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Medical Care for Humans in Space (3)

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NEW EXTRAVEHICULAR ACTIVITY'S SPACESUIT DESIGN TO ALLOW ACCESS TO  
EMERGENCY MEDICATIONS**Abstract**

Until now, all extravehicular activities (EVAs) conducted in Space have been limited, in the proximity of the vehicle and for a short amount of time. Therefore, medications during EVAs have never been deemed necessary. However, with the Artemis program ongoing and the numerous human spaceflight missions being planned for the future, it might be prudent to re-evaluate this decision. It is predicted for EVAs to be much further away from the vehicle, and for them to be longer, more tiring, demanding and frequent. Astronauts may face more risks and injuries due to extended physical activity and the spacesuit itself. To prepare for this, it is advisable to develop easy-to-use technology to incorporate into EVA spacesuits. The aim of this project is to evaluate the best, cheapest and easiest way to enable this new capability.

A previous study showed that injection devices were the only way to get medication through EVA spacesuits. The design included a spring-loaded mechanism that allowed for a push-button operation and a self-made injection through an internal syringe and a needle. Here, a review and evaluation of relevant literature of possible new hardware that could fit into suit designs is conducted, leading to an educated final choice.

Remote-controlled microneedles patches meet many of the requirements. They are patches able to inject medications through microneedles directly, through the stratum corneum, into the upper dermis layer. They could be positioned, under the pressure garment, on the stomach area of the suit, where there is a sufficiently good blood flow in the underlying tissues. These patches (one per drug) would inject the medication, once the signal would be sent by the astronauts from their control panel. Only fast acting medications needed quickly are considered for delivery with this method, in order for the astronaut to use a medication and keep working on the task, before going back to the vehicle and obtain more traditional treatment. At the moment, potential medications for consideration include adrenaline, ibuprofen and modafinil, for, respectively, emergency cases, pain relief and alertness, these being considered the most common issues during EVAs.

Spacesuits are very expensive and each small variation can carry significant costs. The solution identified here is the quickest method to solve an issue which is relevant now, and will be even more in the future. By pressing one button, the astronauts would be able to greatly help themselves throughout the task.