CUSTOMIZED THERMOTHERAPY PACKS FOR ASTRONAUTS

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As humans are not designed for the space environment, a medical suit is essential to support astronauts' life, safety and health. While focusing on life support so far, efforts are needed to improve the quality of life when astronauts stay in space for a long time. Accordingly, future exploration missions need further considerations for preventive care, regular wellness and treating medical conditions directly in space [1]. Until now, medical kits have been supplied from Earth to space, but they could be made in space on-demand in the future. On the other hand, heat therapy is effective, less expensive, safe and quick mode of treatment yielding relief. Preference for non-pharmacological treatment for pain especially in space is the key driver for the development. However, most heat packs are bulky, heavy and inconvenient to use because they are not custom-designed for individuals [2].

On this background, we have demonstrated a heat pack using nanotechnology and printed electronics: an office printer, nano-inks and medical tape without special equipment and toxic materials. Digital printing makes it possible to produce customized heaters on-demand, and chemical sintering is applied to eliminate the need for subsequent processing at high temperature [3]. The proposed healthcare system provides a thermotherapy to promote healing, decrease inflammation, ease headaches, reduce joint and muscle pain for astronauts. The heat pack can be designed for low energy consumption and therapeutic effect by optimizing the heat transfer with the pack sticking to the body, which is especially important in zero gravity. These results can be aligned with the aim of In Space Manufacturing and utilized to humans for long-term space exploration.

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