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On Counting Mitotically Dividing Cells in the Blood of the Cockroach, Periplaneta orientalis (Linn.)*

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Although cell divisions in insect blood have been described by Hollande[1] and others, few quantitative counts apparently have been reported. This is a preliminary report of blood cell counts in *P. orientalis,* especially mitotically dividing cell (M.D.C.) counts. Large nymphs were used.

Method. Antennal blood is taken into a pipette, made to handle 1.22 mm.^{3} blood, and rapidly diluted; a total count is obtained with a hemocytometer. A small drop of the antennal blood is placed also in a larger drop of diluting fluid on a slide, immediately stirred to prevent cell coagulation, covered with a coverslip, and rimmed with oil to prevent evaporation. The cells are randomly counted (oil immersion) and the % M.D.C. determined. The diluting fluid consists of 0.081 M NaCl, 0.002 M KCl, 0.001 M $CaCl_2$, 0.005% Gentian Violet, 0.125% glacial acetic acid.

Results. Some of the counts obtained are in Table I. Groups I and II include normal animals. In Group I only anaphases and telophases, while in Group II prophases, metaphases, anaphases, and telophases were counted. Each animal was bled only once, to make the count. Group III contains 3 series of 3 animals each: 1 control, bled once for the count, and 2 experimental animals bled extensively at previous times; for example, No. A-2 was bled at 4 and again at 2 days before the count. Group IV includes 1 control, bled once for each count, and 1 experimental animal, also bled extensively after each count. This experiment lasted 14 days.

Discussion and Conclusions. The average total cell count of Groups I and II is 31,672 cells/mm.^{3} blood, or about the same as the count for *P. fuliginosa* obtained previously.[2] The average % M.D.C. is 0.07 in Group I and 0.51 in Group II. Assuming this difference to be due (1) to the counting of all phases in Group II and only anaphases and telophases in Group I and (2) to a longer

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[1] Hollande, A.-Ch., *Arch. Zool. exp. et gen.* (5 ser.), 1909, **2**, 271.

[2] Yeager, J. F., and Tauber, O. E., *Ann. Ent. Soc. Amer.*, 1932, **25**, 315.

TABLE I.

Cell Counts of Roach, *P. orientalis.*

Group	Animal No.	Duration of Exp. (days)	Total bl. cell count	M. D. C. per mm.³	% M. D. C.	Condition
I	117C		14,400	29	0.20	Only A- and T-phases counted
	120C		47,186	22	0.05	" " " " "
	124C		57,600	9	0.02	" " " " "
	149C		24,894	51	0.21	" " " " "
	A-1		26,250	17	0.06	" " " " "
	B-1		40,310	11	0.03	" " " " "
	C-1		25,000	8	0.03	" " " " "
	D-1		26,450	6	0.02	" " " " "
	F-1		33,810	22	0.07	" " " " "
	H-1		55,280	11	0.02	" " " " "
		Ave.	35,118	18.5	0.071	
II	145		22,000	220	1.00	P-, M-, A- and T-phases counted
	146		30,250	88	0.29	" " " " "
	147		34,200	106	0.31	" " " " "
	148		26,450	119	0.45	" " " " "
		Ave.	28,225	133	0.51	
Tot. Ave.			31,672			0.51 ÷ 0.071 = 7.2
III	A-1		26,250	16.5	0.06	Control
	A-2		25,988	13.9	0.05	Bled 4, 2
	A-3		23,860	11.1	0.05	Bled 4, 2
	C-1		25,000	7.4	0.03	Control
	C-2		34,840	5.5	0.02	Bled 7, 5
	C-3		34,725	13.9	0.04	Bled 7, 5
	H-1		55,280	22.2	0.04	Control
	H-2		33,100	9.2	0.03	Bled 17, 15
	H-3		26,420	11.1	0.04	Bled 17, 15
IV	145	0	22,000	220.0	1.00	Normal
	"	1	10,650	69.2	0.65	1st bleeding on day 0
	"	3	9,225	35.1	0.38	2nd bleeding on day 1
	"	5	10,600	127.2	1.20	3rd bleeding on day 3
	"	7	8,995	139.4	1.55	4th bleeding on day 5
	"	10	6,605	49.5	0.75	5th bleeding on day 7
	"	12	10,150	154.0	1.52	6th bleeding on day 10
	"	14	(57,200)	(1790.4)	(3.13)	7th bleeding on day 12
	146	0	30,250	87.7	0.29	Normal
	"	1	28,450	335.7	1.18	Control
	"	3	26,090	60.0	0.23	"
	"	5	32,650	32.6	1.00	"
	"	7	36,550	175.4	0.48	"
	"	10	36,250	108.8	0.30	"
	"	12	44,300	168.3	0.38	"
	"	14	38,050	235.9	0.62	"

time duration of pro- plus meta- as compared to ana- plus telophase, then the observed difference would indicate that the average

mitotically dividing cell remains in all mitotic phases about 7 times as long as in the last 2 phases.

Group III indicates that 1 or 2 previous hemorrhages may have no great effect on the % M.D.C. Group IV shows that when an animal is subjected to extensive (No. 145) or moderate (No. 146) recurring hemorrhages no great change occurs in the % M.D.C., except possibly at the end, when the animal becomes less active; and the total count decreases. On the 14th day, No. 145 was feebly active and hard to bleed, necessitating the use of blood from the leg; this may in part account for the high values then obtained. The facts that No. 145 bled freely on all days except the 14th and that its total count decreased indicate that each hemorrhage but the last was followed by a readjustment involving (1) a replacement of lost plasma by fluid and (2) a failure to replace all of the lost blood cells. No. 146, suffering slighter hemorrhages, seemed able to replace lost cells and fluid, maintaining its total count and always bleeding freely.

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Some Effects of X-Ray Irradiation on Respiration and Development.*

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In much of the previous work on the biological effects of X-rays morphological criteria alone have been used. It is, therefore, impossible to tell whether certain end-points are reached in similar or far different manner. This report states briefly the findings of a study of the effects of different intensities of irradiation on the oxygen consumption and development of the larva of the Mud-dauber Wasp *Sceliphron caementarium.*

The method used to separate latent-developing (diapause) larvæ from the developing organisms has been described.[1] Correlations between the morphological stages in development and the respiratory curve are also pointed out.

Four distinct morphological and physiological stages are distin-

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[1] *Biol. Bull.*, 1932, **63**, 235.