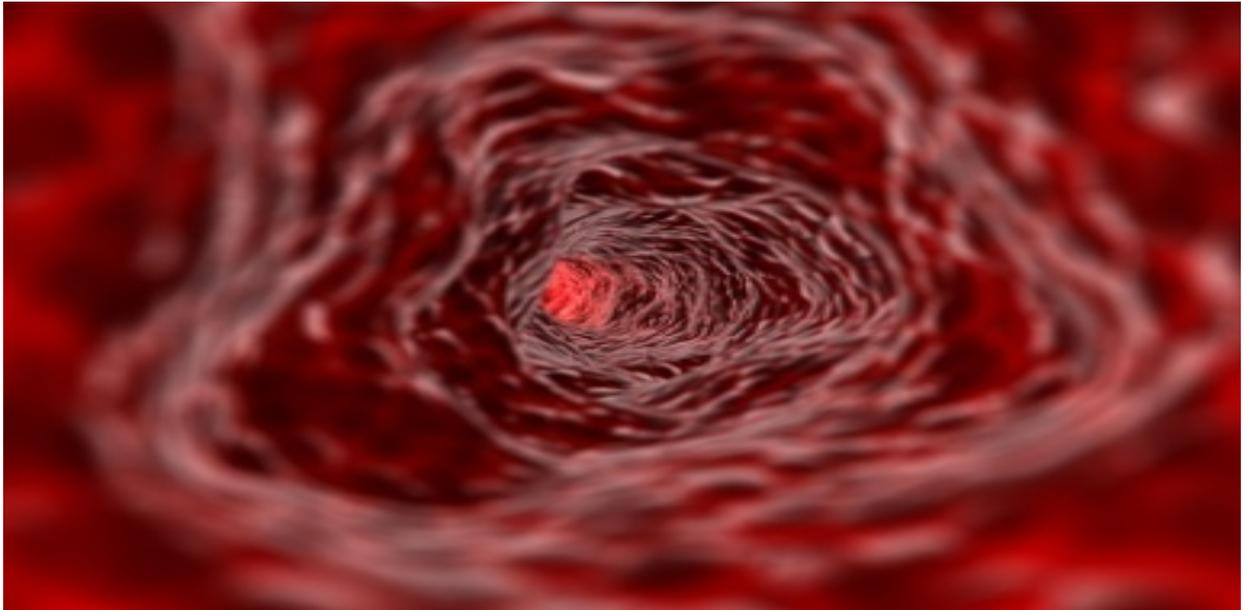




technology opportunity

Endothelium Preserving Microwave Treatment for Atherosclerosis



The National Aeronautics and Space Administration (NASA) seeks interested parties for the commercial application of an endothelium preserving microwave treatment for atherosclerosis that was developed by engineers at the Johnson Space Center. In theory, this technology provides for the non-surgical repair of diseased coronary arteries by interventional cardiologists during coronary catheterization. It is potentially safer than balloon angioplasty and other prior art. Millimeter-wave/microwave ablation (essentially, heating by use of millimeter-wave and microwave electromagnetic radiation) is proposed as a means of treating atherosclerotic lesions. Because it is expected to be safer and more effective than traditional methods, millimeter-wave/ microwave ablation could soon supplement or even supplant today's treatment choices.

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Benefits

Small size:

- Millimeter-wave/microwave power source
- Antenna fits in a catheter
- Uses a transmission line in the form of a waveguide or coaxial cable

Treatment:

- Non-invasive
- Improved method to dilate congested arteries without harming endothelial layer or healthy tissue
- Does not scar or damage blood vessel walls

Operation:

- Less time to heat atherosclerotic lesions
- Can be used while blood continues to flow in the artery

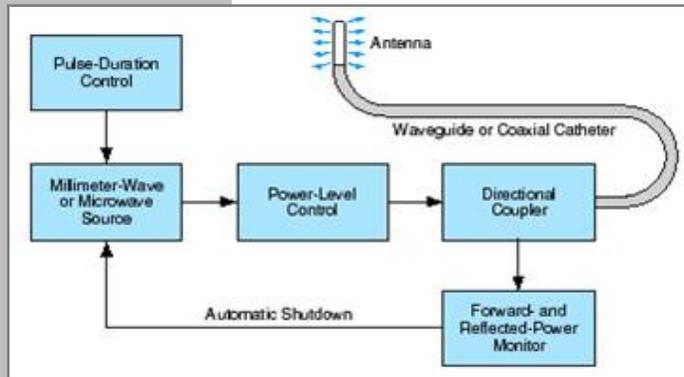
Applications

Bio-Medical

- **Atherosclerosis**

Technology Details

Although millimeter-wave /microwave ablation has yet to be proven in tests on live animals, it offers the potential to significantly advance the state of the art. Indeed, after further testing, millimeter-wave/ microwave ablation might be used by cardiologists during balloon angioplasty replacement procedures (PTCAs) or coronary catheterizations.



How it Works

In millimeter-wave/microwave ablation, electromagnetic energy would be delivered via a catheter to a precise location in a coronary artery for selective heating of a targeted atherosclerotic lesion. Heating to controlled, customized temperature profiles could be used to treat lesions in the intima and media layers of an artery wall, yet the most superficial endothelial cell layer and the outer adventitial layer would be preserved. Preservation of the endothelial cell layer is necessary to prevent thrombotic, inflammatory, and proliferative processes (restenosis), which complicate angioplastic procedures.

In millimeter-wave/microwave ablation, advantageous temperature profiles would be obtained by controlling the power delivered, pulse duration, and frequency. For best results, the profile would be chosen so that the maximum temperature is delivered at the center of an atherosclerotic lesion and the temperature would decrease, uniformly in all directions, with distance from the center. The heating would favorably modify lipid-rich lesions that contain the inflammatory cellular infiltrates that are prone to rupture, and the rupture of which causes thrombotic artery occlusions (heart attacks).

The source would generate millimeter-wave or microwave power at a controlled level up to 10 W, with a pulse duration between 0.1 and 10 s controlled to within two percent. A chosen frequency between 3 and 300 GHz could be used; a separate source would probably be needed for each frequency. The catheter/transmission line would deliver the power to the antenna.

The antenna would focus the radiated beam so that most of the millimeter-wave or microwave energy would be deposited within the targeted atherosclerotic lesion. Because of the rapid decay of the electromagnetic wave, little energy would pass into, or beyond, the adventitia. By suitable choice of the power delivered, pulse duration, frequency, and antenna design (which affects the width of the radiated beam), the temperature profile could be customized to the size, shape, and type of lesion being treated. By controlling temperature, one could limit (1) the damage to the endothelial layers and (2) the risk of overheating non-diseased tissue and proximal blood. For safety, the control system of the apparatus would incorporate automatic shutoff protection interlocks.

Patents

NASA has patented this and associated technologies. (U.S. 6047216, 6226553, 6223086 and 6496736)

Licensing and Partnering Opportunities

This technology is part of NASA's Innovative Partnerships Program (IPP), which seeks to transfer technology from and to NASA for benefit of the space program and U.S. industry.

NASA invites companies to consider licensing the Endothelium Preserving Microwave Treatment for Atherosclerosis technology (MSC-22724) for commercial applications and other related microwave technologies within this portfolio.

For More Information

If you would like more information or want to pursue transfer of this technology please contact us at:

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Technology Status

- Patent Pending
- U.S. Patent(s)
- Copyrighted
- Available to License
- Available for No-Cost Transfer
- Seeking Industry Partner for Co-Development