**TABLE: *Drosophila* Models for TBI-related Research**

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| --- | --- | --- | --- | --- | --- |
| Model | Head-specific injury | Throughput potential | CO2 use for injury induction | Experimental design | Main findings |
| High-Impact Trauma (HIT) device 1,2 | no | High | no | * Used multiple age groups to characterize acute mortality, long-term survival and climbing deficits, as well as neuropathological evaluation of vacuoles to assess neurodegeneration * Used both male and female flies * Delivered repetitive injuries with lethal potential | * Single and repetitive injuries elicit acute mortality within 24h (~5% mortality following single exposure and ~20% following 4 repetitive exposures) * Acute activation of innate immune response seen following injury * Injury exacerbated age-related neurodegeneration seen 14d post-injury * performed high-throughput genetic screen to compare mortality outcomes in mutant lines for innate immunity |
| Tissue Homogenizer model 3 | no | Low | yes | * 7d old male or female flies received multiple injuries; different sexes were used for different assays and not used for comparative analyses | * Flies receiving multiple sublethal injuries showed increases in innate immunity and autophagy within 24h until 1 week following injury * Injured flies also exhibited acute climbing deficits, long-term circadian rhythm abnormalities and decreased overall survival |
| CO2 powered impactor model 4 | yes | Low | yes | * 2d old female flies received 1 or more head injuries from 4 different severities, including acutely sublethal (100% survival within 24h) to highly lethal (<10% survival) | * Following a single sublethal injury, flies exhibited a decreased locomotive response for 2d post-injury * Following repetitive sublethal injuries, flies exhibited a persistent locomotive deficient through at least 20d post injury and a decreased overall survival |
| *Drosophila* Closed Head Injury (dCHI) 5 | No | Low | No | * 3-7d old male flies received either 1, 5, or 10 injuries inflicted by the pin of a pull-type solenoid * Behavioral, pathological, and transcriptional analyses up to 7 days post injury. | * Injured flies exhibit immediate dose-dependent motor deficits, apoptotic cell death, fragmentation of sleep and reduction of lifespan. * Acute activation of the innate immune system (increase of AMPs up to 3d post injury) but returns to baseline by 7d. |
| *Drosophila* TBI (dTBI) or piezo-electric actuator model 6-8 | yes | High | yes | * 3d old males received a single injury of one of three injury severities * Behavioral and histological analysis was chronologically performed through 10d post-injury following severe injuries * Transcriptional changes measured until 28d post-injury | * Dose dependent deficits in locomotion, reduced acute and chronic survival and vacuole formation following severe injury * Recapitulated glial cellular reactivity following trauma * Measured transcriptional changes following injury, including glial AP1 which has a biphasic role in tau pathology following injury |
| HIFLI model 9 | yes | High-throughput | no | * 2-5d old male and female flies received multiple mild head injuries and were assessed for behavioral and histological examination throughout lifespan | * Female flies demonstrate worse persistent locomotive deficits following repetitive injury * Early injury-induced neuronal activity potentiates chronic neurodegeneration |

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