

Micromagnetic-microfluidic device could quickly pull pathogens from the bloodstream

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Sepsis, an infection of the blood, can quickly overwhelm the body's defenses and is responsible for more than 200,000 deaths per year in the U.S. alone. Premature newborns and people with weakened immune systems are especially vulnerable. Since most existing treatments are ineffective, researchers in the Vascular Biology Program at Children's Hospital Boston have come up with a first line of defense -- using magnetism to quickly pull pathogens out of the blood.

Their blood-cleansing device, developed by Chong Wing Yung, PhD, a researcher in the laboratory of Don Ingber, MD, PhD, is described in the journal [Lab on a Chip](#).

The system they envision will work like this: The patient's [blood](#) is drawn, and tiny [magnetic beads](#), pre-coated with antibodies against specific [pathogens](#) (such as the fungus *Candida albicans*) are added. The blood is then run through a [microfluidic system](#) in which two liquid flow streams run side by side without mixing -- one containing blood, the other a saline-based collection fluid. The beads bind to the pathogens, and a magnet then pulls them (along with the pathogens) into the collection fluid, which is ultimately discarded, while the cleansed blood is reintroduced into the patient.

Tested with contaminated human blood, a device with four parallel collection modules achieved over 80 percent clearance of fungi in a single pass, at a flow rate and separation efficiency that would be viable for clinical applications. Yung and Ingber estimate that a scaled-up

system with hundreds of channels could cleanse the blood of an infant within several hours.

"This blood-cleansing microdevice offers a potentially new weapon to fight pathogens in septic infants and adults, that works simply by removing the source of the infection and thereby enhancing the patient's response to existing antibiotics," says Ingber.

More information: The article can be accessed at <http://www.rsc.org/publishing/journals/LC/article.asp?doi=B816986A>, and is scheduled for formal online publication on April 13.

Source: Children's Hospital Boston

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