

Silkworm feeding as the source of the animal protein for human

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Abstract: Controlled Ecological Life-Support System (CELSS), which is also called Bioregenerative Life Support System, has been considered now as the most advanced and complicated Closed Ecological System in the world. Based on the construction principle of the CELSS, the resources could be permanently regenerated, so the flexibility and security for long-term spaceflight and lunar-base missions could be improved. The cost could be also decreased. CELSS is more appropriated for long-term manned spaceflight and applied for the possibility of long-term space missions or planetary probe in the lower cost. The increasing closure and reliability is considered as the development and integrality direction of Life-Support System (LSS). The LSS closure and configuration is mainly depended on the human space diet composition. Vast researches have been carried on this aspect, but these researches mainly concentrate on the space vegetable protein exploitation. The animal protein supply is still a problem, the solution should be found and the LSS constitution analysis also deserves being explored. Many animals have been taken into account to provide the animal proteins, nowadays world-wide animals selection mainly focus on the poultry, for instance, sheep, chicken, fish, etc. But the poultry feeding exist many problems, such as the long growth periods, low efficiency, complex feeding procedures and capacious feeding space, and these animals also cause the water and air pollution. The complete food composition is often depended on the features of the nation diet habit. Chinese have kept the habit to consume the silkworm as food from ancients. The mulberry silkworm, especially, has the many merits including high protein content, short growth periods, high efficiency of protein conversion rate, small feeding space, small quantity of odour and no waste water during its feeding. This paper discusses that feeding the silkworm as the source of the animal protein during long-term spaceflight and lunar-base missions in the several aspects, including that the nutrition structure, feeding periods, processing methods, feeding equipments, growth conditions and the influence to the space environment caused by silkworm. The silkworm protein has also been compared with the protein of other animals. At the meantime, the originally non-edible part, silkworm silk of cocoons, is also considered as the protein source, the possible process of edible silk protein is put forward in the paper. The process includes first prepare the water-solubility fibroin powder, then add appropriate amylose and sugar into the powder. The silk could be converted to the edible foodstuff for human. The all-around discusses are carried on the feasibility of feeding silkworm

in space and utilizing silkworm as the animal protein source in the human diet in CELSS. The conclusion could provide a possible new approach to solve the animal protein supply problem of human diet for the crew who live in the CELSS.