New technique for study of blood diseases

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A new technique to study the flow of liquids developed by scientists from Université Paris-Saclay (https://www.universite-paris-saclay.fr/en) and the University of Amsterdam offers fresh hope for tackling blood diseases like thrombosis.

Previous microfluidic measurement tools have been based on particle tracking. The new technique uses polarized optical signals from luminescent nanorods to measure flow shear – i.e. the strain produced by directional pressure – at an instant, microscopic level never achieved before.

This can be used in medical diagnostic devices, as well as in other channels, to replicate diverse flow systems such as blood vessels.

“Like logs floating on a river, it is known that elongated objects orient along the direction of flow. This rule is even more strictly obeyed by tiny nanorods, into which we incorporate luminescent properties to signal their orientation,” says Jongwook Kim, assistant professor of physics at École Polytechnique, Université Paris-Saclay. “We suggest a novel way to analyse flows on a microscopic scale by detecting the group orientation of the nanorods dispersed in fluids.”

It is perfectly suited to the study of thrombosis as the generation and breakdown of blood clots are directly influenced by shear stress that depends on the geometry of veins and capillaries. As blood flow is dynamic, with beats and swirls, the new technique can provide an instant, precise measurement.

Furthermore, beyond microfluidics, the principle of rod-orientation determination developed by the team shows promise as bio-markers to monitor the complex dynamic motions of micro-biosystems such as cells, genes, and enzymes.

These findings, that have the potential to be applied to many fields, have been published in the journal Nature Nanotechnology.

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