Coulter Counter Encyclopedia Article

Coulter Counter

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Contents

Coulter Counter Encyclopedia Article.....1

Contents.....2

Coulter Counter.....3

Coulter Counter

A Coulter counter is a device that is used to measure the number of cells in a certain volume of a sample suspension. The counter achieves this enumeration by monitoring the decrease in electrical conductivity that occurs when the cells pass through a small opening in the device. While originally developed for use with blood cells, the Coulter counter has found great use in a diverse number of disciplines, including microbiology, where it is used to determine the total number of **bacteria** in samples.

Because the device operates on the physical blockage of electrical conductivity by particles in a sample, the Coulter counter cannot distinguish between living and dead bacteria. An indication of the total number of bacteria (alive, dormant, and dead) is provided. The number of living bacteria can, however, usually be easily determined using another volume from the same sample (e.g., the heterotrophic plate count).

The Coulter counter is named after its inventor. Wallace H. Coulter conceived and constructed the first counter in the basement of his home in Chicago in the early 1950s. Then as now, the device relies on a vacuum pump that draws a solution or suspension through an electrically charged tube that has a tiny hole at the other end. As particles pass through the hole the electrical field is interrupted. The pattern of the interruption can be related to the number of particles and even to particle type (e.g., red blood cell versus bacteria).

A bacterial suspension is best analyzed in the Coulter counter when the suspension has been thoroughly shaken beforehand. This step disperses the bacteria. Most bacteria tend to aggregate together in a suspension. If not dispersed, a clump of bacteria passing through the orifice of the counter could be counted as a single bacterium. This would produce an underestimate of the number of bacteria in the suspension.

The Coulter counter has been used for many applications, both biological and nonbiological. In the 1970s, the device was reconfigured to incorporate a laser beam. This allowed the use of fluorescent labeled monoclonal antibodies to detect specific types of cells (e.g., cancer cells) or to detect a specific species of bacteria. This refinement of the Coulter counter is now known as flow cytometry.