أساسيات عن دم القوارض فى مصر

د . م . ص عرفة ، د . ع . م سليط ، د . ط . ى . هلال
د. ع. م. على ، د. عبد الوهاب

الملخص

أجريت هذه الدراسة للتعرف على صورة الدم فى أنواع القوارض السائدة بمصر لاهميتها فى الدراسات الحيوية والسمية ولعدم وجود معلومات متاحة عن مثل هذه الدراسة بمصر .

وقد أوضحت النتائج أن الجرذ النرويجي يتبوأ المركز الأول فى عدد كرات الدم الحمراء والبيضاء ونسبة الهيموجلوبين كما أظهر أقل وقت لسرعة النزف والبروثرومبين مما يوضح نشاطه الدموى العالى ويتبع الجرذ النرويجى فى ذلك الجرذ المتسلق السكندرى ثم الفأر الشوكى القاهرى يليه الجرذ المتسلق ذو البطن البيضاء ثم جرذ الحقل النبلى .

ولقد وضح من العدد التفريقى لكرات الدم البيضاء أن هذه القوارض جميعا ذات نسبة عالية من الليفوسيتس تليها النيتروفيلس والمونوسيتس والازنيوفيلس وأخيرا البيزوفيلس .

وأمكن استخلاص أن الحيوانات ذوات التغذية الأساسية على البروتينات تميل الى **اظهار نشاط دموى انتاجى أو تجلط فى الدم أعلى من تلك التى تتغذى أساسا على مواد أقل فى مكوناتها البروتينية . كما اتضح اختلافا فى صورة الدم باختلاف السن والجنس فى** هذه الحيوانات .

Departments of Parasitotogy and Pathology, Faculty of Medicine, Assiut University
Department of Plant Protection, Faculty of Agriculture Assiut University.

Head of Dept. Prof. A. M.Ali

BASIC HAEMATOLOGIC DATA ON THE EGYPTIAN RODENTS

(With One Table)

By

M. S. Arafa, Ali M. Salit, T. Y. Helal A. M. Ali and A. M. Abdel-Wahab.

(Received, 12/3/1975)

SUMMARY

The present paper gives the base-line data on the blood picture of various sexes and age groups of commensal, domestic and field rodents in Egypt.

According to the haemopoetic activity of these animals based on descending values of haemoglobin percentages, eryrthoplastid and leucocytic counts, and ascending values of bleeding, coagulation and prothrombin times, these animals might be arranged in the following order :

Rattus norvegicus, *R. r. alexandrinus*, *Acomys cahirum*, *R. r. frugivorus*, and *Arvicanthis niloticus*.

All of them showed high lymphocytic count. followed by neutrophils, monocytes, eosinophils and finally basophils.

It was concluded that animals feeding essentially on protein diets such as *R. norvegicus*, *Ac. cahirinus* and *R. r. alexandrinus* tended to show pronounced haemopoetic activity and more coagulability than the remaining rats which feed on less protein diets.

Variations due to age and sex of these animals were also recorded.

INTRODUCTION

Review of the available literature denotes that basic haematologic data for domestic, commensal and field rodents in Egypt and probably other parts of the world are lacking. The need for such data is essential for further biological and toxicological studies of these animals. So the need for the present work was quite evident.

MATERIAL AND METHODS

Different sexes, age, weight groups of the Norway rat *Rattus norvegicus* Berkenhout (213 animals), the grey-bellied rat *R. r. alexandrinus* Geoffory (260 animals), the white-bellied-rat *R. r. frugivorous* Ranfinesque (320 animals), the grass rat *Arvicanthis niloticus* Desmarest (152 animals) and the Cairo spiny mouse *Acomys cahirinus* E. Geoffory and St. Hillaire (204 animals) were included in the present study.

Bleeding time and Coagulation time tests :

DUKES technique, quoted by BRITTON (1963) was adopted but the lightly anaesthetized animal was pricked sharply with a syringe needle (Nc. 11) in the muzzle's area. The oozing blood was consequently blotted until bleeding stopped and the bleeding time in seconds was recorded. Also coagulation time using a dry microscopic slide was recorded.

Collection of blood for other tests :

The axillary veins of the anaesthetised animal were severed with a sharp surgical scissors. For haemoglobin test and differential leucocytic count, uncitrated blood was used. Wintrobed blood (WINTROBE, quoted by BRITTON, 1963), on the other hand, was used for prothrombin test, total count and platelets count. The minimum required amounts of blood to be added to 0.5 ml. of Wintrobe's solution were determined before hand as 5.0 ml. for the white bellied rat and the grass rat, 4.5 ml. for the greybellied rat and the spiny mouse and 4.0 ml. for the Norway rat. To overcome the difficulty of obtaining sufficient amounts of blood from the spiny mouse and young rats, one half volume of blood and Wintrobe's solution was used.

Other tests :

The acid haematin technique of SAHLI was adopted in haemoglobin test. In differential leucoytic count the white blood corpuscles were counted in thin blood films stained with Leishman's stain (BRITTON, 1963 and SEIVERD, 1964).

To perform the prothrombin test, the Wintrobed blood was centrifuged (3000 rpm) for 10 minutes. The test was either done immediately, or in case of delay, the plasma was preserved in a refrigerator for not more than 4 hrs. (SEIVERD, 1964). As the temperature of rat has been reported to be 37.5° C and that of mouse to be 37.4°c the tests were performed at these particular temperatures. (QUICK *et al.* 1935 MENTIGEL, 1952, MONTIGEL and PULVER 1952, and MONTIGEL, 1959).

The improved Neubour (CLEY. ADAMS-Inc. N. Y.) was used for total erythrocytic count in million/mm^3, total leucocytic count in thousand/mm^3 and thrombocytic count in thousand/mm^3. The red cells erythroplastids

and white cells diluting fludies were quoted from BRITON (1963) and SEIVERD (1946), while REES and ECHER (1923) fluid was used as diluent to platelets. The techniques given by BRITTON (1963) and SEIVERD (1964) were followed.

RESULTS AND DISCUSSION

The results of this study are summarized in Table 1. Species variation :

The Norway rat ranked first in its erythrocytic count, hoemoglobin content and leucocytic count and presented the shortest bleeding, coagulation and prothrombin times. This indicates marked haemopoietic activity of this rat which might be correlated with its feeding habits, being more cannibalist, omnivorous and prefers diet rich in protein and fats. Next came the Cairo spiny mouse and the grey-bellied rat, both being domestic, living inintimate association with man, feeding on relatively nutrious human diet. Thereafter came the commensal white-bellied rat and the grass rat which are essentially vegeterians.

Study of the differential leucocytic count points out to marked similarity between the large species and genera, viz. *Rattus norvegicus*, *R. r. alexandsinus*, *R. r. frugivorus* and *Arvicanthis niloticus*. They differed from the samller species *Acomys cahirinus* which showed a comparatively higher lymphocytic but lower neutrophil count.

Comparing the blood picture of the wild Norway rat, *R. norvegicus* with that of th albino rat *R. norvegicus albus* as demonstrated by CRESKOFF *et al.* (1949), FERRIS and GRIFFITH (1962) SCHERMER (1967) and ARCHER (1970) the wild species showed a higher leucocytic count, propably associated with more intensive exposure to infectious agents in nature than under laboratory conditions. The wild species exhibited more marked clotting mechanism as evidenced by shorter coagulation prothrombin and bleeding times. This might refer to a better defensive mechanism for protection of the wild species.

On the other hand the cell count, haemoglobin percentage and white cell counttended to be somewhatlower in case of the spiny mouse when ascompared to the laboratory white mouse as reported by SCHERMER (1967). Besides lymphocytic count showed a tendency of increase whereas neutrophils showed a tendency of decrease in case of the spiny mouse as compared with the white mouse. Moreover, the spiny mouse exhibited more rapidly clotting mechanism compared with the white mouse.

Sex variation :

From the table no striking difference was observed between the blood pictures of various sexes of mature rats, thought there was tendency of some increase in the red cell count and haemoglobin content of mature males. The clotting machanism was faster among mature males, probably as they are more

TABLE 1. Base-line Heamatological Data (Mean Values) for both Sexes of Varisus Species of Rodents in Assiut Area

Species of Rodents	Sex. of sdult	No. of anim. examined	H.b. % Sahli,s	R'B.C. in mill mm	W.B.C. in thous mm	Differential Leucocytic count (%)					Time in seconds of		
						Lympho	Neutro	Mono.	Eosino	Basoe	Bleed	Coagulat	Prothr-rom.
R.norveg.	M.	77	100.85	9.943	13.351	62.92	33.31	2.60	0.75	0.42	75.3	1.96	8.6
	F.	85	98.28	9.521	12.899	68.70	30.27	2.2	0.40	0.43	58.88	23.6	10.4
R .r. alex.	M.	66	91.37	8.046	10.158	64.84	31.14	2.59	0.89	0.54	75.3	23.1	10.4
	F.	86	88.18	7.545	9.411	64.02	31.34	3.01	1.00	0.63	69.6	26.8	10.9
R.r. frug. . . .	M.	92	85.13	6.913	8.634	65.59	27.56	4.51	1.36	0.98	82.7	33.5	13.3
	F.	102	84.23	6.775	8.261	62.54	29.44	5.13	1.54	1.35	81.9	42.1	12.1
Ar. niloticus . .	M.	52	81.37	6.725	7.849	69.05	27.64	1.94	1.11	0.26	84.7	46.2	15.6
	F.	46	80.25	6.240	7.532	65.20	30.46	2.41	1.41	1.34	80.3	48.9	16.9
Acomys cahirinus	M.	60	87.34	8.291	8.765	86.96	9.72	1.71	0.26	1.35	75.6	23.0	10.0
	F.	62	85.90	8.456	9.260	88.50	8.73	1.56	0.15	1.06	71.6	22.3	10.4

aggressive and liable to mor hazards in nature. Exceptionally, the old group of mature females showed the shortest coagulation and prothrombin times, in agreement with other workers investigating the white albino rat e.g. COTCHIN and ROE (1967).

On the contrary the spiny mouse exhibited a reversal trend, females showed a slight increase in their blood counts and faster clotting in consistence with KLIENEBERGER (1972) quoted by SCHERMER (1967).

Age variation :

The results show that the haemoglobin content of immature rats was relatively low. It indreased grandually with the increase of age to reach its maximum value in the early mature group of rats. Thereafter, it dropped to reach a low level in the old mature group, which was still comparatively higher than that of the immature group. This trend agrees with the findings of CROSKOFF *et al.* (1949), FERRI GRIFFITH (1962), SCHERMER- (1967) COATCHIN and ROE (1967) and CHARLIS River Laboratroy Breeding of small animals (ANONYMOUS, 1971 and 197?).

The lymphocytes exhibited low count in the newly born rats, and increased gradually to reach a peak in the late immature group, then diminishing gadually with further increase of age but still remaining at relatively high level compared with the newly born rat. The neutrophil followed a reversal pattern. The remaining categories of granulocytes showed the highest count in the newly born rats which then persistently dropped, gradually in case of monocytes and abrubtly in case of e osinophils ad basophils with increase of the animal's age. However, CRESKOFF *el at.* (1949) CATCHIN and ROE (1967) reported also differential count variation with age progress of rats.

The cairo spiny mouse showed a similar trend of haemoglobin percentage, red cell count and leukocytic aount to that of rats, but with delayed peak occuring mostly in the medium mature rats. The lymphocytes showed a trend of increase to reach a peak in the early mature animals. Thereafterer, it showed little reduction with ups and downs. The neutrophils showed a gradual increase in count with the increase of age or weight to the lowest values in the early mature, then rose up with increase of weight showing some fluctuation of a relativly high level. The remaining groups of granulocytes showed the same trend of gradual decrease in case of monocytes and sudden decrease in case of eosoinphils and basophils.

The bleeding time showed a marked increase with age progress. The coagulation time and prothrombin time were the longest in the newly born rats, decreased gradually to a moderate level in the early mature groups, then rose up to show another peak in the medium mature groups, thereafter dropped gradually to attain the shortest time in the elder groups particularly in females.

This trend clearly indicates marked ability for coagulation in the elder group rats and mice, whereas this capacity is relatively diminished in the medium age which is probably correlated with breeding activity and reproductive ability. However, these haematolcgical variations associated with age might be of value to explain differences of susceptibility of animals to the effect of toxicants particularly anticcagulant rodenticides now in current use.

References

Anonymous (1971). Some physiological parameters of small animals. Tech. Rep.Charles River Digest, **10** (4) pp. 4.

——— (1973). The blood picture of small Laboratory animals Tech. Rep. Charles River Digest, XII (1) pp. 4.

Archer, R.R. (1970). Zoological society of London symposial, '27. No,

Briton, C. L. (1963). Disorders of the Blood (text book) **9** th ed,, J. and A. Churchill, LTD, London, W. I.

Creskoff, A.J. Hauge, J.R. and Ferris, E.J. (1949).The rat in Laboratory Investigation 2*na* ed. Hafner Publ. Comp. New York, Chapter **14**, 331-365.

Crowerft, P. and Rowe, E.P. (1957). The growth of confined Colonies of the wild house mouse (*MuS mUscUlus* L.) *Proc. Zool Soc.* Lond., **129** : 359-370.

Farris, E.J. and Griffith, J.Q. (1942). Leucopenia associated with normal estrous in the albino rat. *Anat. Rec.*, **82** : (2) Feb.

Montigel, C. (1952). Zur methodik der prothrombinbestimmuge. Ther. Umsch. **9** : 17-21.

Montigel, C. and Pluver, R. (1952). Die bestimmung der Prothrombinzeit mit der thrombokinase "Geigy" (G 23787) *schweiz, med wschr* 82 : 132-135.

Montigel, C. (1959). Uber die Wirkungsweise Verschiedener Thromboplastinparate. *Schweiz med. Wschr.* **9** : 1259.

Quick, A.J., Stanley-Brown, M. and Baucroft, F. (1935). A study of the coagulation defect in haemophilia and jaundice. *Amer. J. Med. Sco.*, **190** : 505-515.

Rees, H.N. and Ecker, E.E. (1923). An improved method for counting blood platelets. *Jour Amer. Med. Assoc.* **80** : 621-622.

Rowe, F.P. and Redfern, R. (1968). Comparative toxicity of the two anticoagulants Coumatetralyl and Warfarim, to wild house mice (*Mus musclus* L.). *Ann. Appl Riol.*, **62** : 355-361.

Schermer, S. (1967). The Blood Morphology of Laboratory Animals. 3*rd* Ed., F A. Davis Company, Philadephia.

Seiverd, E.C. (1964). Haematology for Medical Technologists. 3*rd* Ed. Lea and Febiger Philadelphia.