Title
The photon counting histogram in turbid media: Detection of somatic cells and bacteria in body fluids

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Our purpose is to find alternative, simpler and cheaper methods to detect and analyze cells and bacteria in body fluids for clinical and biotechnological applications. The photon counting histogram (PCH) is a novel tool for extracting the measured photon counts per molecule and the average number of molecules within the observation volume. In practice, it is possible to realize diffraction limited spots of about 0.2 fl. The best sensitivity is obtained when, on the average, one molecule is contained in that volume. In principle, the volume of observation can be increased to achieve a good sensitivity, but background fluorescence and/or fluorescent impurities impose a limit to the lowest concentration that can be measured. We constructed a small-portable instrument specifically designed to measure somatic cells in milk that has high sensitivity and high dynamic range, it is easy to use and relatively inexpensive. The sample is rotated and moved vertically up and down to effectively scan a large sample volume. We have obtained good results using fluorescent spheres in clear and turbid media and with milk. We have been working on the detection of bacteria in water and body fluids. On a more theoretical front, we are deriving an analytic expression for the PCH as a function of the number of molecules in the excitation volume.