BC Centre for Disease Control
An agency of the Provincial Health Services Authority

July 2016

LM LABS

LABORATORY TRENDS

A Report of the BCCDC Public Health Laboratory

Highlights

Emerging MDR *C. auris* and *V. parahemotyticus* detection

Zika surveillance

Mumps and GI outbreaks

Subclinical *P. falciparum* case study

Recent BCCDC PHL awards

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cap ACCREDITED™ PHSA Laboratories BCCDC Public Health Laboratory

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LAB NEWS

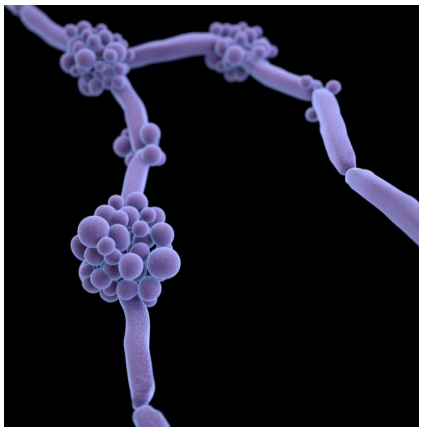
Emerging Multidrug-Resistant *Candida auris* Identification with Sarah Cherian

Recent alerts from the US Centers for Disease Control and Prevention and the Public Health Agency of Canada have identified *Candida auris* (*C. auris*) as an emerging multidrug-resistant yeast that is causing potentially lethal, invasive infections in health care settings.[1] *Candida auris* was first identified as a new species in 2009 and has since been implicated in cases of candidemia and deep seated infections in South Korea, Kuwait, India, Pakistan, South Africa, Colombia, Venezuela, and the United Kingdom.[1,2] At least two countries have described healthcare outbreaks of *C. auris*. Although there are no established MIC break points for *C. auris*, based on the break points for other candida species, *C. auris* has shown to be highly resistant to fluconazole, with isolates also being resistant to voriconazole, flucytosine, and echinocandins; however, not all *C. auris* strains are multidrug resistant.[1,4-5]

Candida auris can only be reliably identified by molecular methods

As *C. auris* may be resistant to firstline anti-candida agents, correct identification is essential in the treatment of infections with this MDR species. Conventional laboratory methods and automated identification systems may misidentify it as *Rhodotorula glutinis , C. haemolonii* or *C. famata; therefore, C. auris* can only be reliably identified by molecular methods.[3,4] However, the MALDI-TOF MS is able to identify *C. auris* accurately and differentiate it from other closely related organisms if *C. auris* is included in the database.[3] The British Columbia Centre for Disease Control Public Health Laboratory (BCCDC PHL) is currently trying to obtain a reference isolate to share with the frontline microbiology laboratories, to evaluate their ability to identify this organisms using frontline routine platforms such asthe MALDI-TOF MS and the YeastOne.

In light of this emerging, global public health concern, the BCCDC PHL is searching its archives for isolates of these organisms for ITS sequencing to conduct retrospective surveillance and reporting. We encourage provincial microbiology laboratories to do the same and send suspect isolates to the BCCDC PHL for confirmatory ITS sequencing.



Candida sp. CDC/James Archer

References

1. Clinical Alert to U.S. Healthcare Facilities: Global Emergence of Invasive Infections Caused by the Multidrug-Resistant Yeast Candida auris [Internet]. Atlanta, GA: Centers for Disease Control and Prevention; 2016. Available from: http://www.cdc.gov/fungal/diseases/candidiasis/candida-auris-alert.html

2. Satoh K, Makimura K, Hasumi Y, Nishiyama Y, Uchida K, Yamaguchi H. *Candida auris* sp. nov., a novel ascomycetous yeast isolated from the external ear canal of an inpatient in a Japanese hospital. Microbiol Immunol [Internet]. Blackwell Publishing Asia; 2009 Jan [cited 2016 Jul 14];53(1):41–4. Available from: http://doi.wiley.com/10.1111/j.1348-0421.2008.00083.x

3. Kathuria, S; Kumar, A; Prakash, A; Chowdhary, A; Masih, A; Sharma, C; Meis, J.F.G.M; Singh P. Multidrug-Resistant Candida auris Misidentified as Candida haemulonii: Characterization by Matrix -Assisted Laser Desorption Ionization-Time of Flight Mass Spectrometry and DNA Sequencing and Its Antifungal Susceptibility Profile Variability by Vitek 2, CL. J Clin Microbiol [Internet]. 2015;53 (6):1823–30. Available from: http://jcm.asm.org/content/53/6/1823.full?sid=4a29eb80-9479-42d5-bdce-3a17723d9bd5

4. Magobo RE, Corcoran C, Seetharam S, Govender NP. Candida auris-associated candidemia, South Africa. Emerg Infect Dis [Internet]. Centers for Disease Control and Prevention; 2014 Jul [cited 2016 Jul 14];20(7):1250–1. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24963796

5. Chowdhary A, Anil Kumar V, Sharma C, Prakash A, Agarwal K, Babu R, et al. Multidrug-resistant endemic clonal strain of Candida auris in India. Eur J Clin Microbiol Infect Dis [Internet]. Springer Berlin Heidelberg; 2014 Jun 20 [cited 2016 Jul 14];33(6):919–26. Available from: http://link.springer.com/10.1007/s10096-013-2027-1

LAB NEWS

This year's first case of *Vibrio parahaemolyticus* reported in British Columbia with Samara David and Lorraine McIntyre

Raw Oysters CDC

The BCCDC has reported BC's first case of *Vibrio parahaemolyticus* (*Vp*) gastroenteritis this summer associated with the consumption of raw oysters.

Vp is a naturally occurring bacterium in seawater, with an increased prevalence in summer months when water temperatures rise. The bacteria accumulate in shellfish, such as oysters, and can lead to illness when these foods are consumed raw or undercooked. Most common symptoms include diarrhea, nausea, vomiting, and fever.

Incidence of *Vp* infection in BC has been increasing since 2007 with the largest outbreak in Canada occurring in BC last year with 73 infections (figure 1). Sixty cases were due to eating raw or undercooked oysters and an additional 13 individuals became ill after exposure to contaminated seawater. This increase in incidence of *Vp* illness may be due to higher than average seawater temperatures during the spring and summer of 2015 (El Nino or the Blob) or possibly due to changes in shellfish consumption habits.

The greatest risk factor for developing disease is from consuming raw or uncooked shellfish

The greatest risk factor for developing disease is consuming raw or uncooked shellfish. In order to minimize the risk of developing illness, the BCCDC has tools for Vibrio control (http://www.bccdc.ca/health-info/food-your-health/fish-shellfish/vibrio), including a *Vp* growth calculator, sea temperature mapping tool and a shellfish opening and closures map. Further information on *Vp* can be found on the BCCDC website:

http://www.bccdc.ca/health-info/diseases-conditions/vibrio-parahaemolyticus

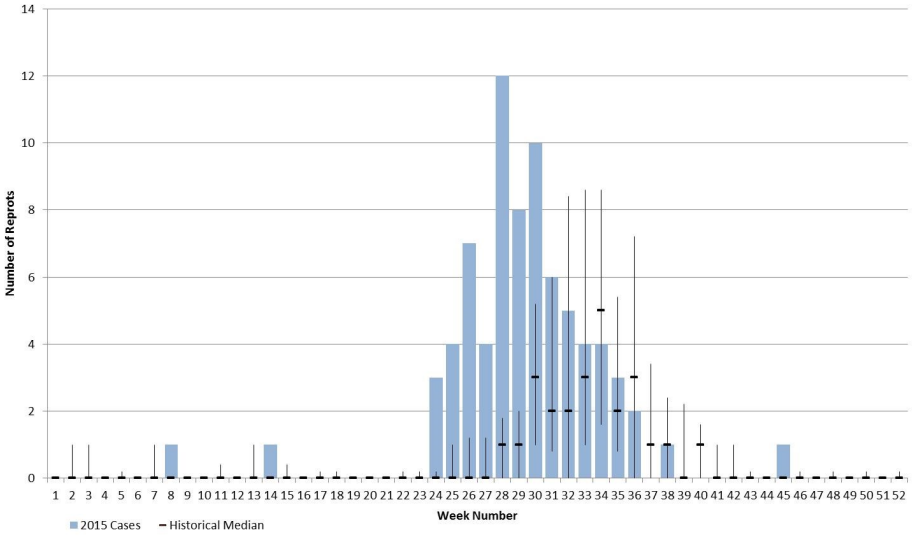


Figure 1: BC *V. parahaemolyticus* infection by date, 2015 and historical mean, BCCDC, 2016

SURVEILLANCE

Correctly applying insect repellant CDC

Zika virus

Since the last report on Zika virus (ZIKV) surveillance in the May, 2016, Laboratory Trends, the number of confirmed cases of ZIKV infection in British Columbia and Yukon Territory as of 16 July, 2016, has increased from seven to 18 (1% positivity rate), all associated with travel to the Caribbean, Central or South America. During epidemiology weeks 1-28, 2016 (3 January – 16 July), there have been 1308 individuals tested. Test order volumes have been sporadic, but have shown a decreasing trend since week 23 (5-11 June, 2016). Cumulatively, since 3 January, 2016, the majority of tests performed have been by Reverse Transcription Polymerase Chain Reaction (55%), with the remainder of tests for IgM class anti-ZIKV serology (45%) (figure 1)

The majority of tests continue to be for females (70%) and 90% of these females are of child-bearing age, with the most at-risk population group (those capable of vertically transmitting ZIKV during pregnancy) representing the greatest proportion of those being tested (figure 2). Since the last Laboratory Trends the ratio of females to males being tested has remained stable.

While the risk of vector-borne transmission in Canada continues to be assessed to be low as the mosquitos known to transmit ZIKV are not established, the BCCDC) and the BCCDC PHL continue to work together with BC Health Authorities on testing, surveillance, case investigation and follow up, and contact tracing. This is increasingly important as we approach the Brazil Summer Olympic and Paralympic Games in August and September. Further information on ZIKV risk, prevention, testing, and advice for travelers can be found on the Zika virus BCCDC website.

"the most at-risk population group represent[s] the greatest proportion of those being tested"

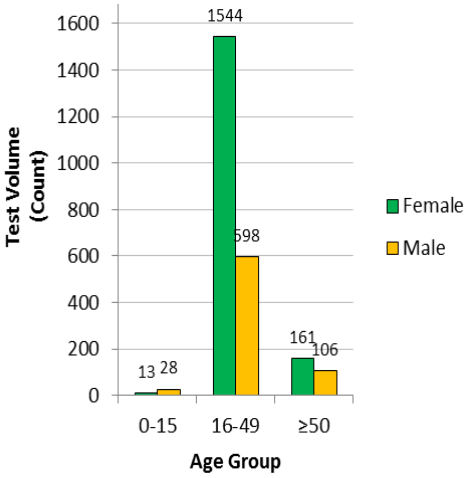


Figure 2. Cumulative Test Volumes of Samples for Zika Virus by Age Group and Gender (Epi Week 1 -27 2016, n=2,450)

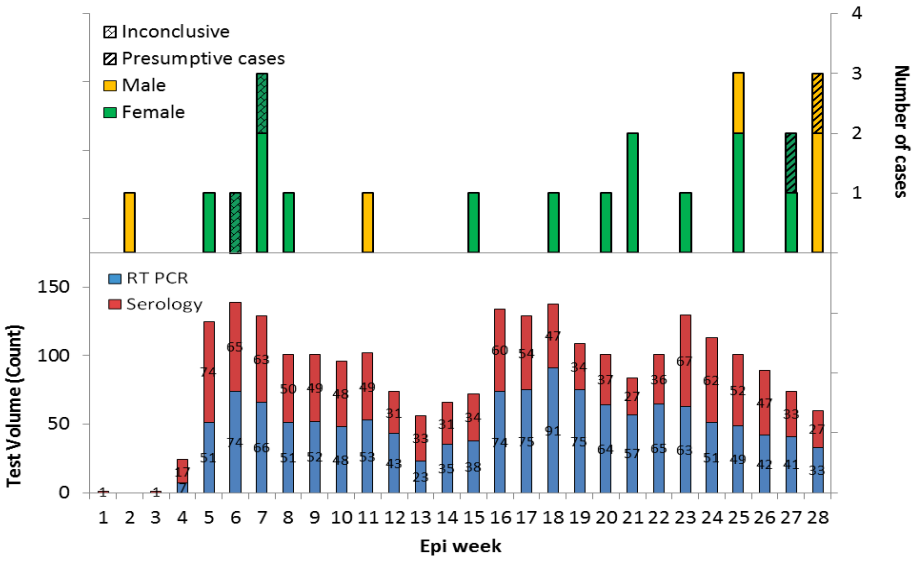
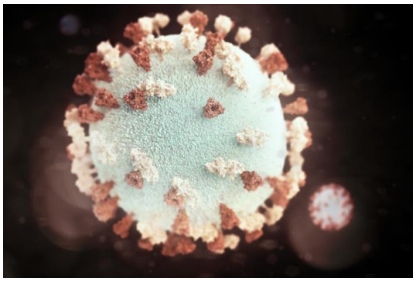


Figure 1. Weekly Volume of Tests for Zika Virus RT PCR and Serology* (Epi Week 1-27** 2016, n=2,450)

*Note: test volume represents number of tests performed, not number of individuals tested, as individuals may be tested by both methods, or may have subsequent testing performed at a different date
**Epi week based on received date of first sample(s) submitted for test volume and based on initial resulted date for cases

OUTBREAK



Mumps virus particle CDC/Allison M. Maiuri

Mumps

with Alex Nunn and Monika Naus

The province of BC is experiencing a mumps outbreak in 2016 and health officials are urging residents to ensure their vaccinations are up to date. Mumps virus, a member of the *Paramyxoviridae* family, is transmitted through droplet or direct contact with saliva or respiratory secretions spread by coughing, sneezing, sharing utensils, kissing or through contaminated surfaces.[1] Up to 70% of mumps infections cause symptoms, most commonly parotitis and non-specific respiratory symptoms. More severe complications of mumps infection include meningoencephalitis, transient or permanent deafness, and orchitis or oophoritis.[1,2]

To confirm mumps diagnosis, the BCCDC PHL tests buccal (preferably within five days of symptom onset), urine (preferably within 14 days of symptom onset) or, for cases with meningeal signs, cerebrospinal fluid samples for mumps virus RNA by reverse transcription polymerase chain reaction (RT-PCR). Reactive RT-PCR specimens are then sent to the National Microbiological Laboratory for genotyping. These genotyping results, when interpreted with epidemiologic data, can help identify possible countries of mumps importation and transmission patterns. Serological testing is performed on acute (within 5 days of symptom onset) and convalescent (10 days to three weeks after symptom onset) samples for detection of IgM and IgG class antibodies.[1-4]

During 2016 (1 Jan – 30 June, 2016) the BCCDC PHL detected mumps virus RNA in 86 samples and anti-mumps IgM antibodies in 28 samples, the highest number of detections since 2013 (figure 1)*. Since March 2016, BC has been experiencing a mumps outbreak with 80 confirmed outbreak-associated cases reported to BCCDC as of June 30. The majority of cases were in Vancouver Coastal Health (n=58, 73%). The cases were primarily young adults, with a median age of 29.

Mumps incidence in BC has declined dramatically since 1997 due to vaccination. Currently, mumps outbreaks tend to affect communities unimmunized due to religious reasons, or young adults who are underimmunized. Adults born before 1970 are likely to have naturally acquired immunity, while those born between 1970 and 1994 may have only received one dose of mumps-containing vaccine and are thus more susceptible to mumps than those born in 1994 and later, who are likely to have been offered a 2nd dose of mumps containing vaccine, introduced in 1996 at 18 months of age in BC.

"BC has been experiencing a mumps outbreak with 80 confirmed outbreak-associated cases"

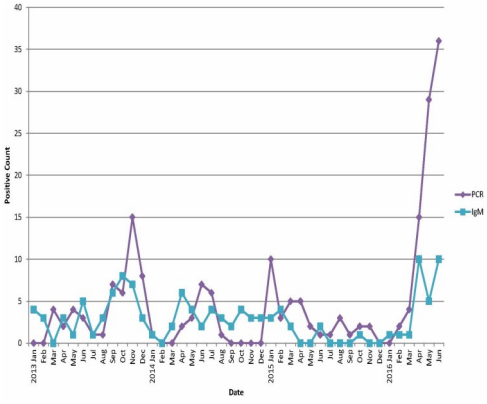


Figure 1. Mumps positivity isolate count by test type, January 2013—June 2016*

*Note: number of positive counts is sample specific, not patient-specific; therefore, the number of positive patients will be lower

Further information on mumps infection, laboratory testing interpretation and vaccination can found at the sources cited within, and more information on BC's 2016 mumps outbreaks can be found here:

http://mediasite.phsa.ca/Mediasite/Catalog/Full/8b83c4e8dc9540b08787fc2a880b79b321

References

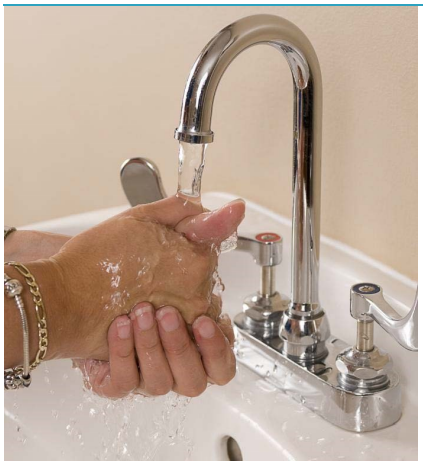
1. Heymann DL, editor. Control of Communicable Diseases Manual. 20th ed. Washington, D.C.: American Public Health Association; 2015.

2. Government of Canada PHA of C. Mumps Vaccine - Part 4 - Active Vaccines - Canadian Immunization Guide - Public Health Agency of Canada. [cited 2016 Jul 14]; Available from: http://www.phac-aspc.gc.ca/publicat/cig-gci/p04-mump-orei-eng.php

3. BC Public Health Microbiology Reference Laboratory, PHSA Laboratories Guide to Programs and Services. 2015 [cited 2016 Jul 14]; Available from: http://www.bccdc.ca/Documents/PHAD_060_00PR_Ver_7.2_Guide to Program Services Oct 2015.pdf

4 Mumps [Internet]. BC Centre for Disease Control; 2012. Available from: http://www.immunizebc.ca/diseases-vaccinations/mumps

OUTBREAK



Handwashing CDC/Amanda Mills

Gastrointestinal

During epidemiology weeks 19-26 there were 26 gastrointestinal outbreaks investigated by the BCCDC PHL. The number of outbreaks investigated exceeded the previous five year average during weeks 24 and 25 (12—25 June).

Outbreaks were investigated from 11 long term care facilities (42%), nine daycare/ schools (35%), two hospital/acute care facilities (8%), and four other types (15%).

Samples were collected from 81% of outbreaks with noroviruses detected in 95% of outbreaks, and one outbreak of unknown etiology (5%, daycare/school facility).

> "noroviruses (were) detected in 95% of outbreaks, and one outbreak of unknown etiology"

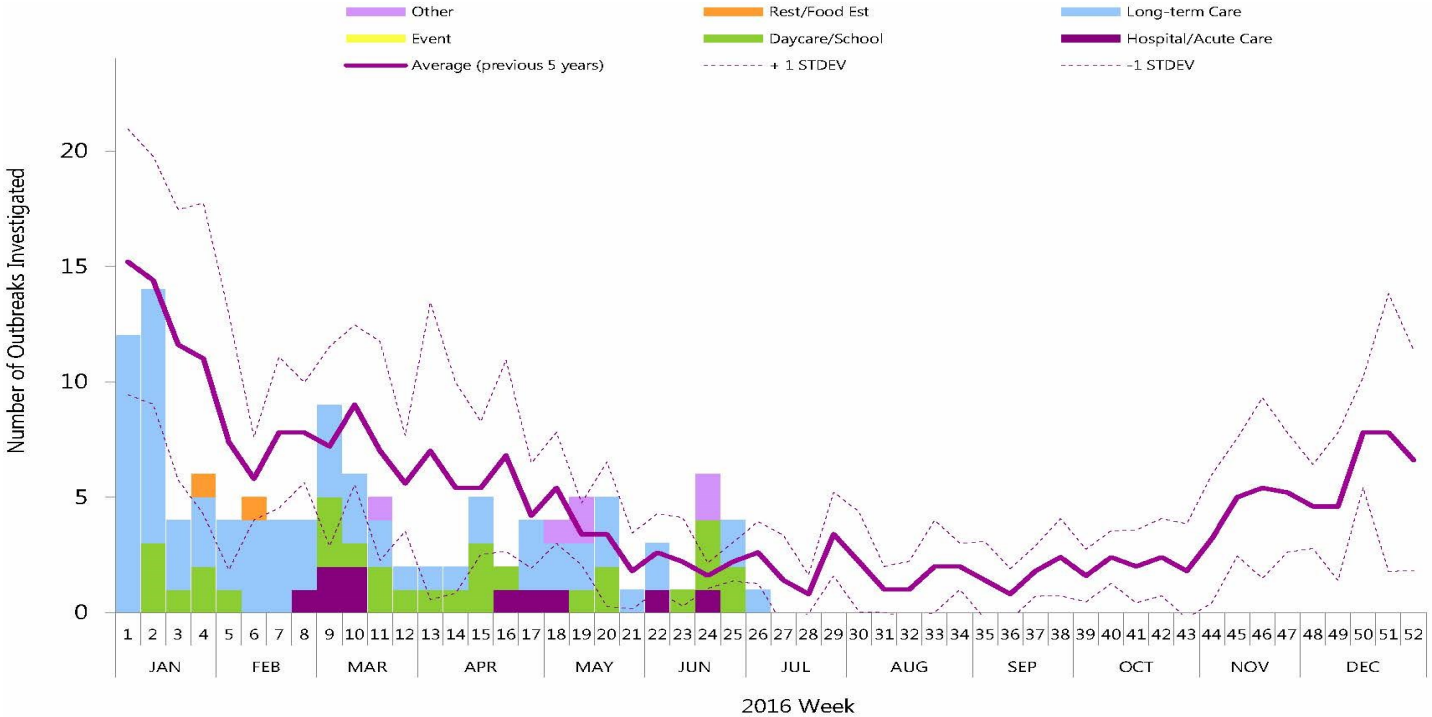


Figure 1. Viral gastrointestinal outbreaks investigated* in 2016 by facility type, Environmental Microbiology, Public Health Advanced Bacteriology & Mycology, Parasitology and Virology Programs, BCCDC PHL.

* The data available are from outbreaks in which the BCCDC PHL has been notified. Some acute care microbiology laboratories are also testing for norovirus in the province and these data may not include outbreaks from all Health Authorities. Given the nature of GI outbreaks, samples are not always available for testing.

CASE STUDY

A case of pregnant female presenting with anemia-subclinical *Plasmodium falciparum* infection

Anopheles mosquito emerging from pupa CDC/ James Gathany

By Shazia Masud, Teresa Lo, Deena Case, Quantine Wong, Muhammad Morshed

A subclinical *Plasmodium falciparum* (*P. falciparum*) infection occurred in a pregnant female 5 months after leaving the endemic area with anemia as the only clinical sign of the disease.

Case

A 21-year-old female G2P1, at 24-weeks of gestation, who recently immigrated in December 2015 to Canada from Liberia after living in a refuge camp in Tanzania presented to family physician with complaints of increasing fatigue. On examination, she was afebrile and the rest of physical exam was unremarkable. Routine blood work revealed a normal total WBC and platelets count, however her hemoglobin was 81g/L. The peripheral blood film microscopic examination showed ring forms of *P. falciparum* species. A rapid antigen test was also positive for *P. falciparum* malaria. Upon further inquiry the patient reported being treated for malaria in her home country. The stained slides along with blood specimens were sent to the provincial lab for confirmation and for estimation of peripheral parasitemia. At provincial laboratory, polymerase chain reaction (PCR) for *P. falciparum* malaria was positive and a review of peripheral blood film microscopy showed a parasitemia of < 0.1%.

The patient was prescribed a 7-day course of oral Quinine and Clindamycin. The repeat blood samples were negative for malaria parasites by both microscopy and PCR tests on day 4 and 5. The patient completed treatment without any complications and recovered fully.

Discussion

Malaria is one of the most common imported infectious diseases in Canada and other western countries. In 2015, 214 million cases of malaria occurred worldwide and 438,000 people died from malaria. More than 85% of cases and 90% of malaria deaths occurred in Sub-Saharan Africa; mainly in children.[1]

Pregnant women and children are particularly at risk of developing severe malaria due to immune tolerance and immature immune system, respectively.[3] The hallmark of falciparum malaria in pregnancy is placental sequestration of infected RBCs. The resulting maternal anemia and placental insufficiency can lead to intrauterine growth retardation, fetal demise, premature delivery and neonatal death. In malaria endemic areas infection is usually asymptomatic due to some level of acquired immunity and severe maternal anemia may be the only sign of *P. falciparum* infection during pregnancy.[4] If fetal transmission occurs, the baby has a higher risk of anemia with congenital malaria.[5]

In Canada, the majority of reported malaria cases occur in recent immigrants from endemic areas or returning Canadian travellers from malaria endemic regions. An average of 483 cases of malaria were reported to

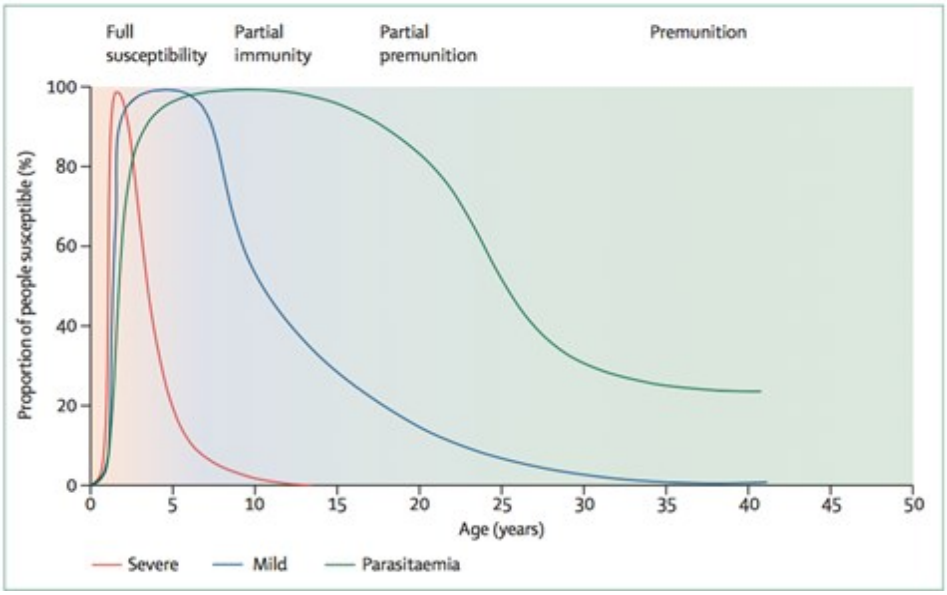


Figure 1 Relationship between age and malaria severity in endemic areas. With repeated exposure protection is acquired, first against severe infection followed by against clinical disease and much slowly against microscopically detectable parasitemia.[2]

CASE STUDY

Public health agency of Canada between 1991-2011.

Depending on the population and diagnostic method used, asymptomatic malaria prevalence ranges from 2.4 to 31.8% in refugees tested post-arrival. Some data suggest that most of the asymptomatic cases from endemic areas will present with in a year of arrival in non-endemic areas. A major cluster of malaria cases was reported in Quebec after the resettlement of 224 refugees who arrived from Tanzania in 2000–2001 where malaria was detected by PCR in 18.8% of asymptomatic refugees. Similarly, *Matisz et al* , reported asymptomatic malaria infection in 3.1% of newly arrived refugees in Edmonton, Canada.[6] The prevalence of asymptomatic malaria in pregnant women among new immigrants or refugee had been reported earlier in literature.[7,8]

Thick and thin blood film microscopy remains the gold standard for the diagnosis of malaria. Several sensitive and specific antibody based rapid diagnostic tests that detect pan malaria species-specific lactate dehydrogenase or aldolase antigen are used widely. However they are expansive and do not quantify parasitemia. Nucleic acid amplification techniques like PCR are more sensitive than classical peripheral blood film examination and can detect very low levels of parasitemia.

Conclusion

This is an interesting case of sub-clinical malaria due to preexisting immunity. Pregnancy associated immune tolerance or partially treated malarial infection leads to late recrudescence of *P. falciparum* parasitemia. The work up for malaria should be included in the differential diagnosis of anemia in pregnant females from malaria endemic regions independent of time since exposure and specific symptoms.

References

1. Malaria situation, 2015: based on updated WHO Fact Sheet, October 2015/Situation du paludisme, 2015: base sur l'aide-memoire de l'OMS, mis a jour en octobre 2015. Weekly Epidemiological Record 2015;90(45):610.
2. White NJ, Pukrittayakamee S, Hien TT, Faiz MA, Mokuolu OA, Dondorp AM. Malaria. The Lancet 2014;383(9918):723-735.
3. Yanow SK, Gavina K, Gnidehou S, Maestre A. Impact of Malaria in Pregnancy as Latin America Approaches Elimination. Trends Parasitol 2016;32(5):416-427.
4. Desai M. Epidemiology and burden of malaria in pregnancy. Lancet Infect Dis 2007;7(2):93-104.
5. Steketee RW, Nahlen BL, Parise ME, Menendez C. The burden of malaria in pregnancy in malaria-endemic areas. Am J Trop Med Hyg 2001;64(1-2 Suppl):28.
6. Matisz CE, Naidu P, Shokoples SE, Grice D, Krinke V, Brown SZ, et al. Post-arrival screening for malaria in asymptomatic refugees using real-time PCR. Am J Trop Med Hyg [Internet]. 2011 Jan [cited 2016 Jul 14];84(1):161–5. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21212221
7. Odolini S, Apostoli A, Casari S, Matteelli A, Castelli F. Recrudescence of Plasmodium falciparum malaria in a primigravid woman with anaemia as the only sign of disease. Journal of Obstetrics & Gynaecology 2014;34(4):356-356.
8. Jiménez BC, Cuadros-Tito P, Ruiz-Giardin JM, Rojo-Marcos G, Cuadros-González J, Canalejo E, et al. Imported malaria in pregnancy in Madrid. Malaria journal 2012;11(1):112-112

SPOTLIGHT

People and papers of the BCCDC PHL

Recent BCCDC PHL Awards

Congratulations to **Dr. Muhammad Morshed** (Program Head, Zoonotic Diseases and Emerging Pathogens) and **Dr. Inna Sekirov** (PGY-5 Medical Microbiology Resident) for being awarded prestigious awards at this year's UBC Pathology Day Event!

Dr. Morshed was honoured with the "Excellence in Clinical Service Award" and Inna won the "Best Resident Oral Presentation Award" when she presented on the CPO whole genome sequencing work that she has been participating in with The BCCDC PHL.

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Congratulations to **Dr. Agatha Jassem** is also well deserved for receiving funding from The BCCDC Foundation for Public Health Open Awards Program. Dr. Jassem will be working on the Genomic Analysis of Influenza A Viruses by Target-Capture Sequencing project. Along with Dr. Jassem, **Dr. Gilbert, Dr. Purssell, Dr. Tyndall, Dr. Kent** also received grants to fund their projects.

The BCCDC Foundation for Public Health

The BCCDC Public Health Laboratory at the BCCDC site provides consultative, interpretative testing and analyses for clinical and environmental infectious diseases in partnership with other microbiology labs and public health workers across the province and nationally. The BCCDC Public Health Laboratory is the provincial communicable disease detection, fingerprinting and molecular epidemiology centre providing advanced and specialized services along with international defined laboratory core functions province-wide.

This report may be freely distributed to your colleagues. If you would like more specific information or would like to include any figures for other reporting purposes, please contact us.

http://www.bccdc.ca/health-professionals/professional-resources/laboratory-services

Editor:

Justin Sorge, justin.sorge@bccdc.ca

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