RESEARCH ARTICLE

Haematological study in the male Rat, *Rattus rattus* narbadae (hinton) during postnatal development stages

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ABSTRACT

The study is based on the examination of 70 male rats *Rattus rattus* narbadae Collected at Amravati. The size and weight of the first maturity of the rate, *Rattus rattus* narbadae is computed out to be 14.7 cm and 62.00 gms respectively. In immature group of rat *Rattus rattus* narbadae, Hb %, R.B.C. count increase steadily as the animal grows but the total W.B.C. count, differential count % decreases. In the post mature group all the concentration of blood does not markedly difference.

Key Words: *Rattus rattus* narbadae, Haemaological, Postnatal Satges, Dvelopment.

INTRODUCTION

The resume of the literature on the haemotology of Indian rodents indicates that the work is so far carried out on the haematological changes during breeding and non breeding seasons in Funambulus pennanti (Purohit *et al.,* 1978) and in *Rattus rattus* (Lohra and Purohit, 1978) and during water deprivation in *Rattus rattus*, Tertera indica and Funarobulus pennanti (Purohit *et al.,* 1978). Major study has been made in female rat during various stages of breeding seasons. Since the information of the male rat *Rattus rattus* narbadae, on its blood picture are inadequate. An attempt has been made in order to study how the blood picture differ from the successive age of the rats, Viz R.B.C., W. B. C., haemoglobin and total differential count.

MATERIALS AND METHODS

Live trapped male rats were collected from Amravati, for the haematological study. The male rats were sacrificed. Their total length (snout to tail), standard length (snout to vent) and weight were recorded. The male rats were classified according to the weight into Fourteen Lots as shown in table 1. From 1 to 5 considered as immature group, 6 to 11 considered as mature group and lot 12 to 14 considered postmature group.

The blood was taken from the tail for estimation of R.B.C. and W.B.C. differential count and hemoglobin percentage. The R.B.C. and W.B.C. were counted with the help of improved Neubaur Haemocytometer, while the hemoglobin percentage was recorded by Sahali's Haemoglobinometer. The differential count studies were based on the blood snares stained by wrights' stain.

Table1:Classification of male Rat *Rattus rattus* narbadae according to the weight.

Lot no.	Weight of Rats
1	10 gms to 20 gms
2	21 gms to 30 gms
3	31 gms to 40 gms
4	41 gms to 50 gms
5	51 gms to 60 gms
6	61 gms to 70 gms
7	71 gms to 80 gms
8	81 gms to 90 gms
9	91 gms to 100 gms
10	101 gms to 110 gms
11	111 gms to 120 gms
12	121 gms to 130 gms
13	131 gms to 140 gms
14	141 gms to 150 gms

RESULTS AND DISCUSSION

The survey of the murdiae of Vidarbha region of Maharashtra State revealed that the population of the wild rats, *Rattus rattus* narbadae (Hinton) appears to abundant at Amravati and its vicinity and hence the study on the haematological changes during postnatal development of the male rat, *Rattus rattus* narbadae undertaken.

1. Growth and Maturity

The male rats, Rattus, rattus, narbadae attains their size of maturity at 14.7 cms. The body length against the weight of the animal was plotted in fig. 1.

The graphic representation reveals that growth of the body is very rapid during early life. It is apparent that the size of first sexual maturity is attained by the rat, *Rattus rattus* narbadae at 14.7 cms. in size and 62.0 gms in body weight. In the rat, *Rattus rattus* narbadae, which attains the first size and weight of maturity is 14.7 cms and 62.0 gms respectively. All the male rats, *Rattus rattus* narbadae measuring more than 14.7 cms and weighing 62.0 gms were mature. Therefore animals representing in lot 6 to 11 (Table 2) are considered as mature group. All the males measuring less are immature (Lot 1 to 5) Table 2. and Lot 12 to 14 are considered as post mature group for the study of Haematological changes.

2. Haematological changes of the immature group of rats :

A immature group of male rat shows increase in erythrocyte count from 6.7 million erythrocyte per cu./m.m. (Lot 1) to 7.3 million erythrocyte per cu.m.m. (Lot 5) Table 2. The total number of W.B.C. decreases from 9220/cu.m.m. of blood (Lot 1) to 8472/cu.m.m. (Lot 5) of blood of these polymorph and Lymphocyte shows a decreased trend from Lot 1 to Lot 5, where as the Monocytes, Basophil and Eosingophil increase from Lot 1 to Lot 5. The haemoglobin percentage increases from 9.5 gms per 100 ml of blood (Lot 1) to 11.2 gms/100 ml to blood.

3) Haematological changes of the mature group of rats :

The haematological picture of the mature group of rat, *Rattus rattus* narbadae are given in Table 2 (Lot 6 to 11). The R.B.C. in the mature group shows decreasing trend from 7.5 million/cu.m.m. (Lot 6) to 6.7 million/cubic m.m. (Lot 11) The total W.B.C. increases from 9842/cu.m.m. of Lot 6) to 10125/cu.m.m (Lot 11) of blood. Rowett (1960) has observed W.B.C. number variation from 6000 to 18,000 in normal albino rat.

Table 2: Biometric Changes during post natal development of the Rat *Rattus rattus* Narbade (Hinton)

Lot No	W.T. of animals	Total length	Standard length	Relative wt. of spleen in mg/gms
1	17.5 ± 0.8	21.5 ± 0.66	9.5 ± .44	2.71 ± .07
2	25.5 ± .65	21 ± 0.27	10 ± 1.33	2.82 ± .08
3	35.5 ± 1.9	22.5 ± 1.81	11.8 ± 3.01	2.96 ± .09
4	47.6 ± .102	23.6 ± 2.34	12.6 ± 5.01	3.20 ± 1.02
5	56.7 ± .083	28.5 ± 4.9	14.0 ± 6.08	3.65 ± 1.05
6	62.0 ± .053	30.5 ± 8.9	14.7 ± 1.3	3.61 ± 1.04
7	77.0 ± 1.028	33.0 ± 9.8	15.8 ± 1.2	2.90 ± .09
8	85.3 ± 0.83	32.6 ± 9.9	16 ± 2.4	2.35 ± 0.86
9	95.5 ± 0.84	35.5 ± 7.7	16 ± 2.8	1.70 ± .06
10	105.5 ± 3.2	32 ± 6.8	17.0 ± 2.3	1.89 ± .07
11	117.5 ± 2.25	34 ± 6.2	17.5 ± 2.5	1.20 ± .03
12	125.5 ± 8.3	32 ± 4.8	17.0 ± 3.1	1.55 ± .04
13	137 ± 10.2	34 ± 5.2	19.0 ± 3.2	1.50 ± .05
14	145.5 ± 5.3	35.5 ± 4.4	19.5 ± 13.4	1.65 ± .06

Table 3: Haematological Changes during post natal development of the Rat *Rattus rattus* Narbade (Hinton)

Lot No	HBmg/100 ml. of blood	Values of R.B.C. (10C.C.M)	W.B.C. count per C.C.M.	Differential Count				
				Polymorph	Lymphocyte	Monocyte	Eosinophil	Basophil
1	9.5 ± 1.25	6.7 ± 0.0213	9220 ± 182	23.0+0.30	72.5+5.8	1.0+.33	1.0+.33	2.5+.58
2	10 ± 2.33	6.8 ± 0.0195	8563 ± 127	21+.53	70.5+5.33	1.5+.22	2+1.08	4+1.08
3	10.2 ± 3.5	6.9 ± 0.0255	8944 ± 136	19+.48	73+5.08	1+.51	2.5+.19	4.5+1.09
4	10.3 ± 3.8	7.7 ± 0.0280	7860 ± 106	22+1.61	68+1.1	2.0+.63	4+.22	4+.29
5	11.2 ± 5.2	7.3 ± 0.0261	8472 ± 135	20+3.2	71.7+1.3	2.0+.90	2.3+.12	4+.30
6	11.0 ± 6.1	7.5 ± 0.0264	9842 ± 151	18.0+6.04	74.0+.48	1.0+.14	3.0+.19	4.0+.24
7	11.0 ± 4.1	5.8 ± 0.0232	10533 ± 144	21+8.3	73+2.13	2+.17	1.0+.09	2+.18
8	12.6 ± 2.5	5.0 ± 0.0336	16426 ± 123	19.6+10.02	72+1.08	1.4+.23	2.6+.18	4.4+.29
9	11.3 ± 1.9	5.9 ± 0.0298	13840 ± 149	21+11.2	70.5+3.08	1.5+.28	3+.18	4+.24
10	11.7 ± 2.4	5.8 ± 0.0252	11280 ± 182	22+11.3	68+5.8	2+.32	4+.24	4+.25
11	12.2 ± 3.49	6.7 ± 0.0201	10128 ± 101	21.5+11.8	73+4.8	1+.08	2.5+.12	2+.18
12	12.1 ± 4.09	7.0 ± 0.0215	11760 ± 123	19.0+10.1	73.0+7.3	1.5+.06	2.5+.08	4+.29
13	11.4 ± 4.8	6.0 ± 0.0123	10620 ± 142	20.6+8.8	71.3+12.0	1.3+.07	2.3+.04	4.5+.32
14	12.6 ± 5.6	6.8 ± 0.0212	9840 ± 159	20+7.8	72+15.4	1+.06	2.5+.02	4.5+.33

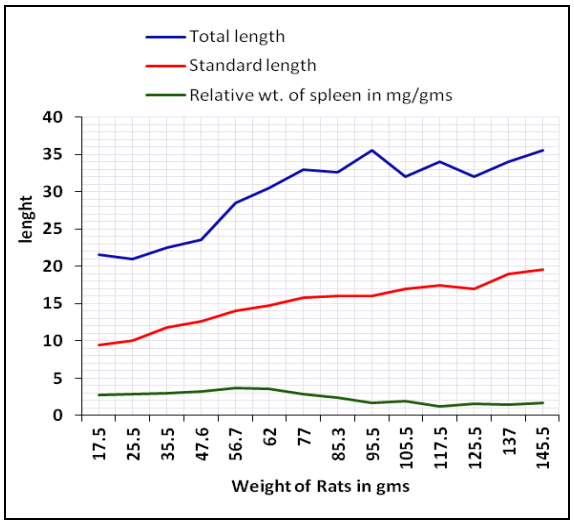

Fig. 1: Showing wt. of Rats against biometric measurments

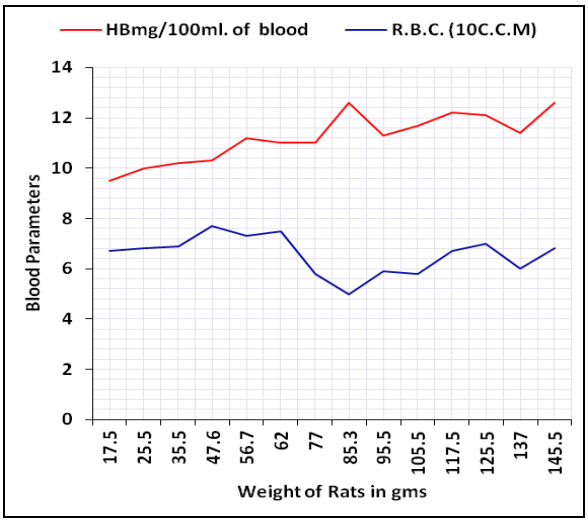

Fig. 2: Showing weight of Rats against blood paramatesnts

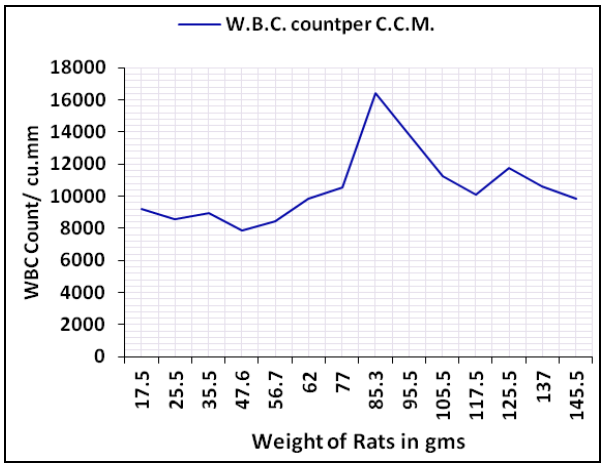

Fig.3 Showing wt. of rat against WBCs /Count cu.mm

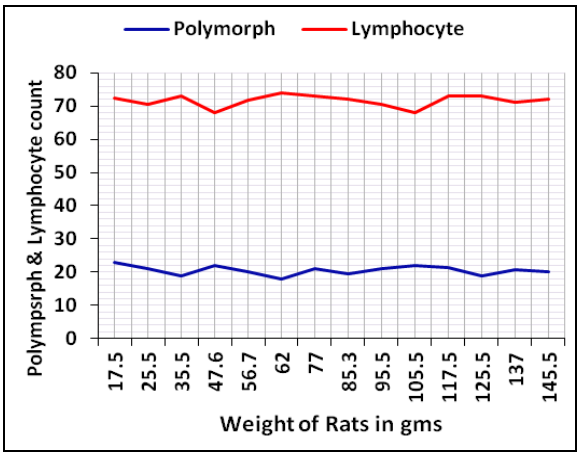

Fig. 4. Showing wt. of Rats against Polymorph & Lymphocyte count.

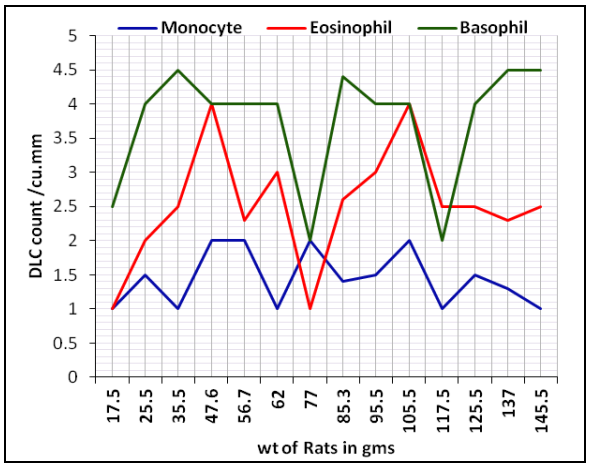

Fig. 5 : Showing wt. of Rats against DLC/Cu.mm.

In the rat, *Rattus rattus* narbadae, Lot 8 contains 16,426/cu.m.m. W.B.C. The polymorph count of the mature group shows increase in number from 18% to 21.5% whereas the Lymphocyte count decreases from 74% (Lot 6) to 73% (Lot 11). The monocyte, Eosinophil and Basophil increases in the mature group.

The haemoglobin percentages of the mature group of rat, increases from 11.00 gms/100 ml. of blood (Lot 6) to 12.2 gms/100 ml. (Lot 11).

4. Haematological changes of post mature group of rats

The R.B.C., W.B.C. number decreases from 7 million/cu.m.m. of blood (Lot 12) to 6.8 million/cu.m.m. (Lot 14) and 11,760/cu.m.m. (Lot 12) to 9840/cu.m.m. of blood (Lot 14) respectively. The differential count percentage also shows decreasing trend except polymorph percentage. The different values of R.B.C. and W.B.C. during growth of postnatal rats are plotted in Fig. 2 & Fig.3 respectively. As the animals grow in size and weight the R.B.C. count increases up to the lot then there is a decline.

The highest peak recorded to Lot 6. But the W.B.C. values show decreasing trend up to Lot 5, with maximum peak at (Lot 8) with 16.526 cu.mm. W.B.C. Percentage of polymorph and lymphocyte in the blood of in the different group of rat, *Rattus rattus* narbadae are plotted fig. 4. Over all the Lymphocyte percentage in different group is the same with little variations.

The percentage of monocyte, Eosinophil and Basophil against the total body weight in different group of postnatal rats are plotted on graph fig. 5. As the animal grow in size and weight, the percentages of Monocyte, Eosinophil and Basophil increases and then there is no much variations. In mature group, the percentage of Basophil and Eosinophil decreases.

Relative weight of spleen increases from 2.71 mg/gms (Lot 1) to 3.65 mg/gms body weight (Lot 5) and then there is a decreasing trend up to the lot 14 of postnatal rat, *Rattus rattus* narbadae.

The erythrocyte count in young individual of Terrapene Carolins, Coluber constrictor, and Heterodon contortrix (Baker and Kline 1937) as well as Vipera aspis (Duguy, 1963) and Natrix Manra (Duguy, 1967) are some times lower than those of the adults at the same date.

Although the inference of age cannot be demonstrated conclusively, the much higher % of basophils in very young Vipers aspis (Duguy 1963) and Natrix manura (Duguy 1967) than in adults at the same date and the larger number of Lymphocytes in the young of cordylus vittifer (Pienear, 1962) suggest an influences of this factor.

Fluid secretion by the testis of rat and rams of various ages has been studied by efferent duct ligution. The testes of prepuberal animals do not increase in weight or water content after efferent duct ligation; but at the age of about 30 days in rats and 5 months in ram lambs, fluid secretion begins, and this occurs before the first spermatozoa are shed (Setchell, 1968; 1970). At this time the microvasculature of the testis is taking its adult from (Kormano, 1967a, 1967d) the sertoli cells (Flickinger, 1967) and the peritubular limiting membrane have attained their adult form (C.R. Leeson and Leeson 1963), the tubules are becoming impermeable to acriflavine and other substances (Kormano, 1967a, 1967b; 1967c; 1967d) the rectum testis temperature differences reaches its maximal value (Kormano 1967d) and the injection of F.S.H. no longer stimulates the in vitro incorporation of amino acids into protein but glucose begins to do so (Means and Hall 1968).

The rate of erythrocyte regeneration is markedly decreased after castration in the albino rat. Administration of Testosterone propionate to operated animals tends to restore this rate to normal.

Testosterone is capable of causing increases in the number of R.B.C. in the fowl (Taber *et al.,* 1943) and the castrated golden hamster. With respect to Hb regeneration, a rather complex set of responses were obtained. That is the male sex hormone tends to inhibit Hb regeneration in the bled normal male and castrated female, acceleration of Hb regeneration was observed in bled hypophysectomized male, normal female and castrated male rats.

Recently Purohit *et al.* (1978) demonstrated that alteration in Hb, R.B.C. total body lipid and water content in Funambulus pennati and Suncus murinus during breeding and non breeding season are within physio-logical limits and are according to needs, i.e. decreases in the Hb, in blood denotes obligatory transfer of iron from pregnant females to their developing embryos and the increases in lipids are

potential source of extra energy needed during pregnancy. However, Marshall (1952) states "alteration of fat metabolism of the blood during pregnancy is due to a decrease of erythrocytes plasma interface".

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