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Red and White Cell Counts and Differential

Practical 02 / Teaching laboratory

Aim

Calculate red and total white cell counts from chamber data and interpret a differential.

Principle

Chamber counting estimates cells per unit of original blood from cells in a known diluted volume. A differential gives relative proportions, which can be expressed as absolute counts.

Materials and Requirements

- Grid diagrams and supplied chamber counts
- Prepared blood smear or anonymised digital fields
- Calculator

Procedure

1. Identify the chamber squares, depth and effective counted volume using the supplied grid.
2. On the ruled teaching grid, outline the areas to be counted for red and white cells separately. Multiply the area by the stated depth to find the counted volume.
3. Apply a consistent boundary inclusion rule and reject an invalid or unevenly filled teaching chamber.
4. Count cells touching the top and left boundaries and omit the bottom and right borders, or use the course's equivalent convention consistently. Check the duplicate field or side for agreement.
5. Calculate the cell concentration from count × dilution factor ÷ counted volume in µL.
6. Use the dilution factor for that cell type and retain the counted volume in microlitres. Work through one count by hand, then verify units and compare the duplicate calculation.
7. In the prepared smear choose the monolayer where cells lie mostly apart. Scan at low power, then classify white cells in successive non-overlapping fields at the taught magnification.
8. Keep a running tally by cell type. Divide each tally by the total classified and multiply by 100. Multiply the total white cell count by the relevant fraction for an absolute count.
9. Record the total counted, any abnormal or uncertain forms and discrepancies between fields. Confirm unexpected patterns with the instructor before reporting.

Precautions

- Use only the approved laboratory or prepared field set.
- Account for the actual volume counted and avoid double-counting boundary cells.

Observations and Interpretation

Red and White Cell Counts and Differential

Observations and Record

Item	What to record	What it tells you
Red cell count	Cells, dilution and chamber volume	Convert to cells/µL
Total white cell count	Cells, dilution and chamber volume	Check convergence of replicate counts
Differential	Cell category, percent and absolute count	Distinguishes fraction from concentration

Worked Example

An illustrative white cell count of 160 in 0.40 µL at 1:20 dilution is 8,000 cells/µL. With 60% neutrophils, the absolute neutrophil count is 4,800 cells/µL.

Result and Interpretation

Report the chamber area, computed volume, dilution and differential basis with the result.

Viva Questions and Answers

Why multiply by the dilution factor?

The counted chamber contains diluted material.

Why calculate absolute counts?

A percentage can change even when the absolute number of that cell type stays the same.

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