

White Paper

Endothelium Preserving Microwave Treatment for Atherosclerosis

A Potential Treatment for Penile Erectile Dysfunction.

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The Endothelium-Preserving Microwave Treatment for Atherosclerosis (EPMTA™) was first developed and patented by engineers at NASA's Johnson Space Center (JSC). The apparatus and method is designed to enable the repair of diseased coronary arteries during cardiac catheterization by delivering microwave energy to precise arterial locations to selectively target and heat atherosclerotic lesions. The treatment preserves the most delicate endothelial cell layer, which is especially important for preventing restenosis due to thrombotic, inflammatory, and proliferative responses that complicate current treatment procedures.

In the 1990s, JSC engineers were investigating the use of millimeter waves to collect images of the human body. They rented an expensive experimental imaging system, but quickly determined that this millimeter wave technology was not going to be useful for the original intent. However longer wavelength (1cm) microwave energy could be adapted for use in a miniaturized, directional antenna attached to a catheter. Inserted into a diseased artery, the millimeter wave transmissions could penetrate the arterial wall and soften atherosclerotic lesions without damaging healthy tissue and cells. The validity of this concept was subsequently confirmed by a local physician. In July 2011 Meridian Health Systems, Inc., dba **Vascular Medicine Institute of America** in collaboration with scientists and engineers in the **Human Health and Performance** and **Engineering Directorates** at **NASA Johnson Space Center**, signed a Space Act Agreement (SAA) to conduct feasibility studies and further develop the technology collaboratively. After a successful technology demonstration in November 2011, NASA licensed the EPMTA™ technology to Meridian for further development and commercialization as a nonsurgical method for the repair of diseased arteries. The EPMTA™ technology was the “**2013 FLC Excellent in Technology Transfer**” awards winner, a prestigious honor in the technology transfer world, with dozens of federal laboratories submitting nominations each year. These awards have become a source of great pride for both the laboratories and their government agencies.

Another potential use of EPMTA™ technology is in the management of penile erectile dysfunction (ED). A decrease in the blood flow to the penis due to arteriosclerosis (clogged arteries) will affect the quality of erections. The erections will be weak and/or short lasting. EPMTA™ may enhance or augment the action of Phosphodiesterase type 5 (PDE5) inhibitors, by opening up the diseased Internal Iliac and or Pudendal arteries, thus increasing the blood flow to the penis. Penile erection is dependent on an adequate inflow of blood to the erectile tissue through both endothelium-dependent vasodilatation and corporal smooth muscle relaxation. Pathologic alteration in the endothelium of penile vasculature and/or erectile tissue and/or impairment of neurovascular processes can result in erectile dysfunction. Both cardiovascular disease (CVD) and ED have been linked to endothelial dysfunction, a vascular condition resulting in a diminished vasodilatory response to pharmacologic and physiologic stressors. Endothelial dysfunction may be a pathophysiologic mechanism underlying both ED and CVD, forming a unifying link between these two conditions. Furthermore, in the general population and in men with diabetes or obesity, ED may be a valuable early marker for serious subclinical CVD, coronary artery disease and atherosclerosis.

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