

Microfluidic cartridges for automated, point-of-care blood cell counting

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ABSTRACT:

Disposable, low-cost microfluidic cartridges for automated blood cell counting applications are presented in this article. The need for point-of-care medical diagnostic tools is evident, particularly in low-resource and rural settings, and a full blood count is often the first step in patient diagnosis. Total white and red blood cell counts have been implemented toward a full blood count, using microfluidic cartridges with automated sample introduction and processing steps for visual microscopy cell counting to be performed. The functional steps within the microfluidic cartridge as well as the surrounding instrumentation required to control and test the cartridges in an automated fashion are described. The results recorded from 10 white blood cell and 10 red blood cell counting cartridges are presented and compare well with the results obtained from the accepted gold-standard flow cytometry method performed at pathology laboratories. Comparisons were also made using manual methods of blood cell counting using a hemocytometer, as well as a commercially available point-of-care white blood cell counting system. The functionality of the blood cell counting microfluidic cartridges can be extended to platelet counting and potential hemoglobin analysis, toward the implementation of an automated, point-of-care full blood count.