

Journal of
**Continuing
Education**

April 2017
Volume 19 ■ Number 2

TOPICS & ISSUES

Official publication of the American Medical Technologists



AMT

American Medical Technologists

Certifying Excellence in Allied Health

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On the cover: Sickle cell anemia

This digitally-colored scanning electron micrograph (SEM) revealed some of the comparative ultrastructural morphology between normal red blood cells (RBCs), and a sickle cell RBC (left) found in a blood specimen of an 18 year old female patient with sickle cell anemia, (HbSS). People who have this form of sickle cell disease inherit two sickle cell genes ("S"), one from each parent. This is commonly called "sickle cell anemia," and is usually the most severe form of the disease.

Sickle cell disease is a group of inherited red blood cell disorders. Healthy red blood cells are round, and they move through small blood vessels to carry oxygen to all parts of the body. In sickle cell disease, the red blood cells become hard and sticky and look like a C-shaped farm tool called a "sickle". The sickle cells die early, which causes a constant shortage of red blood cells. Also, when they travel through small blood vessels, they get stuck and clog the blood flow. This can cause pain and other serious problems.

Credit: Janice Haney Carr

Journal of Continuing Education Topics & Issues (ISSN 1522-8606) is published in January, April, and August under the sponsorship of the American Medical Technologists, 10700 W. Higgins Rd., Suite 150, Rosemont, Illinois 60018. Copyright 2017 by American Medical Technologists. Subscriptions include three issues of *Journal of CE Topics & Issues* and three issues of *AMT Events*: \$50.00/year + \$10 postage for foreign countries. Members may not deduct subscription price from dues. Postmaster: Please send change of address to AMT, 10700 W. Higgins Rd., Suite 150, Rosemont, Illinois 60018. Moving? Be sure AMT publications move with you. Send your new address and old mailing label from an AMT publication to AMT six weeks before you move.

Blood Transfusion Safety and the Challenge of Zika Virus

By Linda Williford Pifer and Wyenona Hicks

“Risk management is a more realistic term than safety. It implies that hazards are ever-present, that they must be identified, analyzed, evaluated and controlled or rationally accepted.”

—Jerome F. Lederer¹

Introduction

Jerome Lederer was an early leader in both air and spacecraft safety who inspected the Spirit of St. Louis before Charles Lindbergh’s magnificent trans-Atlantic flight, and not without concerns. He was also Chief of NASA’s Manned Space Flight Safety Office created after the tragic on the launch pad fire that killed astronauts R. Chaffee, V. Grissom and E. White, II in 1967.²

What, you may ask, does the blood bank professional have in common with Jerome Lederer? If you think about it, you have a lot more in common than you might ever imagine. Every day that you release blood components to surgery or a unit in the hospital, it’s a “launch”, and someone may benefit from the transfusion (or not) based upon your technical accuracy, as well as the safety, purity, and potency of the component released. The specter of infectious diseases, such as the Zika virus (ZIKV), has made that responsibility much more difficult.

This little-known Flavivirus (relative of the far more dread-inspiring Yellow Fever, Dengue and Japanese Encephalitis viruses) was discovered without any fanfare whatsoever in Uganda in 1947, and promptly forgotten.³ Over the decades, it flitted on delicate mosquito wings toward South America where it virtually exploded upon the scene in Brazil in 2015, and the prevalence of microcephaly in infants skyrocketed by twenty-fold.⁴ These infants were left with mental re-

tardation, developmental delays and damaged motor function.

In North America, ZIKV is transmitted by both *Aedes aegypti* and *Aedes albopictus*, and once the virus becomes endogenous to a mosquito population, females pass it directly to their young. Only females require blood meals, but unlike the Malaria parasite, they are not required to bite an infected human or animal to acquire the virus. They hatch “armed and dangerous”, ready to transmit ZIKV.

As if microcephaly and mental retardation were not sufficiently horrific, it was also found to be one more cause of Guillain-Barré syndrome, a demyelinating autoimmune-like condition that can leave the patient quite debilitated.⁵ It is interesting, however, that up to 80 percent of patients experience mild or no symptoms at all. Those who do may have rash, conjunctivitis, headache, muscle aches, pains, and fever.⁶

In a way, the paucity of symptoms manifested by ZIKV compounds its threat, allowing infected donors who have no idea that they have been infected, especially in borderline Zika zones, to innocently pass the queries as to whether they have been or are feeling ill. Inquiries about prior residence in, or travel to, an area with local ZIKV transmission are weakened by ever increasing areas of local transmission. The fact that it can be sexually transmitted undercuts the significance of asking potential donors about mosquito bites, thus the ZIKV screening algorithm undoubtedly allows more infected individuals to slip under the radar than many other blood borne and/or sexually-transmitted infectious diseases. Zika is a remarkably devious virus compared to Ebola, for example.

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Preventing a Hospital-Wide Outbreak of Carbapenem-Resistant *Klebsiella pneumoniae* Infection

By Crayton Strouse and Jonathan Keller

A Critique of Evidence Based Practices in Preventing a Hospital-Wide Outbreak of Carbapenem-Resistant Klebsiella pneumoniae Infection

Introduction of Problem

The problem being analyzed in this research paper is the control of a hospital-wide outbreak of carbapenem-resistant *Klebsiella pneumoniae* infection through active surveillance. With the increased use of antibiotics, especially in cases where they are not necessary, strains of bacteria have developed that are resistant to our strongest antibiotics normally reserved for our most severe infectious cases. As a result, there is potential for infection to spread that we have no pharmacological means to counteract. Active surveillance of this antibiotic-resistant infection is an efficient way to prevent its spread.

Background and Significance

The carbapenem-resistant *Enterobacteriaceae* (CRE) superbug is resistant to the commonly used antibiotic carbapenem and completely resistant to most other antibiotics. Carbapenems themselves are used to treat severe infections. In March of 2013, the Centers for Disease Control and Prevention stated that “3.9% of short-stay acute care hospitals and 17.8% of long-term acute care hospitals reported at least one CRE healthcare-associated infection” (Bitanga & Austria, 2015, p. 51) This is a fourfold increase over the last 10 years. In addition, mortality rates of patients with CRE range from 48%-71%, with the World Health Organization stating that these multidrug resistant organisms are “one of the three greatest threats to human health” (Thaden *et al.*, 2014, p. 978). A recent study

shows that previous antibiotic use in the last 90 days, an ICU or hospital stay longer than 5 days, mechanical ventilation, multiple invasive devices, and/or immunosuppression all increase the risk of contracting CRE or another bacteria leading to infection (Zurawski, 2014). The same journal detailing this study goes on to say that the signs and symptoms of CRE mirror those of sepsis, specifically the hyperinflammatory response. The patient’s condition typically improves with antibiotic therapy initially, but quickly deteriorates, where the symptoms of sepsis and organ failure are seen.

Since no new antibiotics to combat CRE are expected, the best way to remove the infection is through “debridement, drainage, and catheter removal” (Zurawski, 2014, p. 52). Surveillance, control measures, isolation precautions, and hand hygiene are the leading defenses to prevent the spread of the bacteria. CRE infection is growing in prevalence, is resistant to current pharmacological methods, and has no expected future cure. It has an incredibly high mortality rate, and many common patient experiences in the ICU are risk factors for contracting CRE infection. The only way to fight the infection is through physical removal and preventing its spread through active surveillance. In this paper, we will critique a research study which has examined the evidence regarding the potential role of active surveillance in the control of a hospital-wide outbreak of CRE infection.

Literature Review

The discovery and influx of CRE is fairly recent. As a result, most research is just as new. The “Compare the Studies” section of this paper will elaborate more on the research articles cov-

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Is It Really Necessary to Allow Specimens to Reach Room Temperature Before Analysis?

By Roberta Fern Pizarro

Introduction

A recent misunderstanding between shifts regarding work being left over for the next shift to complete resulted in this inquiry. Our “day shift” testing personnel had left several racks of chemistry samples for the “evening shift” workers to complete. As it seemed evening shift was burdened with extra workload, the explanation was that the samples were being left to reach room temperature before being tested since the courier delivered the samples a little later than usual that day. Would it have made a difference if day shift had just run the samples? Or was it necessary to hold them at room temperature for more than an hour to equilibrate, forcing the day shift to stay past their time to run them resulting in overtime; or rather, leaving them for the evening shift to pick up, causing extra work for them?

A reference lab or any other clinical laboratory that processes samples drawn and/or collected from a different site faces a unique challenge regarding specimen arrival temperature versus specimen testing temperature. Samples being transported from local and distant sites to a reference laboratory are processed for stability and shipped maintaining their integrity, for example using ice packs, for testing upon arrival, whatever time that may be. When these samples arrive, they get processed again by client service staff, meaning the samples get unpacked, checked against the manifest, and racked getting them ready for testing. As sample tubes are processed, depending on testing schedule, some samples may be tested right away, and others may be set aside to be batched and tested at a later time and/or date. That could mean refrigeration, freezing, or leaving the samples at room temperature.

The evening shift maintained to have day shift hold the samples and make them sit for more than an hour and keep them for the off-shifts to complete was unnecessary and the tubes could be loaded straight away and tested. The samples may have been shipped in a “refrigerated” state with ice packs and received cold; by the time they are processed, loaded to the MPA, or Modular-Pre Analytic section of the chemistry analyzer-COBAS, then aliquoted and run through to the COBAS, the less than ½ a ml specimen in the testing cup has indeed reached room temperature prior to any mixing of reagent for testing. The amount pipetted is so miniscule it is sure to reach room temperature before any actual testing is done to the sample, regardless of what temperature the sample was received.

Discussion

Good laboratory practice generally means allowing samples to reach room temperature before testing (CDC, 2016.) For example, a commonly performed CAP survey for blood gas has strict directions that prior to analysis, the ampules should be brought to room temperature for at least 4 hours (College of American Pathologists, 2016.) Another readily found test kit in the average clinical laboratory is an hCG test for pregnancy. In the SA Scientific Pregnancy Ultimate (hCG) Serum/Urine kit instructions, it states the test kit itself is to be kept at room temperature and is very specific regarding the sample temperature before testing. Refrigerated serum or urine should be equilibrated to room temperature or between 15 and 30 degrees C before being tested.

A study posted on the website for the National Center for Biotechnology Information discuss-

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