Streamlined Hematology Analysis for Point-of-Care Settings (#8303)

A highly accurate, compact, label-free method for blood testing using ultraviolet microscopy

Researchers at Georgia Tech have developed a highly effective, simplified method for hematology analysis using ultraviolet (UV) microscopy. In particular, this new method streamlines a complete blood count (CBC) procedure, the most common form of hematology analysis. This novel technology allows for testing that is critical for diagnosing and monitoring blood and bone marrow conditions to be performed in point-of-care settings, like in the clinic or at home. Deep UV microscopy enables cell analysis without chemical reagents or fluorescent labels that often interfere with image quality and make procedures complex. This technique extracts morphological and molecular features from individual cells and uses machine learning for their classification.

This unique approach quickly collects quantitative endogenous molecular information from live cells without causing any cell damage. The short wavelength of UV light produces high-resolution images that allow for highly specific cell phenotyping which, in turn, leads to more accurate diagnoses and treatments.

Benefits/Advantages

- **Streamlined**: Enables testing in point-of-care settings without complex procedures and specially trained personnel
- **Highly accurate**: Offers a spatial resolution higher than current methods due to the shorter wavelength of UV light
- **Cost-effective**: Saves on reagents, complex equipment costs, and time-intensive processes without compromising diagnostic quality

Potential Commercial Applications

This technology offers an improved and simplified approach for complete blood count analysis that can be used in clinical and diagnostic testing settings. It has applications for the diagnoses and treatment of blood and bone marrow conditions including:

- Anemia
- Hemophilia
- Leukemia
- Thrombocytopenia
- Neutropenia

- Sickle cell disease
- White blood cell counting (five-part differential)
- Infections
- Inflammation

Background/Context for This Invention

Hematology analysis is a critical tool for the diagnosis and treatment of blood conditions and diseases. Often, however, its methods are costly and laborious, requiring specially trained personnel, complex equipment, and multiple chemical reagents. Many current standard-of-care models evaluate the morphology, population, and molecular or cytogenic properties of blood cells using several different modalities, such as absorption spectroscopy, impedance measurement, and flow cytometry. The UV microscopy hematology analysis method developed by Georgia Tech moves beyond the obstacles of current models while delivering highly accurate and timely results. This means lower costs for doctors, clinics, and caretakers as well as higher quality care for patients.

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More Information

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Publications

Deep-ultraviolet microscopy for label-free hematological analysis, Proceedings of the Optical Diagnostics and Sensing XX: Toward Point-of-Care Diagnostics (SPIE BiOS), February 14, 2020

Label-free hematology analysis using deep-ultraviolet microscopy, Proceedings of the National Academy of Sciences, June 19, 2020

For more information about this technology, please visit:
https://licensing.research.gatech.edu/technology/streamlined-hematology-analysis-point-care-settings

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot