

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Medical Care for Humans in Space (3)

Author: Mrs. Chunyan Wang

China Astronaut Research and Training Center, China, wcybj2004@126.com

Mr. Yin Gu

China Astronaut Research and Training Center, China, wcybj2004@126.com

Mr. Yingjun tan

Institute of Space Medico-Engineering, China, tyj1@163.com

Prof. Yumin Wan

China, spacefisher@126.com

Ms. Lina Qu

China, linaqu@263.com

Prof. Yanqiang Bai

China, baiyanqiang@126.com

Prof. Yinghui Li

China Astronaut Research and Training Center, China, yinghuidd@vip.sina.com

ESTABLISHMENT AND SPACE APPLICATION OF THE ON-ORBIT MONITORING
TECHNOLOGY FOR 3-NITROTYROSINE IN URINE SAMPLES

Abstract

Monitoring the biochemical index in body fluid on-orbit is essential for the health evaluation of astronauts during the spaceflight. 3-nitrotyrosine (3-NT) is a marker of oxidative damage which can be excreted in the urine and reflect the health condition of human beings. In this study, we developed a simple and sensitive immunassay method based on the surface plasmon resonance (SPR) principle to detect 3-NT in human urine samples. This technology was successfully applied in the China's first manned rendezvous and docking mission to evaluate the stress statue of the astronants during the flight. The lowest detection limit for 3-NT was 4.7 ng/mL with a linear dynamice ranges up to 2 μ g/mL (S/N = 3). No obvious cross reactivity was observed. Intra-assay and inter-assay relative standard deviations <8%, and average recovery was 88.68%-128.14%. The sensor surface remained stability through more than 200 regeneration cycles and 15 days of repeated measurement. This technology was firstly applied in space, and proven to be high sensitive, non-invasive and real-time, which can be used for assessing the risk and ensuring human safety in the extreme environments of long-term space flight.

Keywords: 3-nitrotyrosine, urine, spaceflight, surface plasmon resonance