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IMPACT OF SIMULATED MICROGRAVITY ON NANOEMULSION STABILITY

Abstract

Purpose This project includes an analysis of nanoemulsions in microgravity simulation. Based on this understanding, we can produce nanoemulsion drugs stable enough to go on the mission to space.

Methods Oil in water nanoemulsions were formulated using 30% oil and 70% water phase. A total of five nanoemulsions: control, carbamazepine, diclofenac sodium, fenofibrate, and melatonin were prepared via sonication method. The average viscosity of the emulsions was around 33.3 cP and the average pH was around 6.27. These nanoemulsions were characterized by particle size distribution, and zeta potential before and after 1, 2, 3, 4, and 7 days in microgravity simulation by using a three dimensional Clinostat.

Results Before microgravity simulation, the control, carbamazepine, diclofenac, fenofibrate, and melatonin had an average particle size of 253.6, 202.3, 909.3, 221.1, and 226.9 nm, respectively. After 7 days in microgravity simulation, the control, carbamazepine, diclofenac, fenofibrate and melatonin nanoemulsions decreased in particle size by 25.5, 4.4, 137.7, 7.9, and 0.6 nm, respectively. The zeta potential of all nanoemulsions were in the range of -64.3 to -67.95 mV.

Conclusion Throughout 7 days in microgravity simulation, all of the nanoemulsions remained stable and decreased in particle size. Future research must be done on the stability of nanoemulsions containing different drugs and evaluating the drug stability using High Performance Liquid Chromatography analytical method. It is also essential to simulate microgravity for a longer period of time in order to truly determine its effect on drug stability.