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BV I08-16 - *Device and Methods for In Vivo Flow Cytometry: Non-invasive and Sensitive Detection of Circulating Cancer Cells Using Photoacoustic Waves*

APPLICATION:

non invasive *in vivo* detection of cells circulating in blood or lymphatic vessels

SUMMARY:

This device describes a laser diode array and a photoacoustic detector that operates as a non-invasive, *in vivo*, flow cytometer able to detect in a sensitive and real-time manner individual cells circulating within the human body. Thus, for example, individual cancer cells in circulation could be detected at a level of 1 cancer cell in a background of 108. Another potential utility of this device and method is the monitoring the course of therapy during cancer treatment using specific agents to identify and quantitate selected cellular markers. Portable versions of this device are envisioned.

A prototype is available which non-invasively detects laser-induced photoacoustic waves which emanate from different cells, pathogens, microparticles, and nanoparticles. The device located on the skin surface in proximity to circulating in blood vasculature or lymphatic vessels can detect and initiate therapeutic action on appropriately tagged circulating cells.

Ultrasound transducers attached to the skin of an organism detect the photoacoustic ultrasound waves emitted by target objects in response to their illumination by at least one pulse of laser energy delivered using a selected wavelength. The wavelengths of the laser light pulse may be varied to optimize the absorption of the laser energy by the target object. The target objects detected by the device may be unlabelled biological cells or cell products, contrast agents, or biological cells labeled with one or more contrast agents.