portant result with respect to radiobiology of early cleavage stages is the demonstration that differences in oxygen concentration within the cell nucleus during the progression through the cell cycle do not contribute to the variation of radiosensitivity.

On the other hand, these tests do not exclude the possibility that the oxygen concentration within the nucleus changes during the cell cycle. Figure 2 shows the dependence of the X-ray-induced rate of lethality on the external oxygen concentration as demonstrated by FINSINGER[9] for zygotes. As is indicated by the arrows, small respiration-dependent changes in the oxygen concentration within the cell nucleus cannot influence the radiosensitivity to a measurable extent[11].

Zusammenfassung. *Drosophila*-Embryonen zeigen eine mit dem Ablauf der Furchungsteilungen korrelierte Variation der Strahlenempfindlichkeit. Für alle Mitosestadien wurde eine Sauerstoff-Erhöhungsrate von rund 2 festgestellt. Dies zeigt, dass eine vermutete atmungsbedingte Variation des Sauerstoffgehaltes in den Zellen nicht am Zustandekommen der Empfindlichkeitsvariation beteiligt ist.

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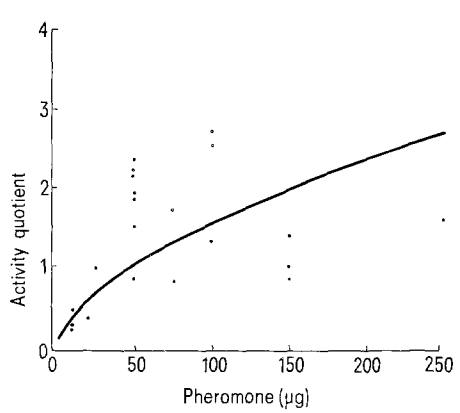
Attraction of the Male House Fly to Cuticular Hydrocarbons and Feces of Several other Dipteran Species

The male house fly, *Musca domestica* L., responds to a pheromone[1] which was found in hydrocarbons of the cuticle and feces of sexually mature females[2,3]. This pheromone was isolated and chemically identified as *cis*-9-tricosene[4]. In an earlier study, it was shown that male house flies also were attracted to the feces of the stable fly, *Stomoxys calcitrans* (L.)[5]. This suggested that cross attraction might occur among various species in the family Muscidae. Cross attraction has been demonstrated conclusively in the order Lepidoptera where several species and families utilize the same pheromone[6-9]. Generally, where several sympatric species use the same sex pheromone, the presence of additional pheromones may be postulated to explain reproductive isolation and to reduce meaningless communicative signals.

The behavior of Muscid flies in a bioassay system makes it difficult to measure responses to pheromone. Further studies on other species of flies will require investigating their behavioral patterns before implementing methods for pheromone assays. Because our house fly assay system provides reliable data, it was considered important to conduct preliminary tests on the attractiveness of cuticular hydrocarbons and feces from other Dipteran species in the male house fly bioassay system even though in-depth studies are not planned at this time. This communication reports results of these preliminary tests which may be useful to others currently conducting Dipteran pheromone studies.

The bioassay techniques and olfactometer design have been described in detail elsewhere[2,3,10]. For these tests, 300 newly emerged male house flies were placed in each of 4 olfactometers maintained at 28 °C, 60% R.H., and were held until they were 2 or 3 days old before bioassaying. The cuticular lipids were obtained as previously described and the hydrocarbons were isolated by hexane elution from silicic acid[3]. Aliquots of the eluate were concentrated in a rotary evaporator and the concentrate was applied to filter paper for bioassay. Fecal samples were collected on paper towels or filter paper and tested without further purification. Each test material was bioassayed as previously described using Edamin (hydrolized milk protein) as an internal standard and 60 mg of crude fecal lipid as an external standard. Activity quotients[2] were used as indices of attractiveness. The activity quotient as a measure of sensory response is demonstrated in the Figure for the natural house fly pheromone, *cis*-9-tricosene. These data confirm the proper function[11] of this type of olfactometer



Relationship of quantity of *cis*-9-tricosene to attraction (expressed as A.Q.) of the male house fly (power curve $Y = aX^b$; $a = 0.10$, $b = 0.59$; $r = 0.69$; $p < 0.01$ at d. f. = 20).

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Cross attraction of the male housefly to cuticular hydrocarbons and feces collected from various species of Diptera

Species	Type of material tested - Feces	Cuticular hydrocarbons	Quantity tested (mg)	No. of tests	Percentage attraction to Test material	Edamin	A.Q.[a]
Musca domestica L.	+		60	111	17.3	6.8	–
		+	5×10^{-3}	6	18.4	7.3	+1.2
		+	5×10^{-2}	6	15.5	5.9	+1.1
Haematobia irritans (L.)		+	0.6	6	15.2	7.3	+1.1
		+	5.7	6	25.3	6.7	+2.1
Musca autumnalis De Geer	+		[b]	6	24.4	9.8	+0.9
		+	0.6	6	14.6	11.4	+0.2
		+	6.3	12	18.3	7.4	+1.7
		+	12.6	6	15.8	7.6	+0.5
Stomoxys calcitrans (L.)		+	0.2	6	5.6	4.7	+0.1
		+	1.5	4	5.4	6.3	−0.1
Glossina morsitans Westwood	+			15	7.8	8.9	−0.1
		+	0.4	12	12.5	12.4	+0.02
Glossina austeni Newstead	+			15	9.4	9.9	−0.04
		[c]	[c]	5	7.5	12.0	−0.3
Fannia canicularis (L.)		+	1.3	6	12.8	13.5	−0.1
		+	3.8	6	15.6	15.9	−0.03
Cochliomyia hominovorax (Coquerel)	+[d]		65.1	11	11.3	7.2	+0.9
		+	0.5	6	6.8	10.8	−0.3
		+	5.0	6	2.3	6.8	−0.4
		+	10.0	6	10.8	17.6	−0.6

[a] Activity quotient = $\frac{\text{Percentage attraction to test material} - \text{Percentage attraction to Edamin}}{\text{Percentage attraction to external standard} - \text{Percentage attraction to Edamin}}$. [b] Large unknown amount on paper.
[c] Cuticular rinse of 43 females. [d] Diethyl ether extract of feces.

since the data points are curvilinear, fitting either a power or logarithmic curve as has been shown for most sensory measurements[12].

The attraction data are presented in the Table. Male house flies were attracted to cuticular hydrocarbons from *Haematobia irritans* (L.) and *Musca autumnalis* De Geer. It is likely that *cis*-9-tricosene or a closely related isomer is produced by these two species.

Surprisingly, the cuticular hydrocarbons from *S. calcitrans* were not attractive to the male house fly although their feces were moderately attractive. This agrees with earlier tests[5] in which large amounts of feces were required to give a significant response. Preliminary tests using male *S. calcitrans* as responders in the bioassay gave a positive response to stable fly feces, but not to *cis*- or *trans*-9-tricosene. The results suggest that *S. calcitrans* respond to an attractant which differs from the *cis*-9-tricosene produced by house flies and the house fly attraction to stable fly feces is possibly a gustatory response.

Cuticular extracts and feces from the tsetse flies, *Glossina morsitans* Westwood and *Glossina austeni* Newstead, were inactive in the male house fly assay. However, we had extracts from only a very small number of tsetse flies, and we do not consider these tests conclusive. The cuticular hydrocarbons of *Fannia canicularis* (L.) were inactive; however, the procedure for obtaining cuticular lipids was altered slightly for these extracts. The females for this sample were placed in a glass column and a small amount of solvent was poured over them, possibly resulting in an incomplete stripping of the lipids from the cuticle. The cuticular hydrocarbons of *Cochliomyia hominovorax* (Coquerel) (which is not in family Muscidae) were inactive to the male house fly, while a crude ether extract of their feces induced highly variable results.

The strong attraction of male house flies to the cuticular hydrocarbons of *H. irritans* and *M. autumnalis* permits speculation that these 3 Muscid species may be attracted to one or more closely related chemicals having a structure similar to the house fly sex attractant. However, this idea cannot be tested until reliable assays, using *H. irritans* and *M. autumnalis* as responders, are developed.

Zusammenfassung. Männchen von *Musca domestica* werden von Kohlenwasserstoffextrakten aus der Cuticula weiblicher *Musca domestica, M. autumnalis* und *Haematobia irritans* angelockt (gleiche oder ähnliche Pheromone), nicht aber von entsprechenden Extrakten aus *Stomoxys calcitrans, Glossina morsitans, G. austeni, Fannia canicularis* und *Cochliomyia hominivorax.*

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