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GENETIC VARIATIONS IN SOME BIOCHEMICAL TRAITS AMONG THREE RABBIT BREEDS AND THEIR CROSSES

(With 2 Tables)

by

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الاختلافات الوراثية لبعض الصفات البيوكيميائية في سلالات الأرانب وتجهينها

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أجرى هذا البحث لتقييم الاختلافات الوراثية في ثلاث سلالات من الأرانب (البلدى - النيوزيلندى والكاليفورنيا) وتجهينتها المختلفة من خلال قياس النشاط الأنزيمي وبعض المكونات العضوية والغير عضوية في مصل الدم ، وأظهرت النتائج وجود أعلى القيم لانزيم الألكالين فسفاتيز في مصل الدم كانت في الأرانب البلدى ثم النيوزيلندى مع البلدى ثم الكاليفورنيا مع البلدى على الترتيب ، بينما أقل القيم لنفس الأنزيم السابق كانت في النيوزيلندى مع الكاليفورنيا ثم الكاليفورنيا مع النيوزيلندى. وكان نشاط انزيم ألانين أمينو ترانسفيراز واسبرتيت أمينوترانسفيراز مرتفعا في الثلاث سلالات النقية، بينما انخفض هذا النشاط بشدة في التجهينات المختلفة بين السلالات المذكورة. المعدل الكلى لبروتين مصل الدم كان مرتفعا في الكاليفورنيا مع النيوزيلندى. كذلك كانت أعلى القيم للألبومين في الكاليفورنيا مع النيوزيلندى ثم البلدى مع الكاليفورنيا ثم الكاليفورنيا ثم النيوزيلندى مع النيوزيلندى مع الكاليفورنيا. ووجد أن أعلى معدل الجلوبيولين مصل الدم في سلالة الكاليفورنيا بينما كانت سلالة البلدى بها أعلى القيم لكل من الكالسيوم والفسفور الغير عضوى والحديد في السيرم.

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SUMMARY

The present study was carried out to evaluate the biogenetic differences among three breeds of rabbits (Baladi, Newzealand and Californian) and their crosses in the measurements of some serum enzymatic activities and some other organic and inorganic serum constituents. It was found that the activities of serum alkaline phosphatase, aspartate aminotransferase and serum alanine aminotransferase enzymes were greatly influenced by breed differences. Total serum proteins, albumin, globulins, calcium, inorganic phosphorus and iron concentrations were also influenced by breed differences.

INTRODUCTION

Rabbits are raised for many purposes and are found in virtually every country. They have traditionally been raised by small farmers to provide meat for the family and supplementary income. Also, rabbits are extensively used in biochemical research as laboratory animals (CHEEKE, 1987).

FOX *et al.* (1970) concluded that there were great differences in biochemical parameters among different breeds of rabbits. They found significant differences in inorganic phosphorus concentrations and in the activity of alkaline phosphatase. KOZMA *et al.* (1967) reported that the albumin fraction represents about 55 to 65% of the total serum proteins level and that female rabbits have lower globulins level than males. On the other hand, the normal calcium level is 12.40 mg/100 ml serum which is sharply reduced at parturition and during lactation (BARLET, 1980), while, CHEEKE (1987) reported that the normal calcium is about 10 mg/100 ml in female rabbits. The differences in the mean values of calcium concentrations may be due to differences in the concentration of dietary calcium (CHAPIN and SMITH 1967). The normal inorganic phosphorus level in mature does is 6 mg/100 ml (BARLET, 1980). Serum enzymatic activities are sensitive to many diseases, while available literature, regarding their values in serum in different breed of rabbits, is lacking.

So, this study was planned to throw light on possible genetic variations among some breed of rabbits by measurement of some serum constituents which may be used in identification of breeds, their selection for breeding purposes and possibly in the early diagnosis of some rabbit diseases.

MATERIAL and METHODS

This study was carried out on three different breeds of rabbits (Egyptian baladi, Newzealand white and Californian) and their crosses. The bucks and does were housed separately in steel cages and received basic ration and management. All possible crosses were made between bucks and does (BC, CB, NB, NC, CN)**. The young suckled their mothers for about one month, then the were weaned and moved to separate raising hutches. Complete records were made for the does and bucks and their off springs. Each rabbit progeny reaching about three months of age were subjected to blood sample collection. Blood samples were taken from the ear vein and collected in sterile centrifuge tubes. The blood was left at room temperature to clot. Then was cooled at 4 C for about 4 hrs for clot retraction. The samples were centrifuged for 10 minutes at 3000 r.p.m. and the clear nonhaemolysed serum was then pipetted into Wasserman tubes and kept frozen at -20 C until used. Sera were used to determine of serum alkaline phosphatase (SAP) (KIND and KING, 1974), serum aspartate aminotransferase (SAST), serum alanine aminotransferase (SALT) (REITMAN and FRANKEL, 1957), total serum proteins (WEICHSELBAUM, 1946), albumin (BARTHOLOMER and DELANCY, 1966), globulin (COLES, 1974), Calcium and phosphorus (WOOTTON, 1982) and iron (RAMSAY, 1957). The data obtained were statistically analyzed according to SNEDECOR and COCHRAN, 1967).

RESULTS

Data presented in table 1 indicate that the highest values of serum alkaline phosphatase (SAP) were observed in Baladi (B), Newzealand white X Baladi (N X B) and Californian X Baladi (C X B) respectively. While the lowest one was noticed in (Newzealand white X Californian (N X C) followed by Californian X New zealand white (C X N). The serum aminotransferase aspartate (SAST) activity was significantly higher ($P < .005$) in the three pure breds (B, C, N) while it was greatly reduced in their crosses. However, serum

alanine aminotransferase (SALT) activity was high in (N) followed by (C X B) and (B X C).

It is clear from table 2 that total serum proteins level was high in (C X N) followed by (C) and (N) while the highest value of albumin level was noticed in (C X N) followed by (B X C) (C X N) (N X C) (C) and (N). Californian breed possesses the highest serum globulin level. Baladi breed contain the highest values of serum calcium, inorganic phosphorus and iron concentrations.

DISCUSSION

The measurements of blood constituents is now widely used in veterinary medicine to evaluate the health condition and to diagnose diseases and nutritional disorders in domestic animals. The data obtained (Table 1) show that there were a significant differences in SAP, SGOT and SGPT activities between most breeds and their crosses included in this study. The results obtained generally agree with those of FOX *et al.* (1970) who concluded that there were significant differences in biochemical parameters among different breeds of rabbits, especially in SAP, SAST and SALT. The great reduction of SGOT in rabbit crosses (28.60 to 37.5 i. u./L as compared to pure breeds (59.7 to 64.70) may be considered due to heterosis (-0.48 to -0.54) in the crossbreds.

The source and physiologic significance of the enzyme found in the blood plasma of normal animal is unknown. These enzymes have been considered to represent the products of disintegration of cells undergoing normal wear and tear (ZEMMERMAN *et al.*, 1965). In our opinion the significant differences in serum enzymatic activities estimated in this study between the different breeds of rabbits and their crosses may be attributed to the genetic make-up of each breed. Also, variations in both mineral concentration, and clearance rates of these enzymes may be the cause of this significant differences.

Table 2 shows that there are significant differences in total serum protein among the different breeds of rabbits and their crosses. These differences may attributed to differences in albumin and in fractions between different breeds of rabbits. On the other hands, WOSTMANN (1961) reported that the significant changes in the total serum proteins in the different breed of rabbits may be contributed to the differences in alpha globulin fraction concentrations. The obtained results provide an evidence that the albumin

fraction concentration is more than the globulins one. These results are in accordance with those of KOZMA *et al.* (1967) who concluded that the albumin fraction represents 55 to 65% of total serum protein in rabbits. The proteins fractions are influenced by the genetic and nongenetic factors (ZIMMERMAN, 1965 and AGAG, 1983). However, great effort was done to minimize the nongenetic effects and thus the differences may be mainly due to breed differences in genes controlling these traits. The breed effect on immunoglobulins concentration was observed by LINDSAY *et al.* (1981) in different breeds of calves, RESS and NORDSKOG (1981) in chickens and REDA *et al.* (1992) in rabbits.

On the other hand, the results presented in Table 2 revealed that the Baladi breed has the highest serum calcium concentration. They also reveal that the mean values of serum calcium level in different breeds of rabbits are higher than in other animal species, since the total concentration of calcium in the blood of other mammals is approximately 10 mg/dl. This difference is due to the fact that calcium level in rabbits is not closely regulated homeostatically as in other species (CHEEKE, 1987). The values obtained for calcium level is close to those obtained by BARLET (1980). The highest values of inorganic phosphorus concentrations were recorded in Baladi breed, also the highest values in iron concentrations were noticed in sera of Baladi (B X C) and in (N X B) breeds. The high rate of calcium, phosphorus and iron absorption may be the cause of higher values of these minerals in the serum of Baladi breed. Finally, the significant differences in most serum constituents estimated in this study may be attributed to genetic and physiological differences among these breeds.

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