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10 most made errors in cell counting

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Whitepaper

10 most made errors in cell counting

Manual counting with hemocytometers is still preferred by some researchers; however, manual cell counting is laborious and often an inefficient use of time. Experiments should be carried out with accuracy and precision, and this applies to the collection, quantification, and analysis of cell samples.

Manual cell counting is straightforward and fairly inexpensive; however, mistakes are easy to make. Knowing the basics of cell counting - as well as the top cell counting errors and how to avoid them - can go a long way in ensuring the most efficient use of time spent in the lab.

#1 - Device errors

Hemocytometers do not always keep up with the times, and many lack the latest visualization technology common in more advanced devices. Automated cell counters, like the CytoSMART EXACT, can process images quickly on a tablet or computer, offering faster analysis in a digital format that is far more accurate than traditional visualization methods.

#2 - Manual errors

Manual counting relies on human visualization, a feature that is susceptible to inaccuracies from time to time. Improper visualization of a sample can occur due to a number of factors, including cell aggregation, debris, or eyesight issues. This can cause significant fluctuations in cell numbers that are an inaccurate representation of the true solution. An automated cell counter is designed to visualize and detect cells accurately and with high precision.

#3 - Cell concentration

Using cell concentrations that are too low or too high is generally associated with counting errors, specifically with a traditional hemocytometer. When the concentration is too low, the cells in the field may not be representative of the stock solution. In the situation where the concentration is too high, cells may aggregate and lead to egregious counting errors.

#4 - Sample preparation

When the counting chamber of a hemocytometer is filled with liquid, there is a slight increase in space between the chamber and the cover glass. An error in volume estimation can then occur. Pipetting solutions into the manual counting slide can also impart similar errors. Hairs or air in the sample can also cause errors in the cell count.

#5 - Not Suspending a Sample in Solution

When a cell solution or suspension rests, many of the cells in the solution will move toward the bottom of the test tube. A sample taken from this tube will not represent the true solution and result in inaccurate cell values. It is important to homogenize all solutions prior to counting by re-suspending the cells within the sample. Doing so will produce higher accuracy during manual counting.

#6 - Not Differentiating Between Cells and Debris

Even to the highly-trained eye, sometimes debris can come across as just another cell in the sample. There is a chance that debris will be present, and when this debris is counted as a cell it is known as a false-positive. Sometimes, manual counters will also misclassify a cell as debris, resulting in a false-negative. Automated cell counters usually feature specific detection parameters that reduce the chance of obtaining a significant amount of false-positives or false-negatives.

#7 - Non-Standardized Protocols

Since manual counting is performed by people, each protocol for counting cells in a sample will rely on an individualized approach that is prone to variation. This variation can cause substantial errors if protocols are not standardized throughout the research team. Automated cell counter detection is based on features which the algorithm works through to determine which characteristics the sample 'match' operate on one protocol, eliminating the need for the extra work that goes in creating and maintaining a strict counting strategy.

#8 - Inefficient Recording and Monitoring

Using manual methods, operators simply write down the number of cells in their lab journal. Technological advancements have facilitated faster approaches to cell counting and recording. The benefit of many automated cell counters, like the CytoSMART EXACT, is its ability to utilize cloud technology for the recording and sharing of data. This allows researchers to also monitor samples remotely.

#9 - Mathematical Errors

With any type of data collection, a good deal of math is involved. The use of mathematics is essential in calculating the average number of cells in a solution. Math performed by humans is time consuming and is also error-prone. Some automated cell counting systems, like the CytoSMART EXACT, calculates the mean, median, and standard deviation of a sample almost instantly.

#10 - Believing Manual Counting is the Only Tried-and-True Method

Although manual counting can prove versatile and adaptable in different situations, their utility is limited by their operator. More cell counts at a higher throughput can be performed via automated cell counters, which decreases the likelihood of error while improving productivity across the board.

Are Automated Cell Counters Cost-Effective?

A hemocytometer is relatively inexpensive, at least initially. Many facilities rely on manual counting believing it will be cost-efficient; however, the training involved, the time it takes to standardized a protocol, and the counting errors it produces compared with automated counters result in far more long-term costs than usually anticipated.

Making a one-time investment in an automated cell counter, like the CytoSMART EXACT, will ensure little to no time wasted in the laboratory, translating to improved long-term cost-efficiency.

Conclusion

Automated cell counters, such as the CytoSMART™ EXACT, enable faster and more reliable cell counting with higher throughput, allowing researchers to channel their focus toward other important areas of their work.

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