Winter 2012–2013

Connections

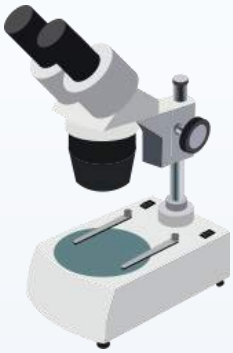
ISSN 1496-3876

www.cmpt.ca

CMPT QUARTERLY ON-LINE NEWSLETTER

Volume 16 Number 4

IN THIS ISSUE



Effects of double heat fixing CMPT's Gram slides

Correct interpretation of Gram stains is of significant clinical importance since identifying the predominant white blood cell (WBC) type in the sample assists in identifying the most likely cause of infection. Bacterial recognition in a Gram stain can further direct the antibiotic therapy until culture results are available.

As Dr. Noble mentioned previously in a recent article, "reading of Gram stains is a skill that requires training and regular competency assessment." Quality control or quality assessment slides are then essential in monitoring the skills of personnel in reading Gram stains, as well as their staining technique and reagent quality.

The most common problems associated with inadequate Gram stain reporting appear to be:

- Misinterpreting WBC types, i.e. most commonly reporting lymphocytes as neutrophils.
- Reporting cellular components that are not present in the sample, i.e. most commonly epithelial cells.

CMPT regularly receives reports of epithelial cells when these have not been introduced into the sample. It is unclear if laboratories actually see the cells or automatically report '1+ epithelial cells' in this kind of sample.

Gram staining technique greatly affects the interpretation of the slides. An over or under decolourized slide can result in the reporting of the wrong type of organism.

Over-fixing a slide greatly affects the final appearance of cells hindering the identification of different cellular types.

Figure 1 shows a Gram stain of three different slides corresponding to the same sample. Figure 1A shows a correctly fixed and stained slide while figures 1B and 1C show the results obtained after the slide was reheated after initial fixing before staining.

While in figure 1A the cells can be easily identified as neutrophils, further heat fixing the slide distorts cytoplasm and nucleus making the identification of cells in figure 1B more difficult. Heat-fixing the slide even further may create artifacts that can resemble epithelial cells (figure 1C).

Laboratories are reminded that Gram smear slides are already HEAT-FIXED at CMPT. Further HEAT-FIXING will cause the material to flake off and wash out.

CMPT regularly controls slides and finds that no further fixing is necessary.

Veronica Restelli
Editor, CMPT

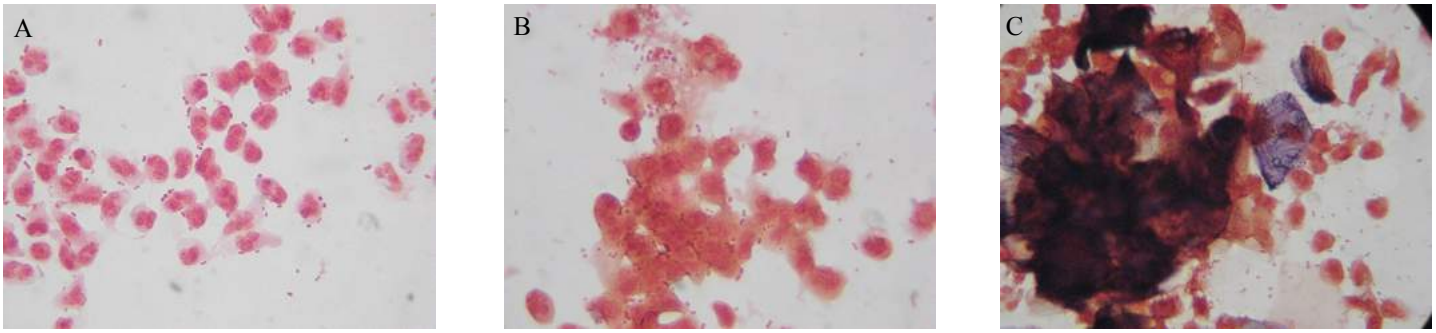


Figure 1. Gram stain performed A: without extra heat fixing; B: after extra heat fixing and C: after extra heat fixing for longer time.

Safe Drinking and Recreational Water - Introduction

According to the WHO, 5 million people worldwide die of water associated disease. Most of these diseases are infectious in nature, and more than half of these are intestinal infections.

Although most of that burden concentrates on children in developing countries, in the US, it has been estimated that around 560,000 people suffer from severe waterborne disease which result in approximately 12,000 deaths per year.[1]

US Surveillance data between 2007 – 2008 revealed 48 waterborne disease outbreaks associated with **drinking water.**[2] Most of the outbreaks (58%) were caused by bacteria, 14% by viruses, and 8% by parasites. Up to 61% of the outbreaks were gastrointestinal illness, 33% acute respiratory illness, and 3% were associated with skin irritation.

There were 134 **recreational water** associated outbreaks reported in the US between 2007- 2008.[3] Most of them (60%) were outbreaks of acute gastrointestinal illness, 18% were outbreaks of dermatologic illness, and 13% were outbreaks of acute respiratory illness. 65% of the outbreaks were caused by parasites, 21% by bacteria and 5% by viruses. *Cryptosporidium* was the etiologic agent of 45% of the outbreaks.

A retrospective surveillance for drinking water-related illnesses in Canada between 1993 and 2008 revealed that *Giardia* and *Cryptosporidium* were the most common etiological agents.[4] Approximately 50% of the communities experiencing waterborne disease events did not monitor water quality in the involved water system.

Waterborne infections result from contact with microbiologically contaminated water. This contact can occur by either the immersion of the body during recreational/occupational activities or by the ingestion of contaminated water.

An important aspect of water microbiology is that waterborne transmission is highly effective means for spreading infectious agents to a large portion of the population.

Although the greatest microbial risks are associated with ingestion of water contaminated with human feces, the source of contamination can be humans, animal, or the environment itself.

In developed countries, a multiple barrier approach that protects the source of water, uses effective treatment methods, properly maintains distribution systems, and routinely verifies drinking water safety, is the best approach to ensure water safety. Ensuring a microbiologically safe drinking water is of great importance for the safety of the population.

The presence of some microorganisms in water serves as an indicator of possible contamination and quality deterioration. Essentially, non pathogenic, easily detectable microorganisms, are used to 'indicate' that contamination has taken place and, as such, there is a risk to public health. These microorganisms are called 'microbiological indicators of water quality'.

Next issue: Microbiological indicators of water quality.

1. BCabral JP. Water microbiology. Bacterial pathogens and water. *Int J Environ Res Public Health*. 2010;7:3657-3703.
2. Brunkard, J.M; Ailes, E; Roberts, V. A; Hill, V; Hilborn, E. D; Craun, G.F; Rajasingham, A; Kahler, A; Garrison, L; Hicks, L; Carpenter, C; Wade, T.J; Beach, M.J; Yoder, J.S. Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water - United States, 2007—2008. MMWR September 23, 2011 / 60(ss12); 38-68
3. Hlavsa, M.C; Roberts, V.A; Anderson, A.R; Hill, V.R; Kahler, A.M; Orr, M; Garrison, L.E; Hicks, L.A; Newton, A; Hilborn, E.D; Wade, T.J; Beach, M.J; Yoder, J.S. Surveillance for Waterborne Disease Outbreaks and Other Health Events Associated with Recreational Water - United States, 2007—2008. MMWR September 23, 2011 / 60(ss12);1-32
4. Wilson J, Aramini J, Clarke S, Novotny M, Quist M, Keegan V Retrospective Surveillance for Drinking Water-Related Illnesses in Canada, 1993-2008: Final Report. National Collaborative Centre for Environmental Health. August 2009. www.ncceh.ca/en/practice_policy/ncceh_reviews/dw_illnesses_surveillance

Reporting Error in the Laboratory–Part II

The BC Patient and Safety Learning System (BC PSLS)

The BC PSLS is one of the BC Patient Safety Task Force's key initiatives to identify and examine patient safety issues within BC aimed at making healthcare safer for British Columbians.

This incident reporting system (IRS) collects information about patient safety events, including errors and system failures occurring in healthcare. Its reports include hazards, near misses, and adverse events reported by trained personnel with access to a health authority computer network.

A total of 12,278 safety event reports in the Laboratory category were submitted from most of the 75 hospital-based laboratories in BC between April 1st 2008 and December 31st, 2010.

Laboratory safety events represented 11% of the more than 250,000 records in the provincial database and were the fourth most frequently-reported type of problem.

Events were classified according to the phase of testing process involved and specific problem that occurred. The system allowed reporters to classify the event as a "near miss" or not and adjudicate a degree of harm or potential degree of harm to patients for that particular event. The reporting system also recorded if any actions were taken after the event was reported.

Analysis of aggregate classified reports helps determine areas of weakness that require deeper investigation or change and establish priorities for resource distribution.

Point of Testing Process

Most laboratory errors occur in the pre-analytical phase. The **pre-analytical** phase had an incident report rate of 76%, with most of the problems associated to sample collection and labelling (51%) while the remaining incidents were related to clerical and order entry incidents (table 1).

The **analytical** process accounted for 6% of the events reported while the **post-analytical** phase had an reported incident rate of 18%. These findings are similar to those reported in other studies (Carraro, 2007 and Plebani, 2006).

Table 1. Point of testing process

Process		BC PSLS	Carraro, 2007	Plebani, 2006
Pre-analytic	Collections (51%)	76%	62%	70%
	Order processing or handling (25%)			
Analytic		6%	15%	
Post-analytic		18%	23%	30%

More laboratory errors are attributable to specimen misidentification than to any other cause (Bonini, 2002) In our study, unlabelled or mislabelled samples was the highest single category reported (16.8%).

Other common pre-analytical errors included lost or compromised sample, delay in collection or delivery of sample and incorrect collection procedure or sample type (table 2).

Table 2. Pre-analytical Reported Patient Safety Events

Pre-analytic Process (collections)	%
Unlabelled/mislabelled sample	16.8
Lost/ leaky/ insufficient/ empty/compromised sample	10.1
Delay in sample collection/delivery	8.4
Incorrect procedure/collection time/delivery	5.3
Incorrect patient/body part/sample type	4.5
Sample / requisition discrepancy/ no requisition	2.3
Other	3.7
Total	**51.1**
Pre-analytic Process (clerical/order entry)	**%**
Incorrect test/product ordered; test ordered on incorrect patient	8.8
Incomplete or incorrect information in order/ requisition	7.4
Order not combined/processed; duplicate order/no requisition	6.5
Other	2.6
Total	**25.3**

The most frequent pre-analytical clerical errors included the order of an incorrect test or the right test ordered on incorrect patient and incomplete information in order or requisition.

Table 3. Post-analytical Reported patient Safety Events

Post-analytic Process	%
Incorrect results reported	10.0
Higher than expected turnaround times for results or products	4.2
Results reported to or on incorrect person	2.2
Other	1.5
Total	**17.9**

The reporting of incorrect results was the most common event of the post-analytic phase (>50%). Other common incidents were excessive turnaround time and results reported on or to the wrong person (table 3).

Almost 40% of incidents reported as "incorrect results reported" were microbiology results.

Identification errors in clinical laboratory testing have the potential to cause serious patient injury.

As mentioned before, unlabelled or mislabelled samples was the single highest category reported in the BC PSLS.

Reporting Error in the Laboratory–Part II

In a study by the College of American Pathologists (CAP) involving 120 clinical laboratories aiming to study patient and sample identification errors, 1 in 18 identification errors resulted in an adverse event (Valenstein. 2006)

One in six identification errors reported in the BC PSLS resulted in an adverse event and 1 in 62 reported events resulted in moderate to severe harm.

The CAP study defined identification error as "any result that was reported for the wrong specimen (or would have been reported for the wrong specimen without some intervention)". It included the mix-up of two specimens from the same patient collected at different times or from different body sites, identification errors due to partial misidentification of the patient, unlabelled specimens, unidentified patients, etc.

Following the same definition, approximately 40% of the events reported in the BC PSLS would fall under this definition.

The reasons for identification errors showed similar percentages in both studies, with the highest proportion being primary specimen label errors (table 4).

Table 4. Reasons for Identification Error

Identification error	BC PSLS	CAP
Primary specimen label error	66.1%	55.5%
Initial registration/order entry error	26.6%	22.4%
Other clerical error		12.4%
Other reason for error		4.2%
Aliquot/block/slide label error	1.9%	3.8%
Result entry error	5.4%	1.7%

80% of the reported events on the BC PSLS were considered to have no harm to the patient which is in agreement with other studies (Astion, 2003; O'Kane, 2009) (table 5).

Table 5. Degree of harm associated to reported event

Degree of harm	BC PSLS	O'Kane	Astion
1 - No harm	80.3%	75.1	95%
2 - Minor harm	16.7	6.4	5%
3 - Moderate harm	2.8	18.5	
4 - Severe harm	0.2	0	
5 - Death	0	0	

17% of the reported events were associated with minor harm to the patient which could have involved the re-draw or recollection of a specimen, additional investigations, which would translate not only in inconvenience to the patient, but also unjustifiable increases in cost.

Three percent of the events reported were associated with moderate or severe harm to the patient. Most commonly, patients were not properly followed up or received inappropriate treatment, however, several consequences associated to laboratory incidents included unnecessary surgeries, transfusion, mastectomy, prostatectomy and even death.

It is important that any system of grading the seriousness of quality failures should consider not only the **actual harm** sustained, but also the potential worst case scenario (**potential harm**).

O'Kane observed that when the events that caused no actual harm to the patient were scored according to the potential harm, 68% were heavily skewed in favor of high potential adverse impact (O'Kane, 2009).

In the case of the BC PSLS, reporters were asked to assign a potential degree of harm to the events classified as near misses. Only 4% of these events were given a moderate to high potential adverse impact.

"Near misses"

A "near miss" is an incident that could have caused harm, but did not because of the intervention of an individual or by a fortunate evolution of the circumstances.

"Near misses" and even adverse events are underreported. It is estimated that only between 4% to 50% of safety events that occur in the US are reported each year.

30% of the events reported on the BC PSLS were classified as "near misses". This number is different from what is normally reported in the literature where near misses are more numerous than adverse events. This is most probably due to differences in the definition of a "near miss".

The BC PSLS defines a "near miss" as an event that did not reach the patient, that is, a sample that had to be re-drawn because it reached the laboratory unlabeled, is not a "near miss".

These differences in definitions make the comparison of data between studies quite difficult. Unclear definitions of an adverse event or "near miss" will jeopardize the quality of data within a study.

The following example reflects this problem:

"Patient had no ID band. Lab confirmed patient ID & birth date prior to collection."

In this particular example, the same event was classified as a "near miss" by 20% of the reporters and as a not a "near miss" by the rest.

After an event has been entered in the BC PSLS, the reporter gets confirmation and the event is revised by a leader. Events classified under No harm or Minor harm category are looked at in aggregate, tracked, and trended and depending on the volume or cost, an action is taken.

Those events classified as moderate harm are reviewed by the leader who chooses the appropriate action according to the incident.

Events that caused severe harm follow a very specific and formal process that involves Quality and safety teams, they are

reported to the board and a critical event investigation is done.

The leader records the action taken from a drop down menu after the incident was reviewed. Only 24% of the events reported had some kind of action recorded.

There must be positive feedback to ensure that staff remains active and engaged. Although feedback is given by the leaders through group meetings, specific feedback to the reporter is still limited. This is a challenge since the lack of feedback deters reporters from reporting further events.

"I would appreciate being contacted to learn what actions are being taken. A lack of response will indicate to me that no action is being taken. I hope you'll excuse my tone, but I have some skepticism that these reports are read by anyone."

- No record of any action taken -

Reporting systems are important to increase patient safety awareness, however, there are still barriers that deter employees from reporting incidents.

Lack of feedback to the reporter is among the most significant barrier to reporting, it demoralizes their efforts and deters them from reporting again. Fear of negative action or embarrassment are also important factors that prevent error reporting in many environments.

Very frequently the failure is considered too trivial to merit reporting or the error is quickly corrected by the person who recognized the error. In this last case, although the mistake is corrected, the learning remains local, confined to the individual level, which is usually not even the individual who initiated the error.

Other common reasons for failure is an inadequate system, difficult definitions, complicated forms, or inappropriate procedures. One of the biggest challenges of information reporting systems is that a stronger link is needed between identifying and mitigating hazards.

A successful Patient Safety incidents identification and reporting program is possible only with management committed to a patient safety culture. A higher number of reports shouldn't be interpreted as a problem, but as a positive sign that incidents are recognized and personnel is aware of the usefulness of reporting systems to enhance patient safety.

"What is not reported cannot be thoroughly investigated.

What is not thoroughly investigated cannot be changed.

What is not changed cannot be improved."

Centre for Chemical Process Safety

The BC PSLS study was performed in conjunction by the Program Office for Laboratory Quality Management, UBC Department of Pathology and Laboratory Medicine and the BC Patient Safety & Quality Council

Astion M.L. (2003) Classifying Laboratory Incident Reports to Identify Problems that Jeopardize Patient Safety. Am. J. Clin. Pathol 120: 18-26

Bonini P, Plebani M, Ceriotti F, Rubboli F. Errors in laboratory medicine. Clin Chem. 2002 May;48(5):691-8. Review. PubMed PMID: 11978595.

Carraro P, Plebani M. Errors in a stat laboratory: types and frequencies 10 years later. Clin Chem. 2007 Jul;53(7):1338-42.

O' Kane M. (2009) The reporting, classification and grading of quality failures in the medical laboratory. Clin. Chim. Acta 404: 28-31

Plebani M. Errors in clinical laboratories or errors in laboratory medicine? Clin Chem Lab Med. 2006;44(6):750-9

Valenstein P. (2006) Identification Errors Involving Clinical Laboratories Chem. 2002 May;48(5):691-8.Arch. Pathol. Lab. Med. Vol 130

Website Updates

Clinical Bacteriology

Critiques: critiques have been grouped by year, source/site, susceptibility comments, clinical relevance, and communicable to Public Health or Infection Control. Each group of critiques can be sorted by challenge number, source, and organism (if applicable). Each challenge in each group has a brief comment on source/ relevance/ communicability/ or antimicrobial susceptibility.

Please check them out by following the links on the left navigation panel of the program overview page:

http://www.cmpt.ca/programs_clinbact/clin_bacteriology_overview_program.htm

Get Connected

CMPT has moved!!!

Please update your records. Effective January 29th, CMPT's new home is located at the UBC campus:

Room G408, 2211 Westbrook Mall,
Vancouver, BC
V6T 2B5 Canada

Our phone and fax numbers have also changed:
Phone: 604– 827-1754
Fax: 604-827-1338

Upcoming Events

March

5th Wastewater Management Conference & 48th Central Canadian Symposium on Water Quality Research

March 6-8, 2013 Hamilton, Ontario

More info: http://cwwa.ca/WastewaterConference_e.asp

April

CACMID—AMMI Canada 2013 Annual Conference

April 4 - 6, 2013 Quebec City, Quebec

More info: http://www.cacmid.ca/

23rd ECCMID

April 27—30, 2013 Berlin, Germany

More info: http://www.congrex.ch/eccmid2013.html

June

63rd Annual Conference of the Canadian Society of Microbiologists

June 17—20, 2013 Carleton University, Ottawa, ON

More info: http://www.csm-scm.org/english/conf_upcoming.asp

July

FEMS 2013—5th Congress of European Microbiologists

July 21—25, 2013 Leipzig, Germany
More info: http://www2.kenes.com/fems2013/pages/home.aspx

About Connections

"Connections" is published quarterly by CMPT and is aimed at the Microbiology staff.

Editor: Veronica Restelli

Contact Connections

By mail
Room G408, 2211 Westbrook Mall,
Vancouver, BC
V6T 2B5
Canada

By phone: 604– 827-1754
By fax: 604-827-1338
By email: restelli@mail.ubc.ca

Connections is available online:
www.cmpt.ca/newsletter_connections.html

We want to hear from you. Please follow the link to submit questions, suggestions, articles, information about events, etc.
www.cmpt.ca/newsletter_bulletin/news_submissions.htm

NEW!

Medical Mycology Case Reports

- Open Source Mycology Journal -

Check it out at:
www.journals.elsevier.com/medical-mycology-case-reports