
THE MANUAL DIFFERENTIAL MYSTERY

Twenty Cells. Five Types. One Very Suspicious Smear.

BRR • ACT-006 | INDOOR | 20-30 MIN | LOW PREP | CONTAMINATION LEVEL: NONE | PRINT OR USE ON-SCREEN

FIELD STATUS	NO BLOOD • NO MICROSCOPE REQUIRED • SIMPLIFIED PAPER CELL MODELS • ONE DELIBERATE UNKNOWN
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There is one cell on this smear that does not belong in any of the neat little categories we gave you.

Which is rude.

Also extremely useful.

This activity turns the logic of a manual white blood cell differential into an indoor visual mystery. We compare simplified cell morphology, tally a 20-cell pretend differential, calculate easy percentages, and—most importantly—practice not forcing an unfamiliar finding into the nearest convenient box.

PURPOSE

Practice careful visual comparison, classification, systematic counting, tallying, simple percentages, and the laboratory habit of flagging morphology that cannot be confidently identified. This is a simplified educational model, not training for clinical cell identification.

MATERIALS

- Included **Cell Reference Key**
- Included **Mystery Smear A** and optional **Mystery Smear B**
- Family Field Notes Binder
- Pencil, crayons, or colored pencils
- Optional magnifying glass
- Optional sticky note to cover the answer key
- Absolutely zero actual blood specimens, which Quality Assurance appreciates

PREPARATION

1 • OPEN THE REFERENCE KEY

Use the cards on-screen or print them. The illustrations intentionally exaggerate a few recognizable features so non-lab families can compare patterns without needing a hematology textbook.

2 • SET UP THE FIELD NOTES BINDER

DIFFERENTIAL TALLY

MANUAL DIFFERENTIAL • SMEAR A

Neutrophil: _____
 Lymphocyte: _____
 Monocyte: _____
 Eosinophil: _____
 Basophil: _____
 Other / Manual Review: _____

TOTAL CELLS COUNTED: _____

3 • MEET THE CELL CAST

	NEUTROPHIL Simplified clue: segmented / multi-lobed purple nucleus.
	LYMPHOCYTE Simplified clue: large, mostly round purple nucleus.
	MONOCYTE Simplified clue: broad folded / kidney-like nucleus.
	EOSINOPHIL Simplified clue: two lobes + warm orange granules.
	BASOPHIL Simplified clue: dark purple granules that can obscure the nucleus.
	OTHER • MANUAL REVIEW Does not confidently match the reference key. Do not force the call.

PROCEDURE

1 • START THE SMEAR

Open **Mystery Smear A**. There are 20 simplified cells. Start in one corner and move in a consistent path across the page so the same cell is not accidentally counted twice.

2 • COMPARE MORPHOLOGY

For each cell, compare the nucleus shape, granules, and overall pattern with the Reference Key. Choose the best-supported category.

3 • TALLY THE DIFFERENTIAL

Add one tally mark in the Field Notes Binder for every cell classified. Do not write on loose paper unless you are using the printed smear itself as a reusable activity sheet.

4 • FLAG THE WEIRD ONE

One cell intentionally does not confidently match the five reference types. Circle it on the printed smear if you want, and tally it as **OTHER • MANUAL REVIEW**. No guessing for the sake of completing the form.

5 • RUN QC

Add the category counts. The total should equal **20 cells**. If it does not, rerun the count. One result is not a trend, and nineteen is not twenty.

6 • CALCULATE THE PRETEND DIFFERENTIAL

Because the activity uses 20 cells, each cell represents **5%**. Multiply each category count by 5. Example: 4 cells = 20%. This math is part of the model only; real laboratory differentials follow validated methods and larger reference counts.

7 • MAKE THE MEMORY

Save one photo or one short video: the tally page, the circled Mystery Cell, the reference key beside the smear, or the family arguing respectfully over a suspicious purple blob.

FIELD NOTES BINDER

Record the tallies, counts, pretend percentages, the Mystery Cell, and one sentence about what made the difficult cells difficult. If the activity is repeated later, keep the new differential beside the old one so the binder becomes a tiny archive of how pattern-recognition changes with practice.

REPEAT? YES / MAYBE / NO

OBSERVATIONS

Things worth noticing:

- Which cell type becomes easy to recognize first?
 - Which two are easiest to confuse?
 - Does using one consistent scan path reduce recounting?
 - What happens when a cell does not match the key?
 - Does anyone become more confident after only a few examples—and then get humbled by the Mystery Cell?
- Hematology welcomes you.

QUALITY CONTROL • QC

ACCEPTANCE CRITERIA	
	✓ Reference Key used before calling cells ✓ 20 total cells accounted for ✓ Tallies transferred to counts ✓ Unknown morphology flagged instead of forced into a category ✓ One finding recorded in the Field Notes Binder ✓ One photo or short video saved for memory
	COUNT = 20? QC PASSED.

QUALITY ASSURANCE • QA / SAFETY NOTES

MODEL ONLY

This activity uses illustrated paper cells only. It is not a diagnostic exercise and should not be used to interpret a real blood smear, CBC, or medical result.

If printing and cutting cards, supervise small children around scissors and small paper pieces. For toddlers, keep the activity on-screen or use full sheets rather than loose cutouts.

PROCEDURAL DEVIATIONS

Child classifies only five cells? Partial differential accepted.

Everyone decides the Mystery Cell is obviously a wizard cell? Story designation accepted; clinical classification remains OTHER.

Toddler identifies every purple thing as 'grape'? Developmentally compelling. No CAPA required.

Someone counts 21? Repeat count before release.

ROOT CAUSE ANALYSIS

If the count keeps missing 20, investigate the process before blaming the cells:

Did we skip a row? Recount the same cell? Lose our place? Change scan direction halfway through? Get distracted by snacks?

Process problem identified. The smear has been cleared of wrongdoing.

CAPA

CORRECTIVE ACTION: Mark a starting corner. Cover completed rows with a strip of paper. Count only 10 cells for a younger child.

PREVENTIVE ACTION: Use the same scan pattern every time and make the tally mark immediately after each call.

BONUS ROUND • DELTA SMEAR

COMPARE, DON'T DIAGNOSE

Run **Mystery Smear B** after Smear A.

Ask only:

- Which category increased?
- Which decreased?
- Did OTHER / MANUAL REVIEW change?

Record the observed difference in the binder. Do not assign a disease or diagnosis.

The point is comparison: **what changed?**

TODDLER / LITTLE-HANDS VERSION

Pick one cell on the Reference Key and say: **"Can you find one that looks like this?"**

Match one or two shapes. Point to colors. Count a few cells. Draw a giant purple circle in the Field Notes Binder. Stop while it is still fun.

The differential does not need to be released to the LIS.

BENCH NOTES •

UNEXPECTED MORPHOLOGY

The Mystery Cell exists because sometimes the most accurate answer available is:

I don't know yet.

That is not a failure of the differential. That is the differential doing its job.

Not everything belongs in the nearest available box.

Unexpected morphology. Manual review required.

FURTHER INVESTIGATION

Follow one rabbit hole if it sticks:

- What does a real peripheral blood smear look like?
- Why do neutrophils have segmented nuclei?
- What are granules?
- What does a laboratory do when a cell is difficult to classify?
- How does an automated differential differ from a visual/manual differential?

REFERENCES • GO DOWN THE RABBIT HOLE

CLSI H20 - Reference Leukocyte Differential Count (Proportional) and Evaluation of Instrumental Methods

CLSI describes a visual differential count as the reference basis for evaluating automated differential counters.

<https://clsi.org/shop/standards/h20/>

American Society of Hematology Image Bank - Normal Blood Smear

Educational peripheral-smear imagery showing red and white blood cells and normal leukocyte morphology.

<https://imagebank.hematology.org/image/64070/normal-blood-smear>

American Society of Hematology - Blood Basics

Overview of the major cellular components of blood.

<https://www.hematology.org/education/patients/blood-basics>

REVISION HISTORY

VERSION 1.0 • AUGUST 17, 2026

Initial activity developed. Includes reusable Cell Reference Key, Mystery Smear A, Mystery Smear B, manual-review trap, toddler variation, and Delta Smear bonus round.

WHAT I'M TAKING WITH ME

A smear is a field full of small differences.

The skill is not simply learning the names.

It is learning which details support a pattern—and recognizing the moment when the evidence does not support pretending.

Look closely enough, and the ordinary starts giving up its secrets.