

Advantages over current methods

This system offers a number of advantages over existing methods to clean human blood of radioactive and other hazardous materials. Current medical procedures to detoxify human blood are restricted to a few types of toxins and are mainly limited to dialysis and filtration.

In addition, currently available treatments can take several hours to complete, require the turnover and filtration of large volumes of blood, are rather inefficient at removing toxins and can be risky for the patient. For these reasons, current methods are mostly restricted to patients with kidney failure and certain types of drug overdoses.

Alternative treatments exist, such as antibodies and chelators — substances that combine with and neutralize toxins. These treatments can be used for specific kinds of toxins, but they are inefficient and can cause serious side effects, such as allergic reactions and organ failure.

Drug delivery

Nanosphere technology is also being developed to deliver drugs, genes and otherwise un-deliverable therapies — such as acutely toxic small molecules, peptides and pharmaceuticals — to targeted cells and organs. The particle surfaces can be designed to provide receptor-mediated targeting of cells, sustained drug delivery, or magnetic targeting of organs. The nanospheres can deliver water-based or oil-based drugs.

Potential applications include:

- Biological toxin exposures
- Radiological toxin exposure and radioprotection
- Internal hemorrhage
- Brain swelling
- Stroke therapy
- Cancer therapy
- Acute trauma leading to kidney failure

The project has developed a prototype magnetic filter, has tested many nanospheres formulations for specific toxins and is conducting ongoing trials *in vitro* and *in vivo*.

Source: Argonne National Laboratory

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