

The hidden impact of slide choice on digital pathology: background staining, scanning efficiency, and data burden.

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Background

Whole slide imaging (WSI) is gaining widespread adoption in diagnostic and research pathology. While attention is often given to image clarity and scanner performance, the microscope slide itself can be an influential factor in digital pathology.

Background staining, an artifact arising from residual stain retained on slide surfaces, can affect the efficiency and economics of digital scanning systems as it can introduce a non-tissue signal that scanners interpret as tissue. This study evaluates the impact of background staining to whole slide image file size and scanning speed between 2 different brands of adhesion slides.

Results

In this initial focused study, the evaluated competitor adhesion slides exhibited moderate to severe background staining, resulting in significantly longer scan times and file sizes, whereas the StatLab KT5+ slides exhibited minimal background staining, resulting in quicker scanning times and smaller file sizes.

StatLab KT5+ Slides

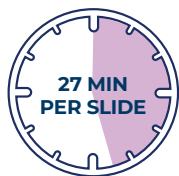
GMS Stain
Fungus Tissue
20X Magnification

Competitor Slides

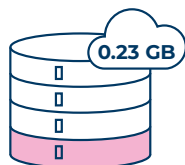
GMS Stain
Fungus Tissue
20X Magnification



Average Scan Time
More than 6X longer when background staining is present.



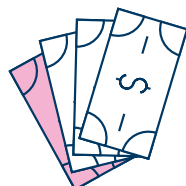
27 MIN PER SLIDE



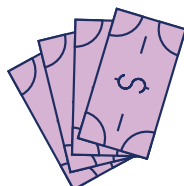
Average File Size
More than 4X larger when background staining is scanned.



1.07 GB



Annual Storage Costs
More than 4X more costly when images with background staining are archived.



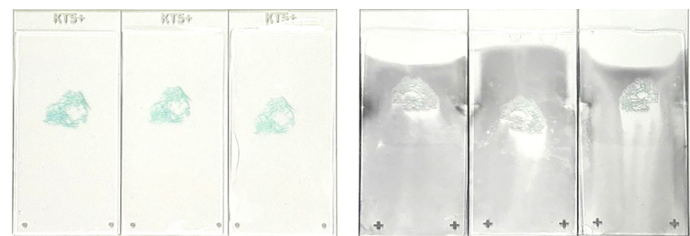
Materials

- StatLab KT5+[®] Premium Advanced Adhesion Slides
- Competitor Adhesion Slides
- StatLab MasterTech[™] GMS (Grocott's Methanimine Silver) Stain Kit
- Motic[®] EasyScan One Digital Imager, EasyScan Application version 1.0.7.156
- StatLab Acrymount[™] Plus Mounting Medium
- StatLab KT[®] Koverglass Thickness #1, 24 x 50 mm

Methods

Twenty-five slides of each slide brand were prepared using 4 µm sections of formalin-fixed, paraffin-embedded tissue containing known positive fungal elements from the same tissue block, manually stained with the same GMS special stain protocol, coverslipped, and dried overnight at ambient temperature. Each slide was then scanned at 20X magnification using a high-resolution whole slide imager according to the manufacturer's manual. The tissue finder was set to auto-scan per the manufacturer's manual. Metrics evaluated included total scan time per slide and whole slide image file size. This study did not evaluate clinical diagnostic quality or outcomes.

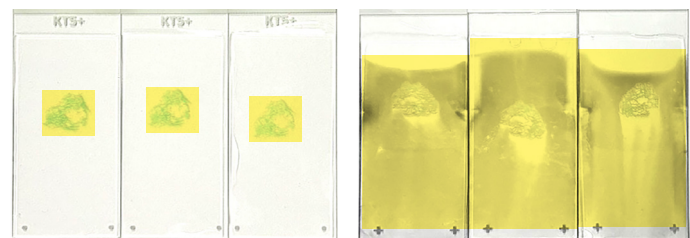
Image 1. Unaided Visual Images



KT5+ Slides

Competitor Slides

Image 2. Representation of Areas Detected by Tissue Finder (highlighted yellow)



KT5+ Slides

Competitor Slides

Table 1. Results Summary	Average Scan Time	Average File Size	Est. Storage Cost for 10,000 Slides (\$0.05/GB)
StatLab KT5+ Advanced Adhesion Slides <i>Standard deviation</i>	<4 min/slide <i>0.096337969</i>	0.23 GB <i>.1GB</i>	\$115
Competitor Adhesion Slides <i>Standard deviation</i>	27 min/slide <i>0.360806551</i>	1.07 GB <i>.18GB</i>	\$535

Table 2. Results of Scan Times	0-5 Minutes	5-15 Minutes	15-25 Minutes	25+ Minutes
StatLab KT5+ Advanced Adhesion Slides	20	5	0	0
Competitor Adhesion Slides	0	0	13	12

Slide Count, n=25 for each brand

Table 3. Results of File Size	0 GB - .3 GB	.3 GB - .6 GB	.6 GB - 1 GB	1.0 GB+
StatLab KT5+ Advanced Adhesion Slides	22	3	0	0
Competitor Adhesion Slides	0	0	13	12

Slide Count, n=25 for each brand

Conclusion

The results demonstrate that slide choice not only directly affects background staining, which is not simply a visual concern, but also contributes to workflow inefficiencies. For labs scaling digital pathology programs, these inefficiencies could affect turnaround times, storage infrastructure, and long-term costs.

Slides with moderate to severe background staining required **six times** longer to scan (Table 1). Scan times could be reduced by manually adjusting the tissue finder for each slide or utilizing 'Preview Mode' but that would increase the hands-on time of histotechs, potentially informing the headcount needs of a lab.

File sizes of scans, including background staining, were more than **four times** as large as slides that had minimal background staining. In the December 2025 issue of *Laboratory Economics*¹, Dr. Lee Cooper, Director of the Institute for Artificial Intelligence in Medicine and a professor of pathology and toxicology at Northwestern University Feinberg School of Medicine, stated file size for a "typical slide is about 1 GB, and that cloud storage costs could be between \$.01 and \$.07 per GB per year." A large lab that is looking to adopt a full digital workflow can readily store between 1,000 GB and 1,000,000 GB.²

Using estimated costs of \$.05 GB annual storage rate per slide, a lab's storage cost for 10,000 slides without background staining, like the StatLab KT5+, would be \$115, whereas a slide with moderate to severe background staining averaging 1GB in size would be ~ \$535 for the same number of slides, which is an increase of nearly **four times** in cost comparison.

Choosing a digital-ready slide, such as the StatLab KT5+, that exhibits minimal background staining is a practical and actionable way for labs to improve consistency, efficiency, readiness for increasing digital workflows, and remove barriers to digital adoption.

References

- Cooper L. [What is the Future of Artificial Intelligence in Digital Pathology?]. *Laboratory Economics*. December 2025.
- Lars Ole Schwen, Tim-Rasmus Kiehl, Rita Carvalho, Norman Zerbe, André Homeyer, Digitization of Pathology Labs: A Review of Lessons Learned, *Laboratory Investigation*, Volume 103, Issue 11, 2023, 100244, ISSN 0023-6837, <https://doi.org/10.1016/j.labinv.2023.100244>.

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