Helping Ensure Workflow Accuracy: Labeling, Tracking and High-Quality Slides

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Learning Objectives

Discuss how on-demand printing contributes to improved patient safety

Analyze the performance benefits of using validated consumables

Identify the necessary steps to transition from batch to on-demand printing

Recognize the importance of slide adhesion in maintaining specimen integrity

Disclosures

Rachel Finn, Arielle Hobson and Bill Martin are employees of StatLab

Labeling and tracking accuracy is critically important to ensure the best patient outcomes.

A CAP study revealed that up to 55% of errors in clinical laboratories are attributed to mistakes in specimen identification.[1]

Poll #1

How do you print – batch or on-demand?

- Batch
- On Demand

On-demand printing helps reduce errors, but ***printer size*** becomes critically important when labs are starved for space at workstations.

The smaller the better!

Batch vs. on-demand printing

What's the difference and why is it important

On-demand printing supports single piece workflow right at the microtome or grossing station

Batch printing utilizes a shared printer where cassettes or slides are then transferred to workstations and paired up with specimens—creating a higher margin for error

Poll #1 Responses

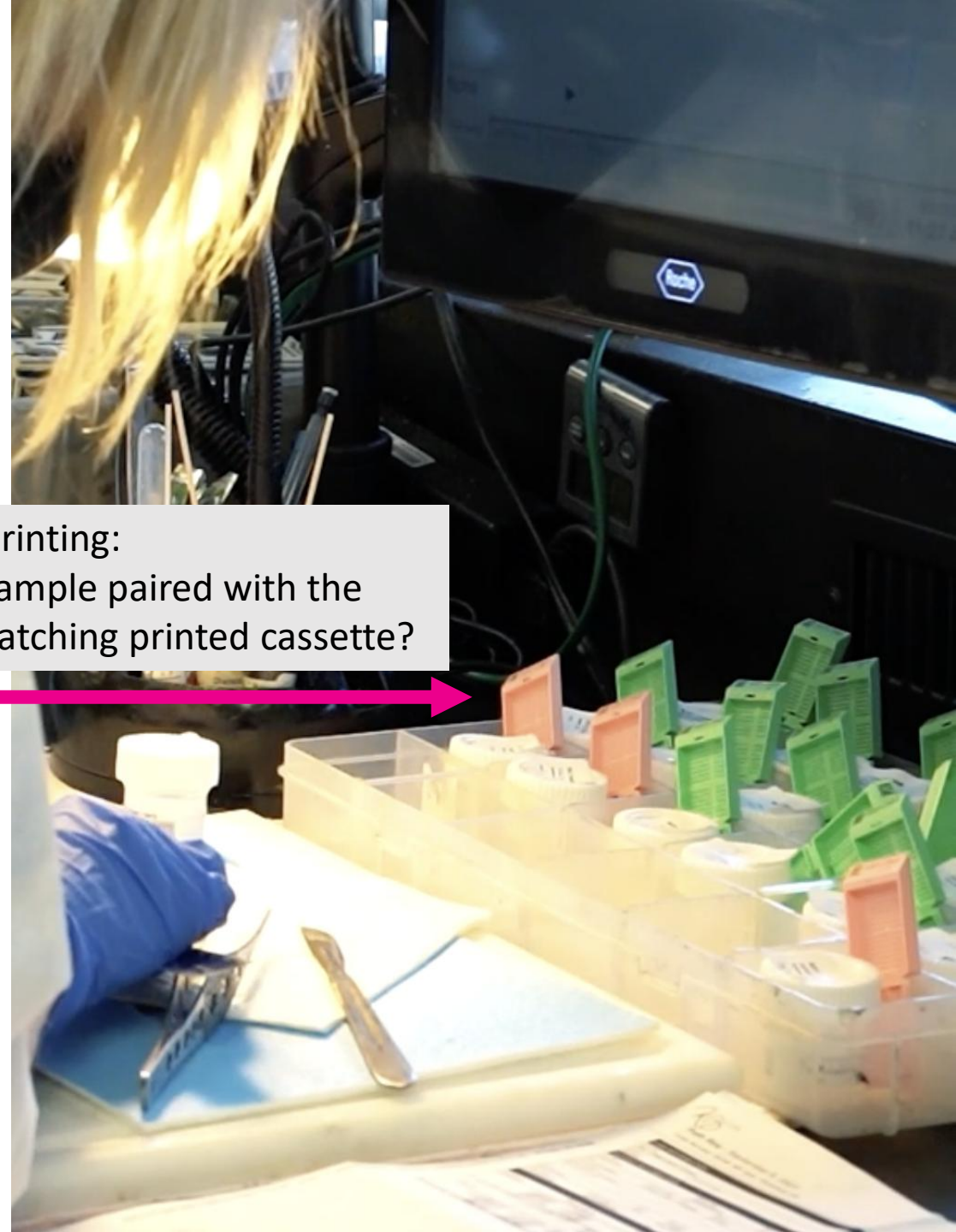
How do you print – batch or on-demand?

- Batch
- On Demand

Prevent errors before they begin

Multiple opportunities for transcription errors are created when batch printing cassettes

- Sample mix-ups can occur in the laboratory at transition points where a requisition form or cassette are being matched to a specimen container or slide
- Batch workflow methods are used without automated systems that prevent errors
- An incorrect cassette or slide can easily be picked up



Transitioning from batch to on-demand

A few steps can help your lab start the journey to improved specimen tracking

PRINTER PLACEMENT

- Begin by placing existing printers at the grossing station (cassette printers), or at the microtomy station (slide printers)

CONNECT AND TRACK

- Ensure the printer is connected with your LIS system if used
- If acquiring a new printer, look for a partner who offers supported integration with application specialists
- Set up protocols within the printer to deliver the right number—and type—of slides or cassettes for specific sample types

TRAIN STAFF ON THE BASICS

- Staff should all know how to scan individual blocks or slides for single slide or cassette printing as needed
- Train how to print from hopper of choice
- Look for a printer with a simple interface, and one that matches between slide and cassette printers to reduce training needed

UPDATE DOCUMENTATION

- SOPS
- Work instructions
- Training checklists

Choosing an on-demand printer

Choosing the right printer and service partner can make printing easy for your lab

LOOK FOR A PRINTER THAT IS:

Small

- Workstations are often crowded--the smaller the printer footprint, the better

Fast and easy to use

- Cassettes or slides should print quickly, ~5 seconds
- Integrated label designers within the printer mean that you don't need additional software or computers
- Look for slide and cassette printers with the same software interface to reduce training burden

Designed with built-in tools for accuracy

- Integrated scanners can support the ability to scan data from a request form or tissue sample barcodes
- Ask if the printer has user login and tracking for traceability for root cause analysis
- Look for a printer with intelligent slide and cassette selection, printing the right type and number of slides or cassettes based on the protocol selected for each tissue type

Designed with connectivity in mind

- Easy to connect to any LIS system
- Flexible connectivity options depending on use

Ask if your printer vendor partner will support your team with LIS integration and training

Preventing common challenges with automated printing

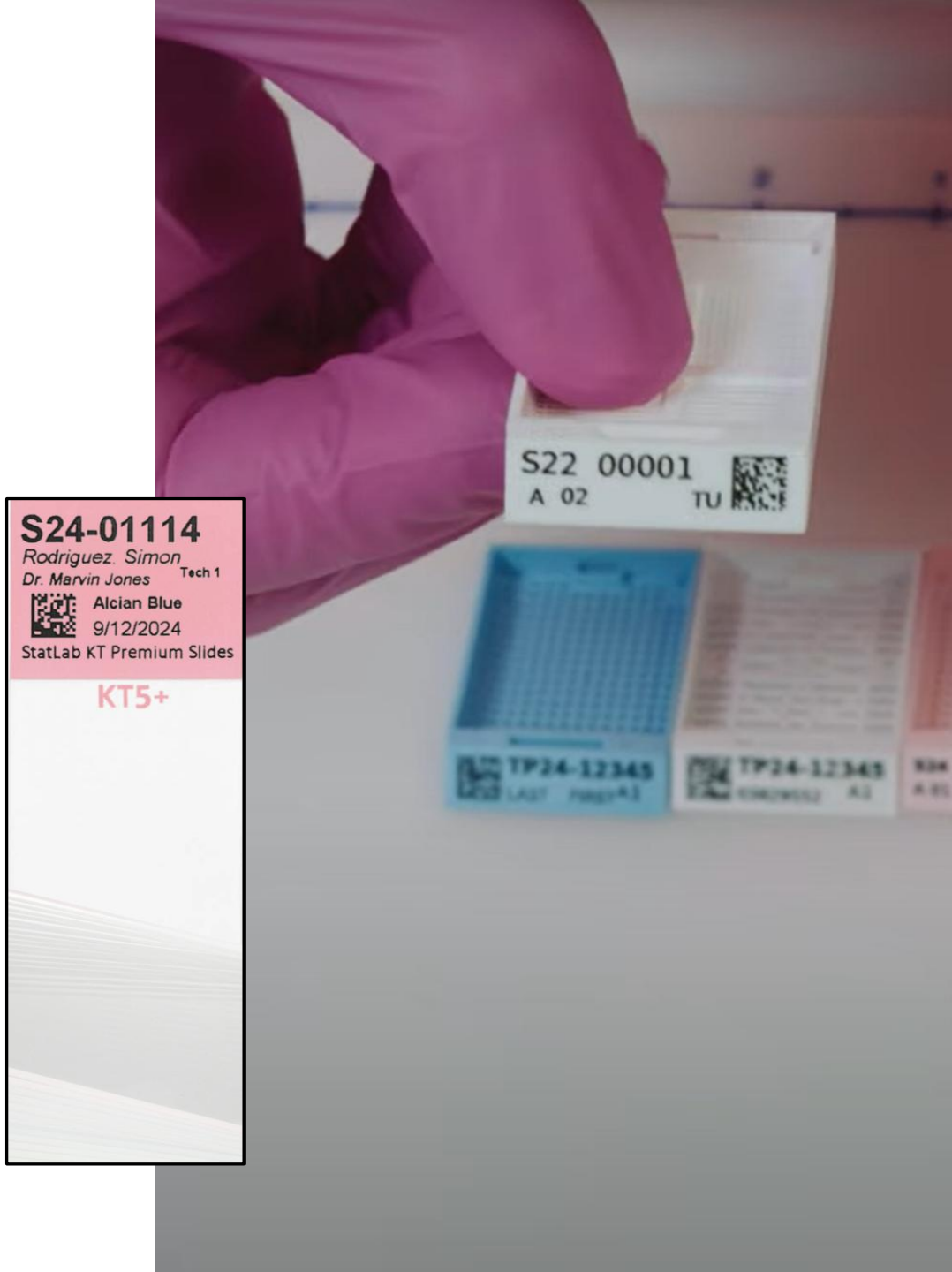
- **Print washes off or fades during processing due to harsh chemicals**
  - *Barcodes do not scan well as a result*
  - *This could be due to incompatible slides or cassettes*
- **Burden of matching cassettes to specimen containers + opportunity for mismatch errors**
  - *Move to on-demand printing*
- **High burden of printer maintenance**
  - *Look for a system with low maintenance*
- **Difficult connection to LIS or other systems**
  - *Ask about LIS compatibility and integration before you complete a purchase*

Why consumables matter

Compatibility between consumable and printing method prevents errors

Choosing validated consumables designed for your printer ensures:

- Reliable barcodes that scan every time
- Downstream automation enablement
- Consistency in quality and performance
- Reduced risk of errors and downtime
- Reliable use month after month
- Look for a vendor partner who manufactures **both** the printer and consumables



Poll #2

What challenges do you face with adhesion slides?

- Tissue wash
- Background staining
- Printing
- Digital pathology

Is there a perfect slide?

It depends on the needs of your lab

- What applications will the slide be used for?
- Hydrophilic or hydrophobic slide?
- How does your lab label and track slides?
- Is digital pathology used in your lab?
- Workflow – is your lab set up to use different slides for different applications?

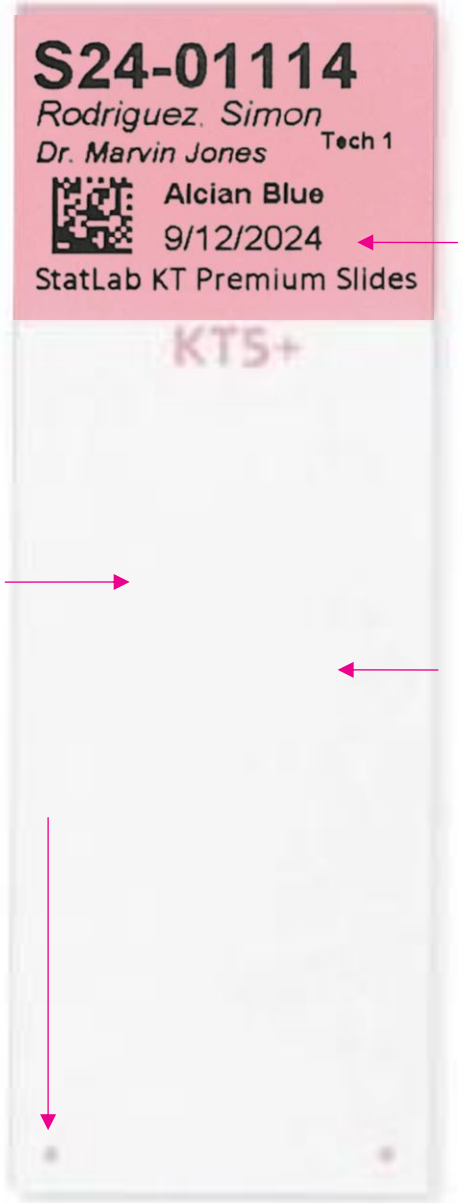
Anatomy of a slide

PAINT
Compatible with printers or hand labeling, various colors available

GLASS
Quality and purity

ADHESIVE COATING
Compatible with your tissues, processes, performance

SLIDE SEPARATORS
Small enough to not interfere with tissue and staining but large enough to separate slides to aid in printer throughput



Paint
- Printer compatibility
- Workflow indicator

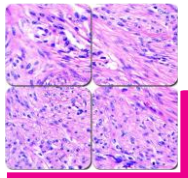
Glass
quality & composition

Adhesive coating
- Tissue adhesion
- Waterbath behavior
- Wettability
- Stainer compatibility
- Background

Slide separators
imaging & printer compatibility

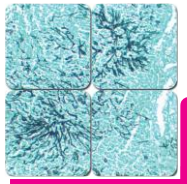
WHAT MATTERS MOST IN YOUR LAB?

Applications



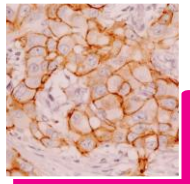
H&E

- Non-adhesion or Adhesion?
- Sticky for Tricky? Trickier tissues like breast, skin, nail, or bone?



Specials

- Non-adhesion or Adhesion?
- Sticky for Tricky? Trickier tissues like breast, skin, nail, or bone?
- Silver stains?



IHC

- Hydrophilic or hydrophobic?
- Extra Sticky for Tricky? Trickier tissues like breast, skin, nail, or bone?
- Which stainer is used?

Digital

- Which digital imager is used?
- What cover glass or coverslip tape is used?

Hydrophilic or Hydrophobic?

Hydrophilic	Hydrophobic
• Water loving • “Chase” tissue section with slide • Forceps to anchor tissue to slide • Tissue section can be repositioned quickly if needed	• Water repelling – almost like a raincoat • Tissue section “jumps” onto slide and adheres easily, allowing you to pick up more slides in less time • Tissue section “stuck” to slide and cannot be repositioned

Slide label paint compatibility with printing method matters

- Slide Printers
  - Ink jet
  - Thermal transfer
  - Laser
    - UV laser
    - IR laser
- Hand Label
- Print Labels

Ink Jet

IR Laser

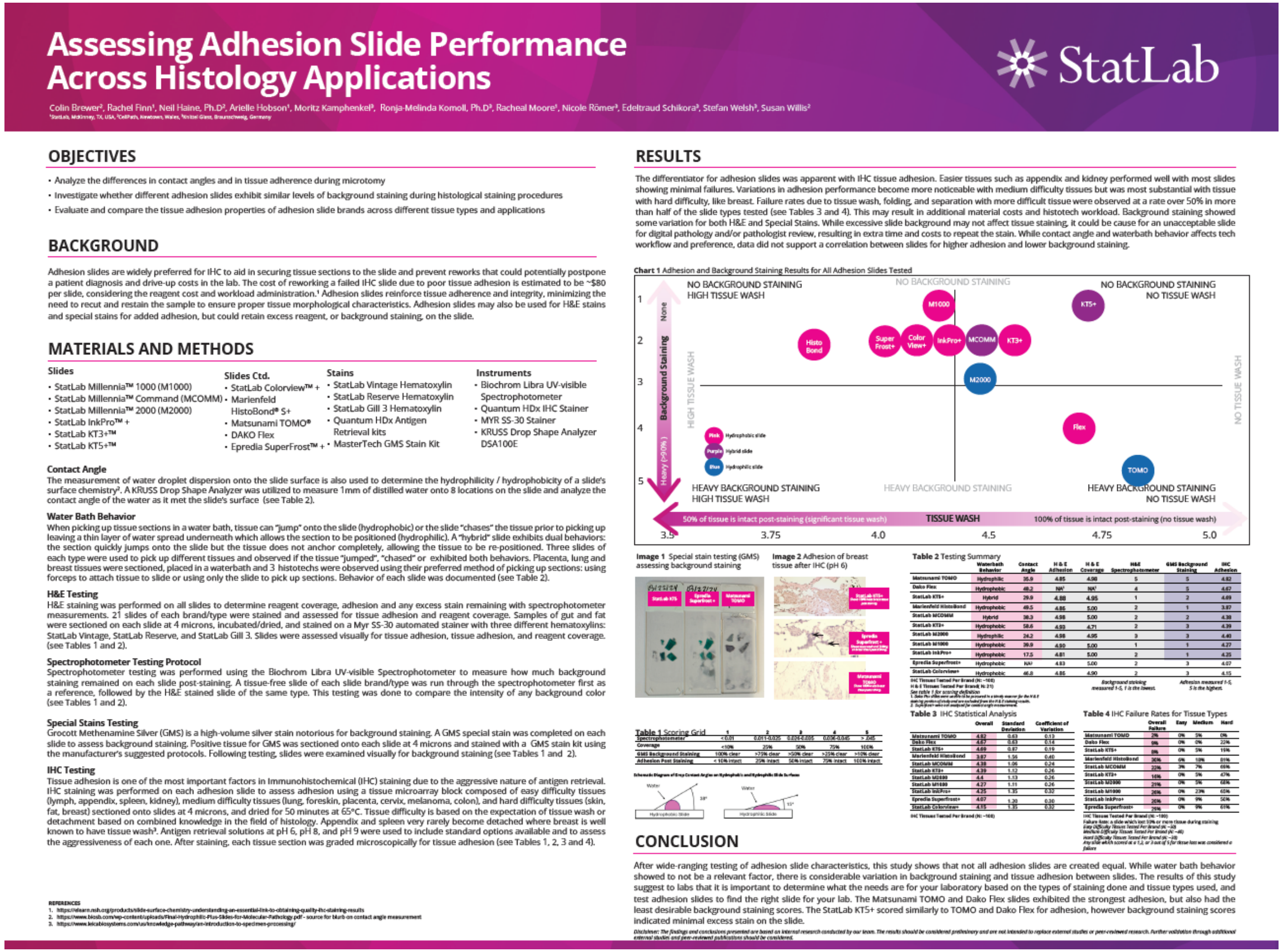
Thermal Transfer

UV Laser

Understanding slide adhesion

NSH Poster

- Showcased at NSH 2024
- Demonstrates performance differences across histology applications, especially with tissue wash and background staining



Background staining

Excessive background can be problematic in two ways:

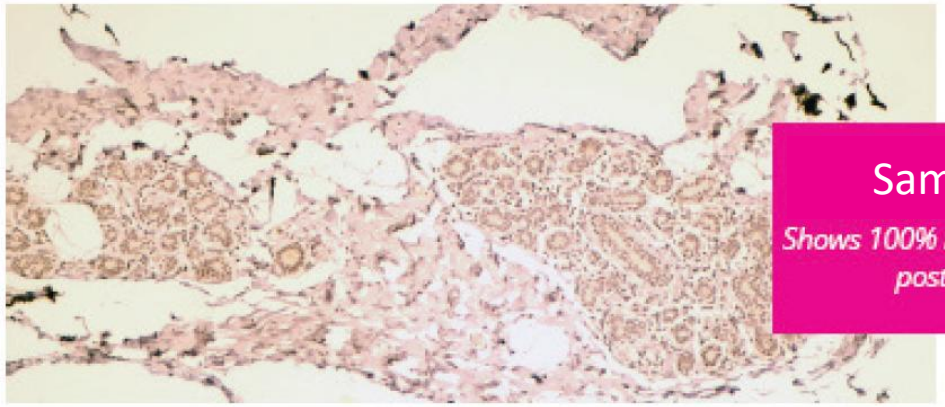
- ✓ Pathologists view it as a sign of "sloppy" work
- ✓ Can interfere with digital pathology

- H&E measured with a Spectrophotometer
- H&E and GMS measured visually

Image 1 Special stain testing (GMS) assessing background staining

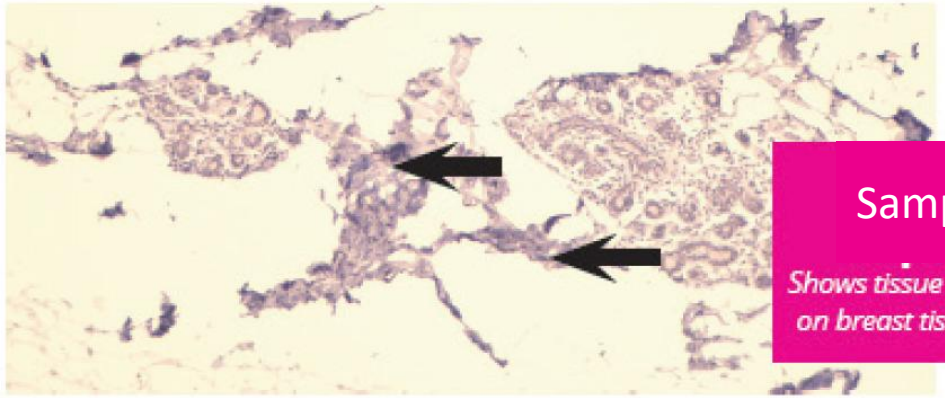
IHC tissue adhesion

- True differentiator between adhesion brands
- Only a few slides were able to hold onto hard tissues like breast and skin
  - Matsunami TOMO
  - StatLab KT5+
  - Dako Flex



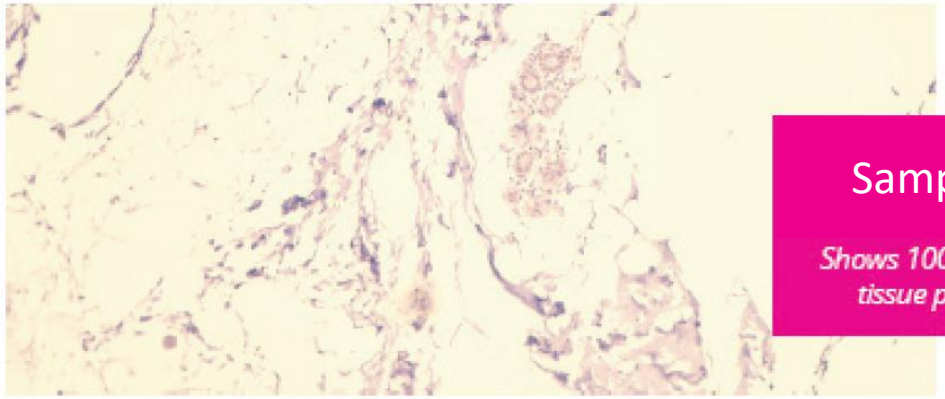
Sample A

Shows 100% intact breast tissue post-staining.



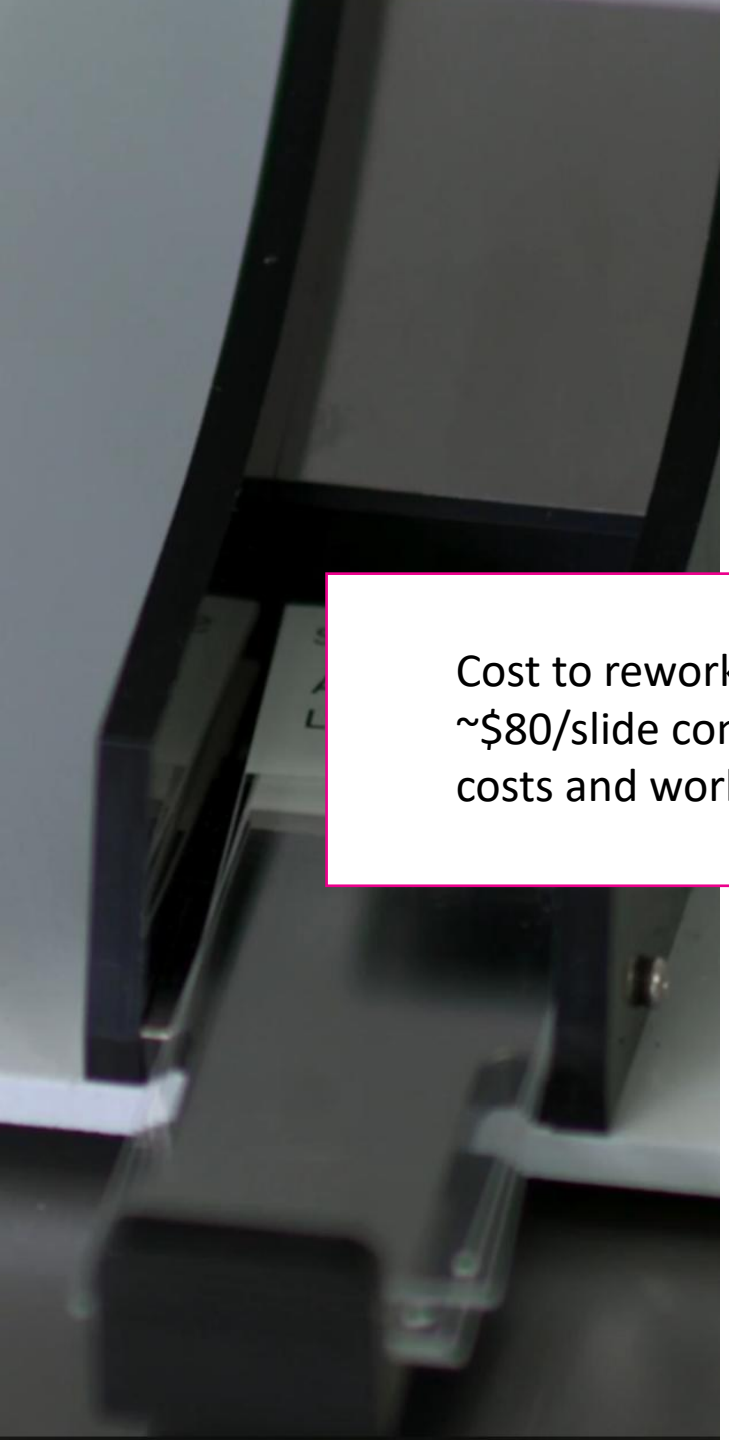
Sample B

Shows tissue wash and folding on breast tissue post-staining.



Sample C

Shows 100% intact breast tissue post-staining.



What is your repeat rate?

Poor slide adhesion could be driving up costs in your lab

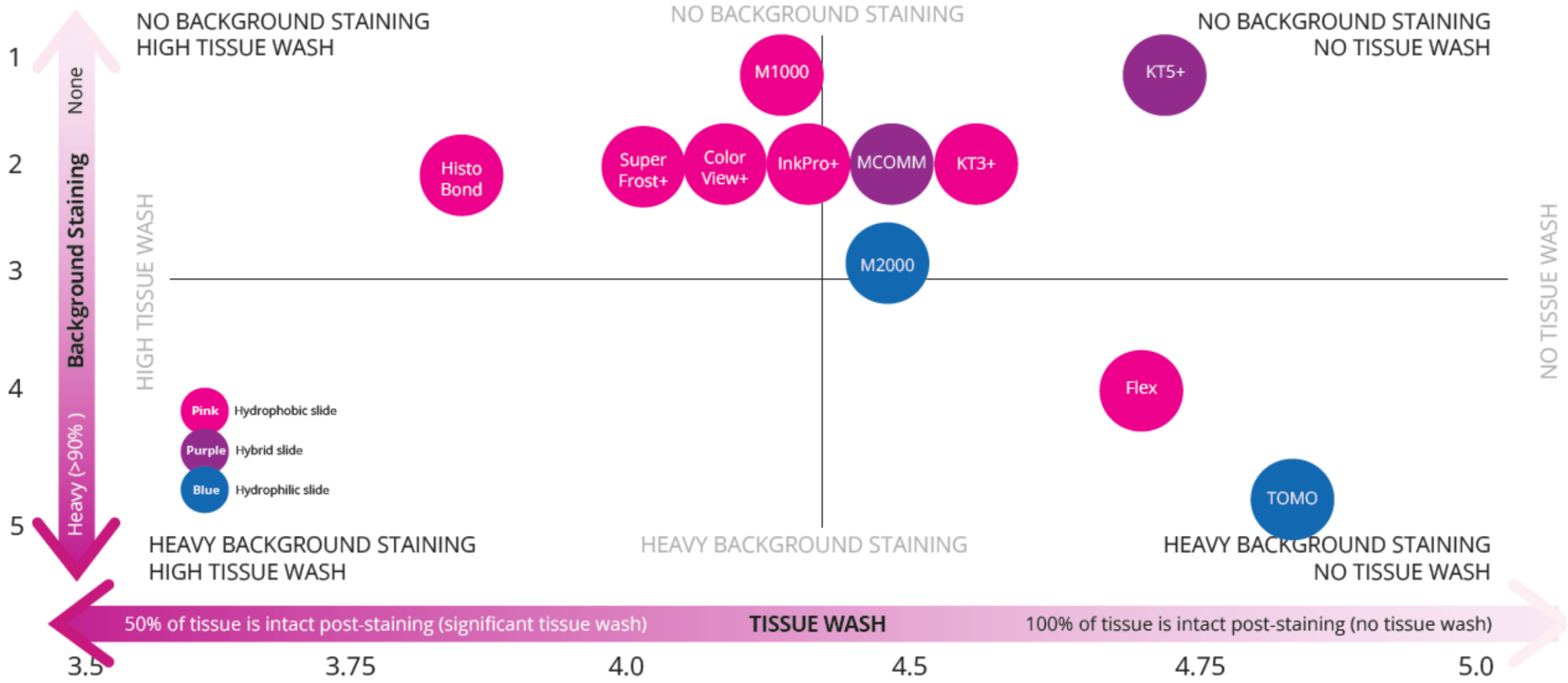
Cost to rework failed IHC slide ~$80/slide considering reagents costs and workload administration

Table 4 IHC Failure Rates for Tissue Types

	Overall Failure	Easy	Medium	Hard
Matsunami TOMO	2%	0%	5%	0%
Dako Flex	9%	0%	0%	22%
StatLab KT5+	8%	0%	5%	19%
Marienfeld HistoBond	30%	6%	18%	81%
StatLab MCOMM	22%	3%	7%	69%
StatLab KT3+	16%	0%	5%	47%
StatLab M2000	21%	0%	5%	68%
StatLab M1000	26%	0%	23%	65%
StatLab InkPro+	20%	0%	9%	50%
Epredia Superfrost+	29%	0%	9%	61%
StatLab Colorview+	25%	0%	10%	69%

IHC Tissues Tested Per Brand (N: ~100)
Failure Rate: a slide which lost 50% or more tissue during staining
Easy Difficulty Tissues Tested Per Brand (N: ~30)
Medium Difficulty Tissues Tested Per Brand (N: ~40)
Hard Difficulty Tissues Tested Per Brand (N: ~30)
Any slide which scored at a 1,2, or 3 out of 5 for tissue loss was considered a failure

Learning more about adhesion & background staining impact



Ventana BenchMark ULTRA Testing

Performance can vary depending on slide type used in specific IHC stainer platforms

Sample A

Tissue adhesion scoring results after aggressive antigen retrieval.

	Overall	Skin Shaves	Skin	Tonsil	Benign Breast	Breast Cancer A	Breast Cancer B
Sample A	**4.60**	5.00	5.00	5.00	4.17	4.25	4.17
Sample B	**4.19**	4.83	4.17	4.83	2.75	4.75	3.83
Sample C	**3.31**	4.50	4.33	4.67	1.42	2.58	2.33

Table 2.
Failure rates by brand.

	Slides Tested	Slides Failed	% Fail
Sample A	72	7	10%
Sample B	72	16	22%
Sample C	72	37	51%

Grading Scale A.

Adhesion Scoring Criteria: % of tissue intact post-staining.

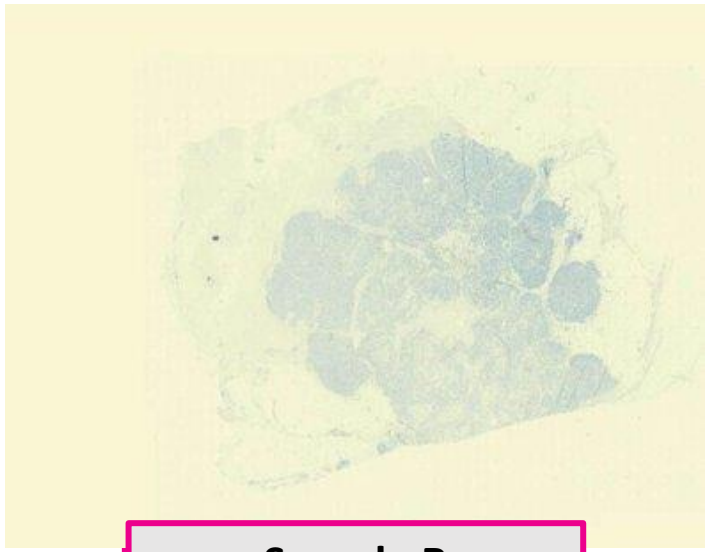
1 >10% 2 25% 3 50% 4 75% 5 100%

Failure defined as any slide scored at a 1, 2, or 3 out of 5 for tissue adhesion, indicating that 50% or less of the tissue remained on the slide after staining.

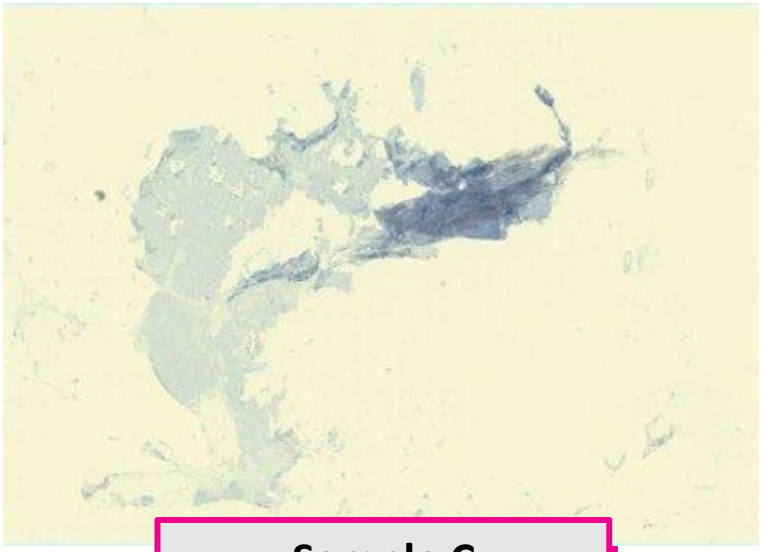
Is tissue wash preventing diagnosis?

Poor slide adhesion can lead to tissue wash and folding, preventing accurate diagnoses

Sample A



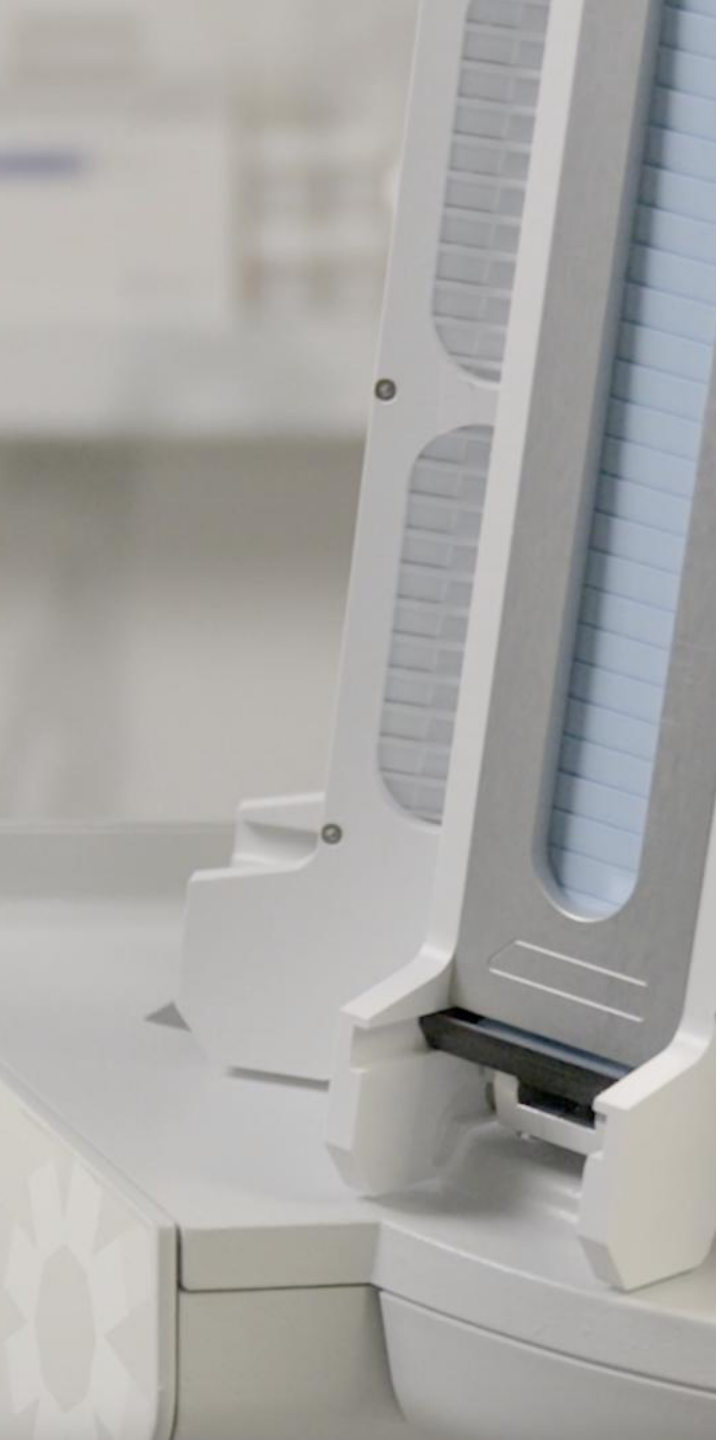
Sample B



Sample C

Same block of breast cancer tissue

- **Sample A maintained tissue integrity**
- **Sample B maintained tissue integrity**
- **Sample C lost more than 50% tissue (wash / folding)**



Many factors contribute to an accurate diagnosis in a lab

Factors covered today:

- Best practices for accurate specimen identification and tracking
- Using automation to minimize human error
- Validated slides and cassettes for your printer
- High slide adhesion when it matters to prevent tissue wash
- Minimal background staining
- Look for a vendor partner who manufactures **both** the printer and consumables

Simple steps can improve results

Get curious in your lab

- Ask questions to understand if incompatible consumables are making automation harder than it needs to be
  - Clues
    - Ribbon burning
    - Smeared slides or cassettes
    - Scanning errors
- Take steps to support on-demand printing
  - Look for a vendor partner who manufactures **both** the printer and consumables
- Choose the right slides for your application