Supplementary Materials A: Literature overview

Table A.1: Overview of studies that investigated developmental effects of Insects under RF-EMF exposure.

Insect	Frequency (GHz)	Exposure Conditions	Control Conditions	Dosimetry	Exposure or Dose Level	Summary of Results	Reference
Mealworm Beetle *(Tenebrio molitor)*	4-6	Horn Antenna and reflector	Sham control. and Control with other heating method.	Geometric Model	1.8 -5000 W/kg (5 min- 6 h)	Increases in mortality and deformities for RF EMF exposed groups. Temperature increase up to 15° was measured. Alternative heating method produces lower mortalities and deformities at similar temperature difference.	(Olsen 1977)
Mealworm Beetle *(Tenebrio molitor)*	6	Horn Antenna and reflector	Unclear	Geometric Model	13-208 W/kg (1.5-13 h)	High whole-body SAR (208 W/kg) and short exposure increases deformities and mortality, while the lower SAR (13 W/kg) and longer exposure time (same dose) has no effect. They find a polarization effect. Temperature increase is measured.	(Olsen 1982)
Mealworm Beetle *(Tenebrio molitor)*	6	Horn Antenna with(out) reflector	Unclear	Geometric Model	54-130 W/kg (2-13 h)	Effects on number of mortalities and deformities in some exposure cases, attributed to polarization effect.	(Pickard and Olsen 1979)
Mealworm Beetle *(Tenebrio molitor)*	10	Waveguide	3 control groups: unexposed controls, sham-exposed controls, and temperature controls.	No	20-80 mW input power for 20, 30 or 120 min	RF-EMF exposed pupae showed decreased survival and increased teratogenesis compared to controls. There were temperature increases in the pupae under RF exposure. Alternative heating method increased teratogenesis, but not mortality. Therefore, in the authors' opinion the effects were non-thermal. However, they did not provide any dosimetric evidence to support this.	(Carpenter and Livstone 1971)
Mealworm Beetle *(Tenebrio molitor)*	9	Waveguide	3 control groups: unexposed controls, sham-exposed controls, and temperature controls	No	8.6-17 mW/cm² for 2-4 h	RF-EMF exposed groups showed decreased survival and increased teratogenesis compared to controls. No dose-related effect. 1.5°C temperature increase during exposure.	(Lindauer et al. 1974)
Mealworm Beetle *(Tenebrio molitor)*	9	Waveguide	Sham control	No	0.05 -20 mW input power for 2 h	Authors find a dose-related effect on survival, teratogenesis, and **duration of pupal phase (increase).**	(Liu, Rosenbaum, and Pickard 1975)
Mealworm Beetle *(Tenebrio molitor)*	9	Waveguide	Sham control	Geometric Model	25 -800 mW/g for t < 90 min	Abnormalities are found in adult insects after RF-EMF exposure at what were presumably non-thermal exposure levels. Relative humidity of the environment also plays a role..	(Green, Rosenbaum, and Pickard 1979)
Mealworm Beetle *(Tenebrio molitor)*	10	Horn Antenna	Unclear	No	50 W/m² for 4 h	inconclusive	(Pickard and Olsen 1979)

Fruit Fly *(Drosophila melanogaster)*	17 and 73	Horn antenna	Unexposed control	No	100 mW/cm² (73 GHz) 60 mW/cm² (17 GHz) for 2-3 h	Increases in mortality of RF-EMF exposed eggs and number of emerging adults (17 GHz). No consistent effects when exposure occurs in larval and pupal stages (17 GHz). Change in emergence of adults, but no teratological changes in adults (73 GHz).	(Dardalhon, Berteaud, and Averbeck 1979)
Fruit Fly *(Drosophila melanogaster)*	10	Horn Antenna	Unexposed control	No	0.0156 W/m² for 3-6 h	**Dose-related effect on pupation time (increase with increasing exposure**). No effect on transition percentages between life stages.	(Atli and Ünlü 2006)
Fruit Fly *(Drosophila melanogaster)*	2.4	waveguide	Unexposed control	No	15-25 W/cm² for 5-60 min/day during 1-5 days.	Increasing duration of RF-EMF exposure decreased the survival rate. Highest power level also causes an additional mortality.	(Marec, Ondráček, and Brunnhofer 1985)
Fruit Fly *(Drosophila melanogaster)*	0.8	Patented exposure device (cavity)	Unexposed control	Not specific for flies	1.6 – 4 W/kg during t < 36 h	The group exposed to the highest level of RF-EMFs has reduced viability after 18 h of exposure. The lowest exposure group after 36 h of exposure.	(Lee et al. 2008)
Western Honey Bee *(Apis mellifera)*	0.9	Mobile phone	Sham.	No	0.9-3.8 V/m for 30 min/day during 2 weeks	Decrease in hatching and educed chances of queen survival in exposed groups.	(Odemer and Odemer 2019)
Blue Bottle Fly (*Calliphora vomitoria*)	5.4	TEM Cell	Unexposed Control and Sham Control	FDTD using micro-CT models	0.03 & 0.23 W/kg during 48 h	No effect on (evolutions of) masses, lengths and diameters during pupal development. Lower Exposure level reduced the total rate of pupal emergence, while the higher level did not alter the total rate of pupal emergence. The sham exposure and lowest RF-EMF exposure caused a median delay in pupal emergence, while the higher exposure caused a relative acceleration in emergence.	This Study