Strain dependent effect of developmental lead exposure on mating latency in *Drosophila melanogaster*.

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Lead pollution remains a serious public health problem because of continued use in commercial products, release into the environment from industrial sources, and residual background levels from past use (*cf*., Sanders *et al*., 2009). Although it is certain that lead exposure is a public health hazard, we do not understand the mechanisms mediating its harmful biological effects. *Drosophila* can provide a useful model system for investigating these mechanisms (*cf*., Hirsch *et al*., 2012). Hirsch *et al*. (2003), for example, demonstrated that developmental exposure to lead acts in a dose-dependent manner on a number of *Drosophila* traits associated with reproduction, where low levels increase fecundity and female receptivity to mating but higher levels decrease these behaviors. Here we examined effects of developmental exposure to low levels of lead on latency to copulation in two isogenic strains to determine whether there is evidence of genetic variation altering the response to lead treatment for this trait.

Flies from two isogenic strains numbered 60 and 63 that were derived from the "Dover" wild-type strain (*cf*., Possidente, 1999) were raised from eggs oviposited onto Carolina Instant *Drosophila* Medium made with either distilled water (control), 2 ppm lead acetate, or 20 ppm lead acetate. Flies were raised at 25°C in a 12:12 LD photoperiod, collected within five hours of eclosion, and anesthetized with cold for sexing. They were subsequently placed into new vials with fresh medium: in all cases, the lead concentration matched that present before eclosion. Virgin females were housed in groups of three to five while virgin males were housed individually. At four days of age the flies were transferred to fresh control medium for 24 hours and then tested on day five. The vials were coded so that the tester was blind to each mated pair's treatment history. Copulation latency was tested at 25°C by adding a single virgin male and female from the same treatment group to a fresh vial of control medium and timing the interval to copulation. Flies were tested in successive blocks of six pairs representing one pair from each treatment group (two strains by three lead levels). Some blocks contained less than six pairs depending on available sample sizes for each treatment. Pairs that failed to mate within 30 minutes (approximately 25%) were not included in the analysis. Mating success was not affected significantly by lead treatment ($p > 0.05$, non-parametric crosstabs procedure). Table 1 shows the mean copulation latency for each genotype in each treatment group.

Table 1. Effects of PbAc on mean copulation latency (seconds) ± SEM (n pairs).

Treatment	Strain 60	Strain 63
Control 0 ppm	905 ± 128 (7)	998 ± 119 (6)
Lead at 2 ppm	769 ± 82 (13)	1187 ± 104 (6)
Lead at 20 ppm	757 ± 121 (12)	1228 ± 160 (6)

Analysis of variance was used to test main effects of strain, PbAc treatment, and their interaction. There was no significant main effect of lead. There was a significant main effect of strain ($p < 0.03$) with flies from strain 60 mating faster than flies from strain 63. There was a significant interaction between lead and genotype treatments ($p < 0.03$) as lead treatment increased mating speed in strain 60 and decreased it in strain 63. These results are consistent with lead acting in a genotype-dependent manner on behavior in *Drosophila*. This illustrates why averaging results of lead exposure across a diverse population may obscure variations resulting, for example, from genotype-dependent differences in susceptibility to lead or other toxicants. Our results for mating latency are consistent with those of Hirsch *et al*. (2009) who examined effects of developmental lead exposure (15 ppm) on locomotor behavior in 75 recombinant inbred lines of D. *melanogaster*. While they found no overall effect of lead they did observe a significant strain by treatment interaction.

Our results are consistent with Hoffmann and Parsons' (1991) proposal that environmental stress may increase additive genetic variance. Ruden *et al*. (2003) proposed a molecular mechanism that may mediate such responses to stress and showed that developmental effects of lead exposure (15 ppm) in the same recombinant inbred strains assayed by Hirsch *et al*. (2009) significantly alters transcription at approximately 2,500 loci out of about 19,000 assayed (Ruden *et al*., 2009), including the *cacophony* locus that alters courtship song frequency in males (Schilcher, 1976). It is possible, therefore, that genotype-dependent variation in response to lead exposure results from differential effects on gene expression and possibly differences in sets of loci that respond to lead. Finally, our data are also consistent with the possibility that lead is an endocrine disruptor (Hirsch *et al*., 2010).

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Drosophila fauna of Dharwad District with a report of *Drosophila latifshahi* from South India.

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Abstract

Drosophila species were collected from different localities of Dharwad district. It revealed a total of 21 species belonging to different groups which includes a rare species *D. latifshahi*, Gupta and Raychaudri, belonging to *Polychaeta* subgroup, for the first time from South India.

Introduction

The fruit fly, *Drosophila* is considered as a model organism for the studies of ecology, evolution, and population genetics. At present the total number of Drosophilids described all over the world is about 4217, which includes 1178 species belonging to genus *Drosophila*, among which 751 species belong to subgenus *Drosophila* and 335 species belong to subgenus *Sophophora*, whereas the remaining 92 species belong to other subgenera (Bachli, 2014). Some species are cosmopolitan and some are endemic to certain regions.

According to Fartyal and Singh (2001) a total of 283 species of Drosophilids have been reported. Among genus *Drosophila* 140 species were reported in India of which south India has only 50 species (Hegde *et al.*, 2001). Most of the faunal analysis of *Drosophila* was mainly concentrated on the surrounding areas of Mysore in South Karnataka (Reddy and Krishnamurthy, 1974) and Dandeli and Ambikanagar of North Kanara district in northern part of Karnataka (Nagaraj and Krishnamurthy, 1980; Vasudev *et al.*, 2001) and the Western Ghats, which includes Bababudangiri and Kemmannugundi hill ranges (Prakash and Reddy, 1978 1979), Biligirirangana hills (Ranganath and Krishnamurthy, 1972), Charmadi ghat (Gowda and Krishnamurthy, 1972), three different localities of Maharashtra state (Hegde and Krishnamurthy, 1980), Kodagu, Mysore, and Dakshina Kannada (Mangalore) districts (Prakash and Ramachandra, 2008), and so forth. Most of the other localities in South India have remained unexplored. In view of this present study, a survey of *Drosophila* in Dharwad District was carried out.