

## 智能掌上光流控血细胞分析仪

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血细胞计数板和流式细胞仪通常用于实验室和医院, 阻碍了即时检测 (Point-of-care testing, POCT) 的普及, 可能延误病人的治疗。因此, 开发一款便携式的智能血细胞分析仪有着十分重要的意义和前景。

哈尔滨工业大学赵唯淞教授团队提出了一种掌上光流控血细胞分析仪, 它基于常用于神经学和行为学研究的微型荧光显微镜和微流控芯片平台, 实现了设备的轻便化, 从而提高其便携性。此外, 通过图像处理和基于粒子追踪的细胞计数算法, 还实现了智能化的白细胞信息增强和浓度检测。为了证明系统的准确性和可靠性, 文章使用了 Passing-Bablok 分析法比较了此方法和常规血细胞计数器的白细胞浓度测量结果,

相关系数达 0.979。此外, 通过 Bland-Altman 分析, 得到了两种方法之间的差异与平均测量值之间的关系, 确定了从  $-0.93 \times 10^3$  到  $0.94 \times 10^3$  cells/ $\mu\text{L}$  之间 95% 的一致性范围。同时, 与常规血细胞计数器相比, 此设备计算白细胞浓度的误差小于 10%, 符合英国 NEQAS 和 CLIA-88 对白细胞计数准确性的要求。

掌上光流控血细胞分析仪可以在远离医院或实验室的环境下对患者的血细胞进行 POCT 检测, 从而提高偏远或贫困地区的医疗诊断水平。此外, 宇航员在太空环境中进行血细胞计数, 在辐射生物学和微重力生物学领域具有重要意义。掌上光流控血细胞分析仪的开发为降低体积和重量问题所造成的运输能耗提供了一个潜在的解决方案。

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## A smart Palm-size Optofluidic Hematology Analyzer enables home monitoring of health status

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The hemocytometer and the flow cytometers are often used in laboratories and hospitals, hindering the spread of point-of-care testing (POCT) and delaying patient's treatments. Therefore, the development of a portable smart blood cell analyzer holds significant importance and promising prospects.

The research group of Dr. Zhao Weisong from Harbin Institute of Technology proposes a Smart Palm-size Optofluidic Hematology Analyzer for automated imaging-based leukocyte concentration detection. They compared the leukocyte concentration measurement between our approach and a hemocytometer using the Passing-Bablok analysis and achieved a correlation coefficient of 0.979.

Through Bland-Altman analysis, they obtained the relationship between their differences and mean measurement values and established 95% limits of agreement, ranging from  $-0.93 \times 10^3$  to  $0.94 \times 10^3$  cells/ $\mu\text{L}$ . Moreover, in comparison to a conventional hemocytometer, this device demonstrates an error in calculating leukocyte concentration of less than 10%, aligning with the accuracy requirements specified by the UK National External Quality Assessment Service (NEQAS) and the Clinical Laboratory Improvement Amendments of 1988 (CLIA-88).

Palm-size Optofluidic Hematology Analyzer allows POCT of patients' blood cells away from the hospital or laboratory environment and enhances medical diagnosis in remote or deprived areas. In this context, the development of the Palm-size Optofluidic Hematology Analyzer offers a potential solution by addressing the issues of volume and weight.

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