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EXPLORING RETRONASAL AROMAS AND MOUTHFEEL PERCEPTION IN SIMULATED SPACE ENVIRONMENTS: IMPLICATIONS FOR ENHANCING ASTRONAUT NUTRITION AND PALATABILITY IN LONG-TERM MISSIONS.

Abstract

Although significant efforts have been invested in studying space food to support astronauts, particularly for short to mid-duration missions, ongoing concerns, revolve around ensuring adequate nutrition and addressing challenges such as reduced palatability and menu fatigue, affecting astronauts' appetite, weight loss and bone mass. Therefore, with the newly planned NASA - Artemis program for long-term missions to the Moon and Mars, it has become more important to study the effects of microgravity and the Space environment on humans' perception of basic senses. Researchers have undertaken some studies to evaluate orthonasal aromas and basic taste perceptions; however, investigations into mouthfeel and retronasal aromas have encountered scant attention. Hence, this study aimed to assess retronasal aromas and mouthfeel (trigeminal) perception in two different simulated environments (neutral and immersive Space) and two seating positions (normal and simulated microgravity). For these purposes, two sensory sessions were conducted with 12 trained panellists. The BioSensory© application (The University of Melbourne, Parkville, VIC, Australia) was used to assess participants' non-invasive biometrics (physiological and emotional responses) based on computer vision analysis of videos and to record the self-reported intensity of five retronasal aromas and five mouthfeel samples in the different simulated environments and seating positions. Four principal component analysis (PCA) were conducted for each stimulus for (i) neutral environment using samples in the two seating positions (PCA 1 and 5), (ii) simulated Space environment using samples from the two seating positions (PCA 2 and 6), (iii) normal seating position using samples tested in the two environments (PCA 3 and7), and (iv) simulated microgravity seating position using samples tested in the two environments (PCA 4 and 8). Results from the PCAs showed a separation of the different environments and seating positions in all PCAs for both retronasal aromas and mouthfeel samples. Specifically, overall, retronasal aromas were perceived with lower intensity in both environments with simulated microgravity seating positions (PCA 1 and 2) and in both seating positions in the immersive Space environment (PCA 3 and 4). On the other hand, mouthfeel was perceived with lower intensity in the simulated microgravity seating position in both environments (PCA 8) and the simulated space environment with simulated microgravity position (PCA 6), but higher intensity in the neutral environment with normal seating position (PCA 5). This information will aid in developing plants for space as food sources to offer more palatable foods for astronauts to overcome these differences in perception while in Space.