Rabies Neuroinvasion and Incubation Period in Humans

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This project aims to explore the mechanisms the rabies virus uses to evade the immune system while traveling through the nervous system. We are motivated by the challenge of comprehending how the virus can remain hidden from the body's strong immune response. This investigation could offer new insight into the virus's vulnerabilities and potentially aid in developing new methods to detect and treat the pathogen. Using a computational simulation model, we discovered that the rabies movement from muscle to CNS to measure and predict incubation is proportional to the distance it transports and creates accurate graphs. Also, using the literature data analysis to collect data from published human or animal cases and run statistical tests. Throughout our simulation, we demonstrated that rabies incubation time is determined by the distance from the bite to the CNS and the virus's transport speed. Bites closer to the head have the shortest incubation, while leg bites take the longest. Slower transport increased incubation, and a higher viral dose slightly reduced it, though the dose was less important. Statistical analysis confirmed that distance, speed, and dose significantly affected incubation, explaining about 62% of the variation. These results support the hypothesis that incubation depends primarily on bite location and transport dynamics.

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