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Human Physiology in Space (2)

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REPRODUCTION IN SPACE: IS HUMAN SPERM ALTERED BY MICROGRAVITY?

Abstract

We report on the current status of human reproduction research in space, and in particular the likelihood of preserving and transporting human sperm banks outside Earth. Past and present experiments regarding animal models and human gametes exposed to microgravity are reviewed regarding this challenging topic. Our group had reported the first experimental results published while exposing human “frozen” sperm to microgravity in a controlled parabolic flight experiment. A total of 3 parabolic flights were completed during 2018-19 with 20 parabolas conducted in each flight. The parabolic flights allowed for up to 8.5 seconds of microgravity periods, using a CAP10B aerobatic plane operated by Barcelona-Sabadell Aviation Club. The CAP10B aircraft has successfully proven in the last decade to perform optimal parabolas for both education and research purposes. Sperm motility and concentration in frozen sperm samples was assessed by using a Makler counting chamber and SCA CASA System® as a computerized semen analyser and compared to a sibling samples maintained on ground as a control group. Sperm vitality, DNA Fragmentation and Apoptosis were also assessed in both groups. No significant differences were found between the frozen samples exposed to microgravity and those on ground. In 2020-21 our research group conducted 2 parabolic flights with “fresh” human sperm samples. Significant differences were found between fresh samples exposed to microgravity and those of the control group. Motility and vitality were significantly decreased after just a short period of weightlessness of 160 seconds suggesting that such an effect is likely to be stronger with longer exposure. These findings, consistent with the preliminary report from NASA about the Micro-11 experiment at the ISS, should be taken in consideration, since this may eventually affect human sperm fertilizing capacity and therefore natural conception or Assisted Reproduction outside in space. More studies are needed to evaluate the viability of transporting human sperm samples outside Earth, and to continue advancing in the possibility of human reproduction in space.