.

MATERIALS AND METHODS

The animals used in this experiment were 30 adult male Albino (Wistar) rats, while the test drug was vials of hydrocortisone sodium succinate containing 100mg of hydrocortisone. The animals have average weight of 200gms and are of average age of fourteen weeks old. They were kept under the same laboratory condition and were fed with commercial animal feed made by Pfizer Livestock Feeds Plc, Kaduna. The animals were separated into 3-groups (A,B and C) containing 10 animals each.

The animals in the first test group (A) was given 15mg/kg body weight of hydrocortisone daily intramuscularly (IM), while the second test group (B) was given 7.5mg/kg body weight of hydrocortisone daily intramuscularly. The third group (C) was used as the primary control group and as such was given normal saline through the same route. The administration of the drug lasted for 7 days.

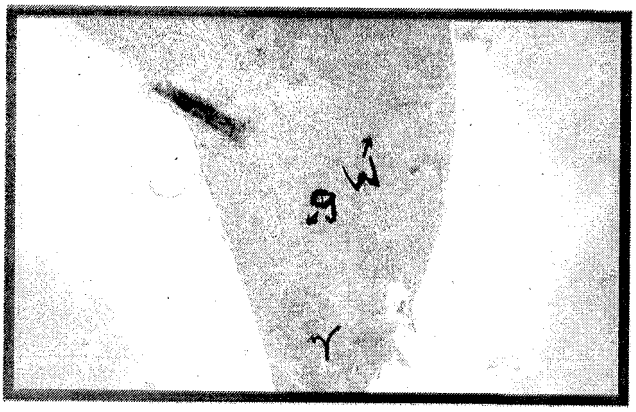

Fig. 1: A section of spleen from control (C) group, showing regular germinal centres (g), red pulp (r) and white pulp (w) H and Ex 100.

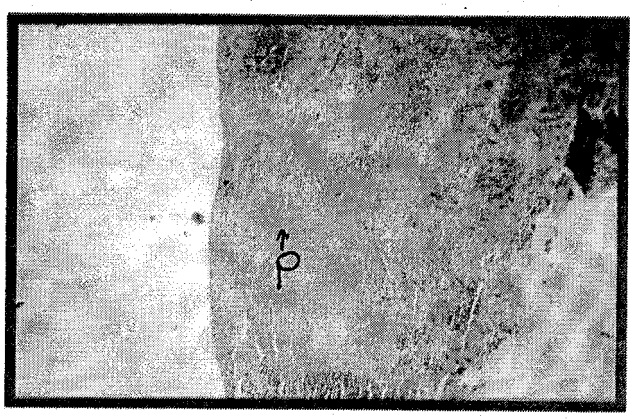

Fig. 2: A section of spleen from test group (B) showing pale appearance of the red pulp (p) and white pulp H and Ex 100.

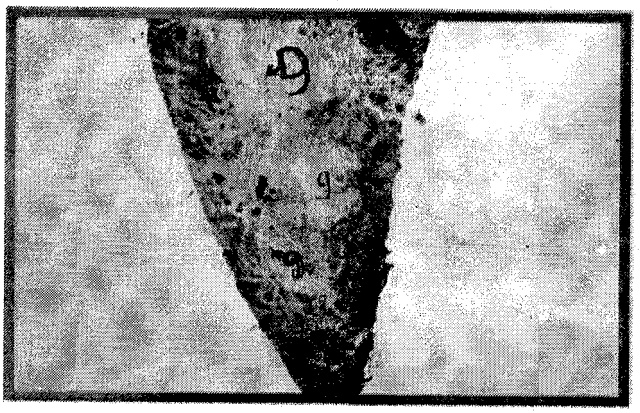

Fig. 3: A section of spleen from test group (A) showing degenerating lymphocytic nodules With pale germinal centers (g) H and Ex 100.

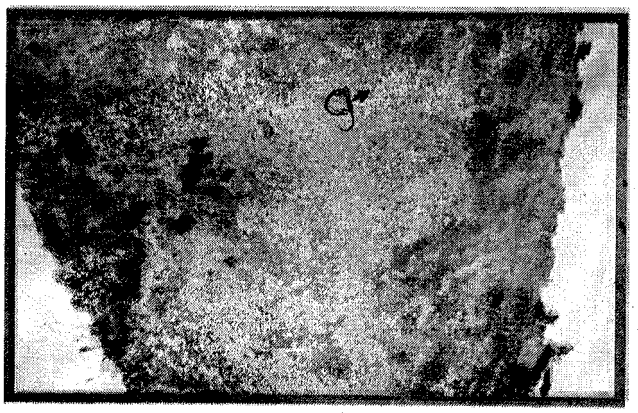

Fig. 4: A section of spleen from test group (A): showing degenerating lymphoid nodules with pale Germinal centres (g). H and Ex 250.

Tissue Preparation For Microscopy

Animals from each of the groups were anaesthetized and their abdomen opened by midline incision and the spleen from each of the groups was excised. The tissues were fixed using 10% buffered Formalin and Bouin's fluid. The tissue processing technique used were both manual and automatic tissues processing techniques using Histokinette bench model tissue processor obtained from the Department of Human Anatomy, ABU, Zaria.

The tissues were embedded in paraffin was and sectior s between 6-8 microns were made using the Rotary microtome. The tissues were stained using both general or routine and special staining techniques. The general or routine staining techniques used were the Haematoxylin and Eosin (H and E) method and Haematoxylin and Ligh green method called Rafferty's stain. The special stains used were the Periodic Acid Schiff (PAS) method and Highman's Congo Red method. These methods were used as outlined by Gurr, (1992); Culling, (1993); Drury and Wallington (1973).

RESULTS

The result of microscopic examination of the spleen, showed changes in the lymphoid tissues of he splenic nodules. The control group © revealed regular appearance of germinal centres, red and white pulp as shown in plate 1, while the test groups showed pale appearance of red pulp as shown in plate 2 for group B. Those in group A, showed disappearance of some germinal centers due to the denegation of lymphocytes and monocytes as shown in plate 3. also shown in plate 4 are degeneration of lymphoid tissues and the disappearance of germinal centers as in group A animals.

DISCUSSION

The effect of hydrocortisone administration on the spleen consists of degeneration of lymphocytes and reduction of lymphoid tissues. It has been shown that the effect of steroid on the morphology of lymphoid tissue include oedema, lymphoid atrophy and progressive decrease in lymphoid tissue (Cope, 1972, Katzung, 1996). It has also been shown that surviving lymphocytes show evidence of degeneration and severe degree of evolutionary changes in all lymphoid tissues of the body, without seriously interfering with the functional activity of the lymphoid tissues which survive (Cope, 1972; Memmier and Wood, 1972). Chandrasoma and Taylor (1995), has shown morphological effects of steroid on the lymphoid cells to include removal of cytoplasm by budding, destruction of the nucleus and suppression of mitosis. The nuclear and cytoplasmic materials from the destroyed lymphocytes is phagocytosed by the fixed reticuloendothelial cells. The destruction of the lymphoid cells in the spleen was shown by the disappearance of the red or pink stain of the cytoplasm. The may be due to atrophy of the lymphocytes at the nodules or movement of lymphocytes out of the nodules to the general circulation (Cope, 1972; Ibegbu, et al., 2001). It has been shown that mitosis of lymphoid cells are inhibited and both reduced formation and greater destruction of lymphocytes contribute to lymphocytopenia (Cope, 1972). This change in the lymphoid nodules may result in the reduction in the circulating blood lymphocytes thereby reducing the number of lymphocyte participation in the phenomena of inflammation. Thus the decrease in bulk of lymphoid tissues available may contribute to reduction in antibodies forming cells which indicates the role of hydrocortisone in immunosuppresion at higher doses (Cope, 1972; Stites, et al., 1994; Edwards, et al., 1995). This may contribute to the reduction in resistance of patients to certain infectious processes and to some viral diseases. Bergersen (1980) has observed that viral infections tend to excite a lymophocytic response and an increase in the number and proportion of lymphocytes in the peripheral circulation.

Thus, this maybe the reason for the increase in the lymphocytes in the peripheral result of their mobilization from the nodules into the general circulation, resulting in the paleness of the nodules in hydrocortisone administration.

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