

Calibration lab 2. Microscopic hair comparison

Four exercises. Every structure named on these pages is visible in the images.

CLAIM CEILING. READ THIS FIRST.

- **Polygraph.** It records breathing and heart rate. A change in either one is a physiological response. It is not a measurement of lying, and nothing in this unit produces a deception call.
- **Hair.** Microscopic similarity can support consistency or support exclusion. It cannot identify one person.
- **Fingerprint.** Pattern class can narrow a field or exclude a person. By itself it cannot name a source, and it never says when or why a finger touched something.
- **Timeline.** A scheduled event is not proof the person was there. Time of death is not established in the early case evidence.

HR-1. Name every part of one hair

Work down the list in order. Do not skip to the answer you expect. Every structure on the list is visible in this image.



HR-1. Questioned hair Q1. Scale bar is 100 micrometres.

Feature	What you recorded	How you decided
Medulla type absent, fragmented, interrupted, continuous		
Medullary index medulla width divided by shaft width		
Pigment density		
Pigment distribution uniform, peripheral, one-sided, clustered		
Shaft diameter		
Root type anagen, catagen, telogen, none present		

Feature	What you recorded	How you decided
Tip type tapered, cut, abraded, split, none present		

HR-2. Measure the medullary index

Use the scale bar. Measure the medulla width and the shaft width **at the same point** on the shaft, then divide. Do all three hairs before you compare with anyone.



HR-2. Hairs M1, M2 and M3. Scale bar is 100 micrometres.

Hair	Shaft width	Medulla width	Your index	A partner's index
M1				
M2				
M3				

THE PART PEOPLE SKIP

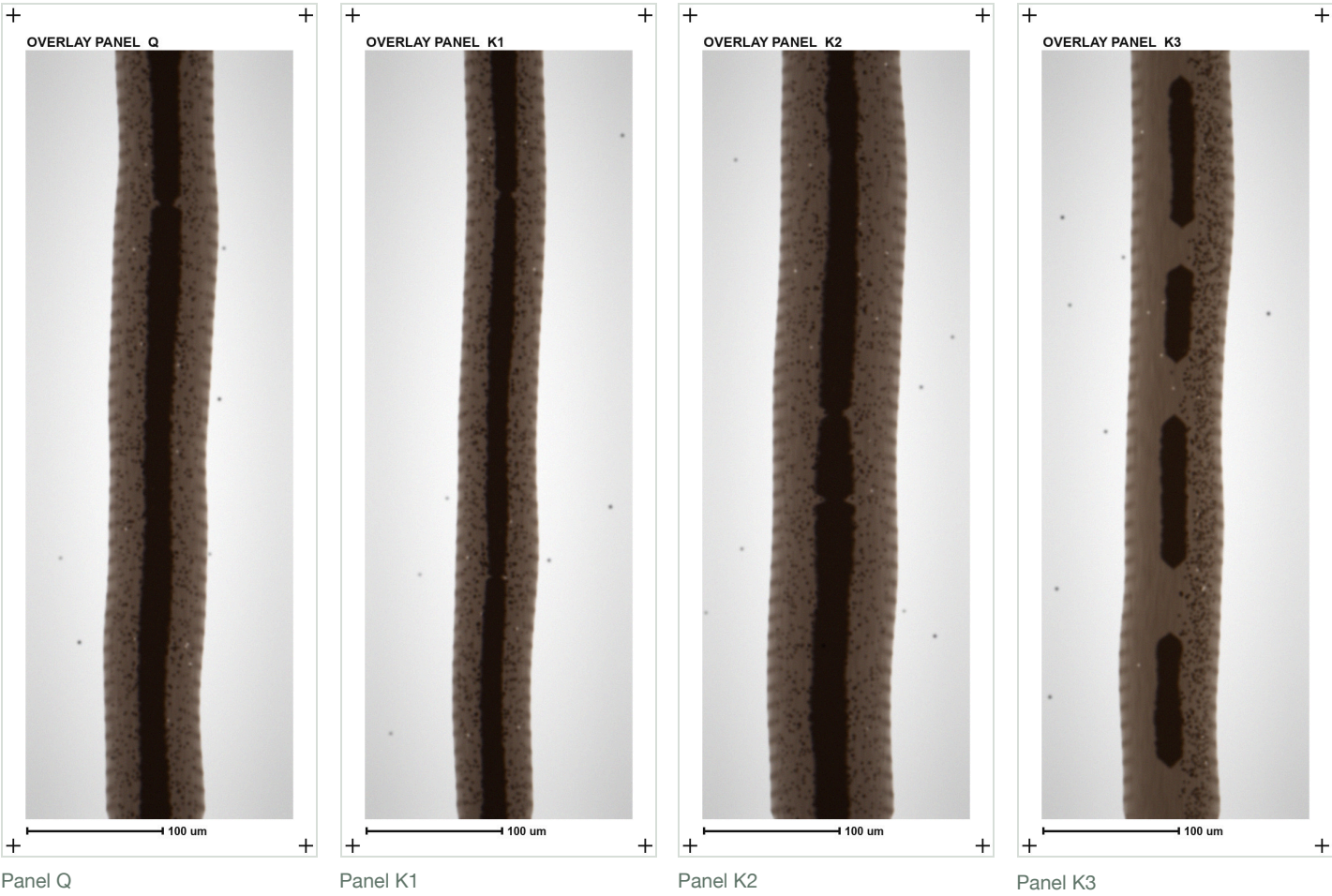
Your index and your partner's index will not be identical. That gap is not one of you being wrong. It is the **measurement uncertainty** of this method with these tools. Write down the size of the gap. Any conclusion you draw has to survive a difference that big.

HR-2b. Stack the hairs

Print this page on transparency film, cut the four panels apart, and lay the questioned panel over each known panel in turn. Line up the crosses in the corners first. Stacking shows you a width difference your eye will miss when the two hairs sit side by side on a page.

THIS ONLY WORKS BECAUSE OF ONE THING

Every panel is printed at the same magnification with the same scale bar. If two images are at different magnifications, laying one on the other compares nothing at all. Check the scale bars match before you stack anything, every time.



Record what stacking showed you

Comparison	Wider, narrower, or the same?	Does the medulla line up?	Your call
Q over K1			
Q over K2			

Comparison	Wider, narrower, or the same?	Does the medulla line up?	Your call
Q over K3			

THE TRAP IN THIS ONE

Three of these four panels came from one source. The odd one out is **not** the widest or the narrowest. If you sort them by width you will pick the wrong panel. Find the feature that is structural rather than dimensional.

The question that matters. Which feature separated the odd one out, and why would sorting by width alone have sent you to the wrong answer?

HR-3. Ten questioned hairs, rule locked first

LOCK YOUR RULE BEFORE YOU LOOK

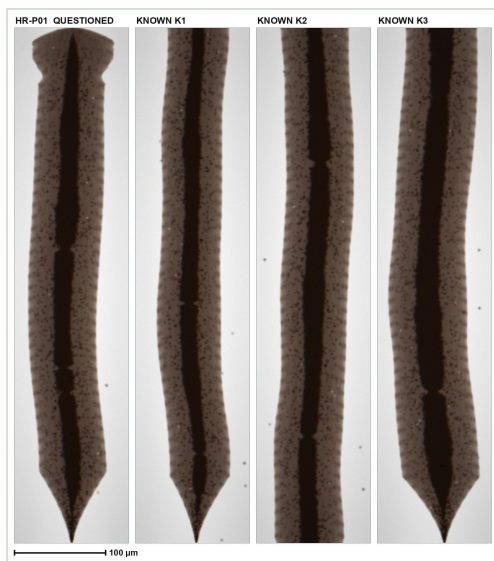
Write your decision rule now, before you open a single item. Once it is written you may not change it for this set. Changing a rule after seeing answers is how a test stops measuring anything.

Which features must agree before you will call a questioned hair consistent with a known sample?

Which single disagreement will make you exclude?

Remember that the strongest legal call here is CONSISTENT. Microscopic hair comparison cannot identify one person, so there is no rule you can write that produces an identification.

Each sheet shows one questioned hair beside a three-hair known sample. Compare the questioned hair to **all three** known hairs, not just the one that looks closest.



HR-P01



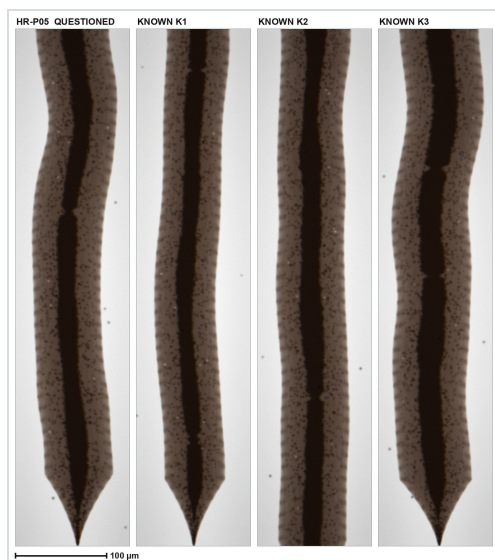
HR-P02



HR-P03



HR-P04



HR-P05



HR-P06



HR-P07



HR-P08



HR-P09



HR-P10

Your calls

Item	Features that agreed	Any feature that did not fit	Consistent / excluded / inconclusive
HR-P01			
HR-P02			
HR-P03			
HR-P04			
HR-P05			
HR-P06			
HR-P07			
HR-P08			
HR-P09			
HR-P10			

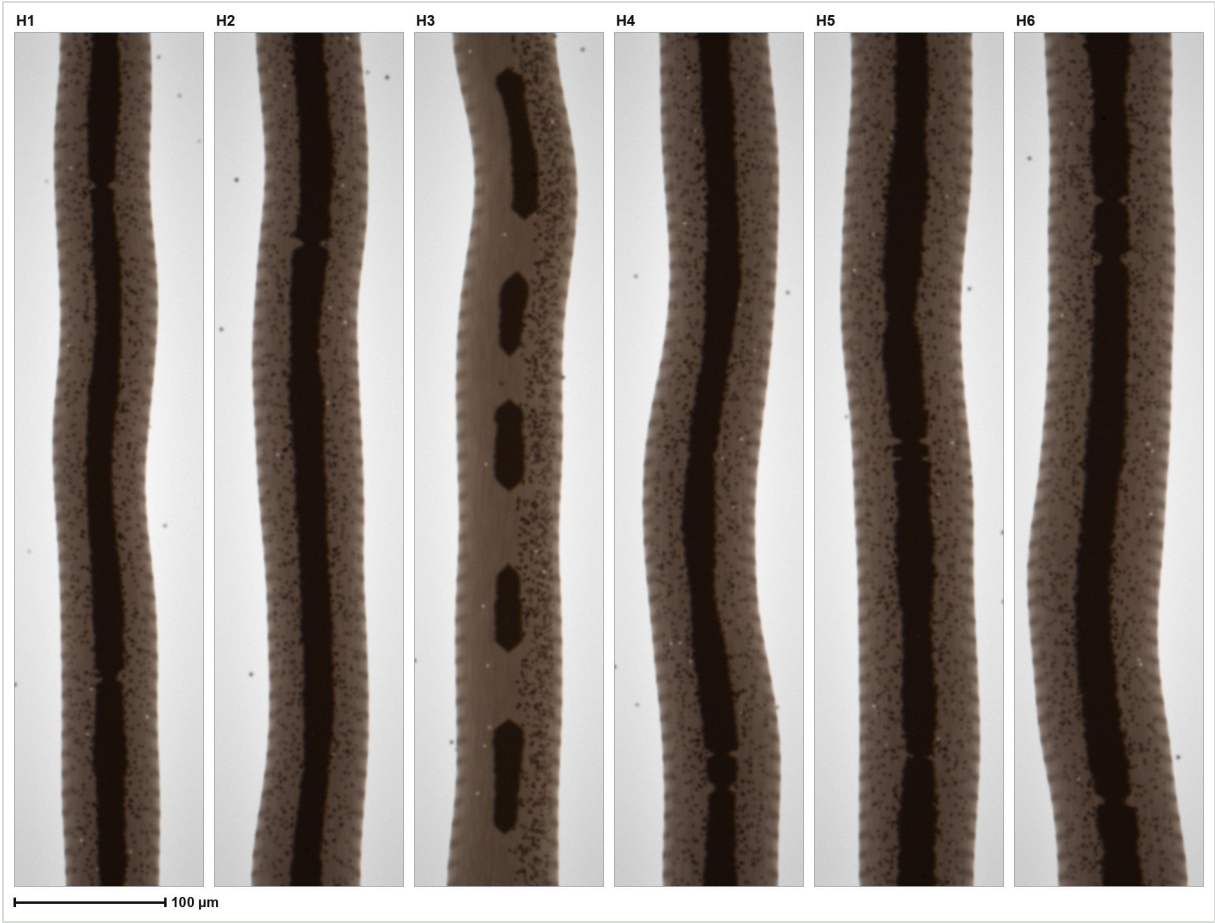
Count your own results

	Truth: same source	Truth: different source
You said same		
You said different		
You said inconclusive		

Inconclusive is not an error. Report it in its own row and keep it out of the numerator and the denominator when you state an error rate. Then say in one sentence how leaving it out changes the number you just reported.

HR-4. Six hairs, five from one head

Five of these six hairs came from **one person**. One did not. Find the one that does not belong, and be ready to say which feature told you.



HR-4. Hairs H1 to H6. Scale bar is 100 micrometres.

Hair	Medulla type	Approx. diameter	Pigment	Belongs with the group?
H1				
H2				
H3				
H4				
H5				
H6				

The two sentences that matter

1. Two hairs from the same head can differ in _____ and _____. So "these look different" is **weak** evidence that the sources are different, because ...

2. The hair that did not belong was separable by _____, which is a structural feature. Colour and thickness alone would not have caught it, because ...
