Using Motor Function and Caspase-3 Activation in Drosophila melanogaster to Determine the Effectiveness of Warfarin, Aspirin, and Methylene Blue in Preventing Induced Ischemic Stroke

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Stroke is the third leading cause of death in the United States, and this prevalent danger to the global population urges researchers to explore potential preventative measures. The three drugs tested in this experiment were Warfarin, Aspirin, and Methylene Blue (MB). MB has previously shown to be helpful in repairing brain damage from traumatic brain injury in Drosophila while Warfarin and Aspirin are common clinical treatments following an initial attack. The hypothesis states that the MB Drosophila groups will exhibit increased mobility, determined by a climbing assay, while Aspirin Drosophila groups will contain lower amounts of active caspase-3, showing heightened neural regeneration. To perform this experiment, an initial generation of Drosophila melanogaster were cultured using drug-infused media. The second-generation then experienced a 2-hour period of anoxia to induce stroke. After four hours, the Drosophila were tested, using a climbing assay. Next, the heads were removed, and an “inverted-ELISA" was performed to determine the amount of active caspase-3. The data were then normalized using the total number of heads. The climbing assay showed that Warfarin had the greatest capability in preserving Drosophila mobility following stroke administration while MB had only slightly lower mobility. The "Inverted-ELISA" showed that MB groups of Drosophila exhibited lower levels of active caspase-3. This experiment confirms Drosophila melanogaster as an invertebrate model for stroke, and it proposes MB as a potential treatment to mitigate the negative effects caused by stroke, to preserve mobility, and to limit post-stroke neurodegeneration through the inhibition of active caspase-3.

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