

## Patient Safety Tip of the Week

August 30, 2022

### Stunning Lab Vulnerability

We’ve done many columns on misdiagnoses due to laboratory errors. Most have dealt with issues such as incorrect specimen labeling or lost specimens. But in several columns, we noted misdiagnoses due to contamination of tissue specimen slides with tissue from a specimen from another patient. In our January 22, 2013 Patient Safety Tip of the Week [“You Don’t Know What You Don’t Know”](#) we discussed the possibility that you might have a biopsy specimen which was either not yours or was yours but also had some tissue from another patient on the slide(s). Such errors are known as occult specimen provenance complications (SPC’s). In that Tip we noted a study providing an estimate of how often such SPC’s occur ([Pfeifer 2013](#)). They examined about 13,000 prostate biopsy specimens from a wide variety of urology practices and pathology laboratories using a DNA identification technology. They found the frequency of occult type 1 errors (a complete transposition between patients) was 0.26% and type 2 errors (contamination of the patient’s tissue with 1 or more unrelated patients) was 0.67%. Overall, the mean frequency of SPCs across practice settings was 0.22% for type 1 errors and 1.69% for type 2 errors.

Our March 24, 2015 Patient Safety Tip of the Week [“Specimen Issues in Prostate Cancer”](#) noted a study ([Wojno 2015](#)) that estimated the potential economic impact of such errors.

The July 2022 issue of the American Journal of Clinical Pathology contained a study that really opened our eyes to the issue of specimen contamination. Carll et al. ([Carll 2022](#)) noted that, after some laboratory changes due to hospital construction, some cases were found to be affected by “carryovers” (contaminants that are incorporated into the paraffin block). They note that incorporation into a block makes identification of a contaminant more difficult, as the contaminant will often be present in multiple cut levels and typically lack the artifactual morphologic features that characterize “floaters” (the more common type of contaminant that occurs when thin-cut tissue sections transfer to inappropriate slides).

Fortunately, the pathologists at this hospital were able to identify the contamination and no patients were impacted. But the occurrence led to an investigation to determine the underlying causes.

Carryovers indicate contamination at or before the point of tissue embedding and have usually been attributed to either the grossing bench or the embedding station. But they were able to rule out contamination at the bench or embedding station. They suspected that the contamination may have occurred during tissue transport through a pneumatic tube system that had been required during the recent hospital construction.

So, they did an interesting experiment to assess that possibility. Cassettes of friable donor tissue were mixed with cassettes of spongy recipient tissue in formalin-filled containers and agitated by shipment via pneumatic tube. The tissue cassettes were processed, embedded as blocks, and cut as usual. Liquid samples were prepared from the submission containers as well as from workstation submission containers and histology tissue processor waste.

They found a high rate of contamination (14.9%) under these artificial conditions. Friable donor tissue, including urothelium and colorectal adenocarcinoma, and placental villi were common contaminants, and fluid from submission containers showed viable tumor cells and fragments.

This study implicates liquid transport media as a possible avenue of contamination during submission and transportation of tissue cassettes for histologic processing. Attention should be given to the friability of submitted tissue and **physical agitation** of the cassettes in transit. Such contaminants may be present in the fluid in tissue submission bins and in tissue processor fluid.

That finding certainly has practical implications. They concluded that agitation of fluid sloshing back and forth between and through cassettes during transport presumably can dislodge small fragments of friable tissue that may subsequently get trapped within tissue submitted in other cassettes. While few labs probably still transport specimens via pneumatic tubes, presumably any method of transport that has significant agitation could produce similar contamination. They note that couriers using carts or motor vehicles to transport specimens may produce some degree of physical agitation that could be similar to that produced by the pneumatic tube transport.

The authors encourage anatomic pathology labs to review their submission and transportation protocols to identify possible sources of tissue contamination and to improve quality and safety outcomes.

In an editorial accompanying the Carll study, Zarbo ([Zarbo 2022](#)) discusses the numerous steps in which contamination of pathology specimens might occur and concludes “it is safe to conclude that tissue contamination occurs daily, everywhere surgical pathology is practiced, despite good intention, written procedures, staff education, competency assessments, and regulatory requirements crafted to promote safety.” He says it is imperative that pathologists be ever suspicious and adopt the “trust but verify” approach to microscopic diagnosis. He notes that when the observations don’t seem to be compatible with the clinical context, we can stop and verify a suspected tissue misidentity

with molecular DNA fingerprinting of even tiny amounts of tissue in doubt. But he acknowledges that an unsuspected contaminant that appears to make sense in the microscopic context of the case creates a dangerous problem.

In one of our earliest columns on lab errors (see our October 9, 2007 Patient Safety Tip of the Week “[Errors in the Laboratory](#)”) we noted a paper ([Suba 2007](#)) that suggested we consider the “DNA timeout” akin to the surgical timeout where we ask the question “Is this the correct diagnosis for the correct patient?” before doing an invasive procedure.

Zarbo laments that” the open and communal systems, numerous manual touches, and reused tools requiring voluntary and imprecise manual wiping to clean between patients are not a sound basis to guarantee a process that is free from contamination.” He concludes that it is time for a radical redesign of the processes involved.

#### **Some of our other columns on errors related to laboratory studies:**

- October 9, 2007 “[Errors in the Laboratory](#)”
- November 16, 2010 “[Lost Lab Specimens](#)”
- October 11, 2011 “[LEAN in the Lab](#)”
- March 6, 2012 “[“Lab” Error](#)”
- April 2012 “[Specimen Labeling Errors](#)”
- January 22, 2013 “[You Don’t Know What You Don’t Know](#)”
- April 15, 2014 “[Specimen Identification Mixups](#)”
- November 25, 2014 “[Misdiagnosis Due to Lab Error](#)”
- March 24, 2015 “[Specimen Issues in Prostate Cancer](#)”
- May 26, 2015 “[How Safe is the Lab You Use?](#)”
- March 29, 2016 “[Inappropriate Lab Testing](#)”
- September 27, 2016 “[Lab Errors Costly](#)”
- November 15, 2016 “[Surgical Specimen Mishaps](#)”
- March 20, 2018 “[Minnesota Highlights Lost Tissue Samples](#)”
- October 9, 2018 “[More on Lab Specimen Mixups](#)”
- March 26, 2019 “[Patient Misidentification](#)”
- May 12, 2020 “[Lab Errors and COVID-19](#)”
- November 24, 2020 “[Specimen Management](#)”
- January 18, 2022 “[AORN on Specimen Management](#)”

#### **References:**

Pfeifer JD, Liu J. Rate of Occult Specimen Provenance Complications in Routine Clinical Practice. Am J Clin Path 2013; 139: 93-100  
<https://academic.oup.com/ajcp/article/139/1/93/1766518>

Wojno K, Hornberger J, Schellhammer P, et al. The Clinical and Economic Implications of Specimen Provenance Complications in Diagnostic Prostate Biopsies. Journal of Urology 2015; Published online: November 13, 2014

<https://www.auajournals.org/article/S0022-5347%2814%2904864-2/abstract>

Carll T, Fuja C, Antic T, et al. Tissue Contamination During Transportation of Formalin-Fixed, Paraffin-Embedded Blocks. American Journal of Clinical Pathology 2022; 158(1): 96-104

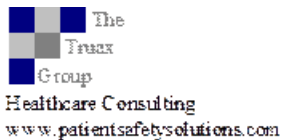
<https://academic.oup.com/ajcp/article-abstract/158/1/96/6534995?redirectedFrom=fulltext&login=false>

Zarbo RJ. The Unsafe Archaic Processes of Tissue Pathology: Manifesto for Change. American Journal of Clinical Pathology 2022; 158(1): 4-7

<https://academic.oup.com/ajcp/article-abstract/158/1/4/6540054?redirectedFrom=fulltext&login=false>

Suba EJ, Pfeifer JD, Raab SS. Patient Identification Error Among Prostate Needle Core Biopsy Specimens—Are We Ready for a DNA Time-Out? J Urol 2007; 178(4): 1245-1248

<https://www.auajournals.org/article/S0022-5347%2807%2901423-1/abstract>



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