EFFECT OF ACTINOMYCIN D ON CHIASMA FREQUENCY IN *CHRYSOCORIS PURPUREUS* (WESTW.) PENTATOMIDAE-HETEROPTERA

It has been shown that actinomycin D (AD) binds to DNA and inhibits the synthesis of RNA[1]. The drug is capable of inducing mitotic inhibition and structural changes in chinese hamster metaphase chromosomes *in vitro*[2]. Further the effect of AD on chiasma frequency has already been described in *Vicia faba* and *Schistocerca gregaria*[3,4]. The chromosomes of most eukaryotes have a localized kinetochore which presents as a primary constriction by light microscopy. The pentatomid bug *Chrysocaris purpureus* represents holokinetic nature of chromosomes. The relationship between kinetochore structure and resistance to radiations has been reported[5,6]. The present study has been undertaken to provide information on chiasma frequency of *C. purpureus*.

Adult males were each injected abdominally with either 0·01 ml. of aqueous actinomycin D (10 μg/ml.) or with 0·01 ml. of distilled water. The insects were released on *Croton sparsiflorus* in cages. Control and treated insects were removed at random after specified intervals. The testes were dissected out in insect saline and fixed in Acetic alcohol (1 : 3) and processed as haematoxylin squashes.

The large number of meiotic cells are active in synthesising nucleic acids and proteins during gametogenesis. This is essential for the formation of chiasma preferentially between chromosomes that were structurally identical. A perusal of Table I would show the increase of chiasma

TABLE I

*Mean Chiasma frequencies for the Different Hours of Treatment (AD)**

Hours of treatment	Treated	Control
6	6·60±0·84	6·22±0·78
12	7·20±0·92	6·10±0·86
24	7·40±0·78	6·24±0·88
48	7·24±0·80	6·20±0·89
Total Mean	7·11±0·83	6·19±0·85

* Based on 25 diplotene—diakinesis.

frequency as compared with that in control. The observed increase in the frequency of chiasma in holokinetic chromosomes of *C. purpureus* is comparable with *S. gregaria*. Chromosomes with holokinetic and localized kinetochore exibit identical response with AD. It is clear from these studies that the biochemical interactions of AD with chromosomes are similar in both cases. The probable action and mechanism of the drug has been reported earlier with special reference to chiasma frequency[1]. Probably AD might play a role in activating kinetochores and chromosomes in favour of chiasma formation.

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Department of Zoology, Post-Graduate Centre, Vidyaranypuri 506'009, Warangal (A.P.), *August* 4, 1976.

P. VENKAT REDDY.
C. JANAIAH.
N. CHARI.

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DIETARY INFLUENCE ON RESPIRATION IN SOME CALLIPHORID AND SARCOPHAGID FLIES (DIPTERA, INSECTA)

Though the importance of protein injestion has been studied in depth[1], very few studies have been conducted to probe the physiological reasoning of injestion of sugar content[2]. Ecologically, this is most important as the major carbohydrate material available to flies in the field is nectar and honey[3]. The present note deals with the comparative effect of sugar deficient diet on oxygen consumption in males and females of *Lucilia cuprina* Weidemann, *Chrysomia megacephala* Fabricius, *Chrysomia rufifacies* Macquart and *Sarcophaga ruficornis* Fabricius.

Flies were provided with a balanced diet of meat pieces, granulated glucose and water in the normal rearing set-up. In experiments lacking sugar, the diet consisted of meat pieces and water. Flies were starved for six hours prior to experimentation. Mild etherisation was used in handling the flies. Wet weight determinations were made prior to measurements of respiratory rates. Individual flies were introduced in manometric flasks for measurement of respiratory rates. Determinations of O_2 consumption were made at the same time each day at 27°C with Warburgh respirometer. Flies (1, 4, and 7 day old) were selected to cover all the major developmental features of the reproductive cycle in blow flies[4].

TABLE I

Oxygen consumption at 27°C

Species	Sex	Mean of $\mu l \cdot O_2$ uptake/mg/hr in male and female blowflies provided with sugar (A), sugar lacking diet (B), corresponding differerce (C) and percentage decrease (D).*											
		1 day old				4 days old				7 days old			
		A	B	C	D	A	B	C	D	A	B	C	D
L. cuprina	♂	2·27	1·79	0·48	21·00	2·43	1·88	0·55	22·70	2·69	2·10	0·59	22·00
	♀	2·56	2·48	0·08	3·20	3·78	3·67	0·11	2·90	5·32	5·17	0·15	2·80
C. megacephala	♂	1·76	1·28	0·48	27·10	1·80	1·30	0·50	28·00	2·16	1·57	0·59	27·30
	♀	1·91	1·82	0·08	4·60	3·15	3·01	0·14	4·50	4·92	4·73	0·19	4·00
C. rufifacies	♂	1·44	0·99	0·42	30·00	1·53	1·07	0·46	30·30	1·84	1·26	0·58	31·70
	♀	1·59	1·51	0·08	5·20	2·72	2·57	0·15	5·50	4·64	4·38	0·26	5·60
S. ruficornis	♂	1·12	0·68	0·44	39·20	1·26	0·75	0·51	40·80	1·56	0·97	0·59	38·00
	♀	1·43	1·32	0·11	7·80	2·38	2·21	0·17	7·40	4·12	3·86	0·26	6·30

* Average for three determinations at each time stage.

Table I gives the mean percentage decrease in O_2 uptake of male and female blowflies provided with sugar deficient diet. The fall in the male species is very significant compared to the decrease in O_2 uptake of the females.

A great variation in oxygen consumption of adult flies of the above species is known to exist[4]. It was also noted that females in general utilise more oxygen than males on μl/mg basis. Metabolic rate per unit weight in different species was found to be in the order of *L. cuprina* > *C. megacephala* > *C. rufifacies* > *S. ruficornis*. Complete reversal of this order as a response to sugar deficient diet, expressed in terms of μl O_2 consumed/mg/hr is a noteworthy feature of the present studies. Fall in oxygen uptake per unit weight in different species was found to be in the order of *S. ruficornis* > *C. rufifacies* > *C. megacephala* > *L. cuprina*.

The reasons for such a physiological expression perhaps lie with the eco-physiological demands imposed on these blowflies. Proteinaceous matter is known to accelerate the reproductive development and egg laying in blowfly females. Thus, in females, the protein hunger is directly associated to the function of species survival. As yet, no physiological explanation has been offered for the uptake of proteins by male blowflies[2]. The primary role of the males is to inseminate the virgin females for which it does not seem to depend on protein diet.

The reported "protein hunger" and the associated higher metabolic rate in the absence of protein diet is more in females, but surprisingly, much less in males of Calliphoridae[1,5]. The sudden fall in O_2 uptake of males in the absence of any sugar supply reveals the necessity of a carbohydrate substrate for males. This further indicates the presence of different dietary demands of males and females and confirms the drive component theory suggested by Calabrese and Stoffolano[1]. In addition, the pattern of respiration emerged as a response to sugar deficient diet helps in understanding the inherent properties of resistance of blowflies to inimical conditions. Parameters, *viz.*, body size, body weight, growth rate, total and tissue water content have satisfactorily explained the $\mu l/O_2$ uptake/mg/hr in selected Calliphorioae[4]. Perhaps the same parameters could be employed to explain the resulting order of resistance, *viz.*, *L. cuprina* > *C. megacephala* > *C. rufifacies* > *S. ruficornis*. The validity of these results in terms of survival fitness of species will be discussed elsewhere.

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Department of Zoology, VIJAY KHOLE,
University of Poona, Poona 411 007, India,
September 21, 1976.

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