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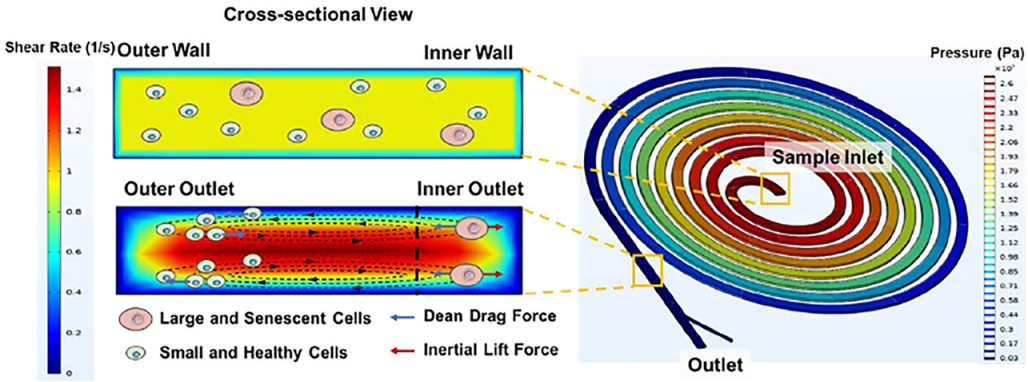
Being able to isolate senescent cells from healthy ones can help understand and treat age-related diseases.



As cells age and experience oxidative stress in the body, they undergo senescence, which stops their division and leads to age-related complications, like Alzheimer's disease and osteoarthritis. The ability to separate and sort senescent cells can be beneficial in treating these diseases, but their intrinsic characteristics make this a difficult task. Because senescent cells are larger than healthy ones, Chen et al. created a spiral microfluidic device which, under fluid flow, separates particles by size, isolating senescent cells.

"Once senescent cells accumulate in the body with aging, it will trigger a plethora of age-related diseases," said author Chunyi Wen. "It prompts the urgent need to isolate senescent cells in order to understand its underlying pathomechanism."

When cells are exposed to fluid flow in vitro, the chip pushes smaller, healthy cells toward the outer outlet of the spiral channel, while larger cells, which tend to be senescent, are dragged inward. By optimizing the fluid flow rate and collecting the cells at the two outlets, the authors were able to achieve a 75% efficiency in isolating senescent cells. The healthy cells can then be implanted back into the patient.

To test and calibrate the device, the group determined optimal conditions by fine tuning the flow rate on microspheres of two different sizes designed to simulate normal and senescent cells. Once they ensured the flow rates are compatible with biological cells, they used oxidative stress to induce senescence.

Because cell size is not an ideal biomarker for senescence, the researchers are working to add additional isolation criteria to the device. With minor improvements, this method can be used for fundamental studies on diseases, age estimation and cell-based drug delivery.

Source: "High-throughput label-free isolation of senescent murine mesenchymal stem cells," by Zhengkun Chen, Kuan Jiang, Zhou Zou, Xiaohe Luo, Chwee Teck Lim, and Chunyi Wen, *Biomicrofluidics* (2020). The article can be accessed at https://doi.org/10.1063/5.0011925.

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