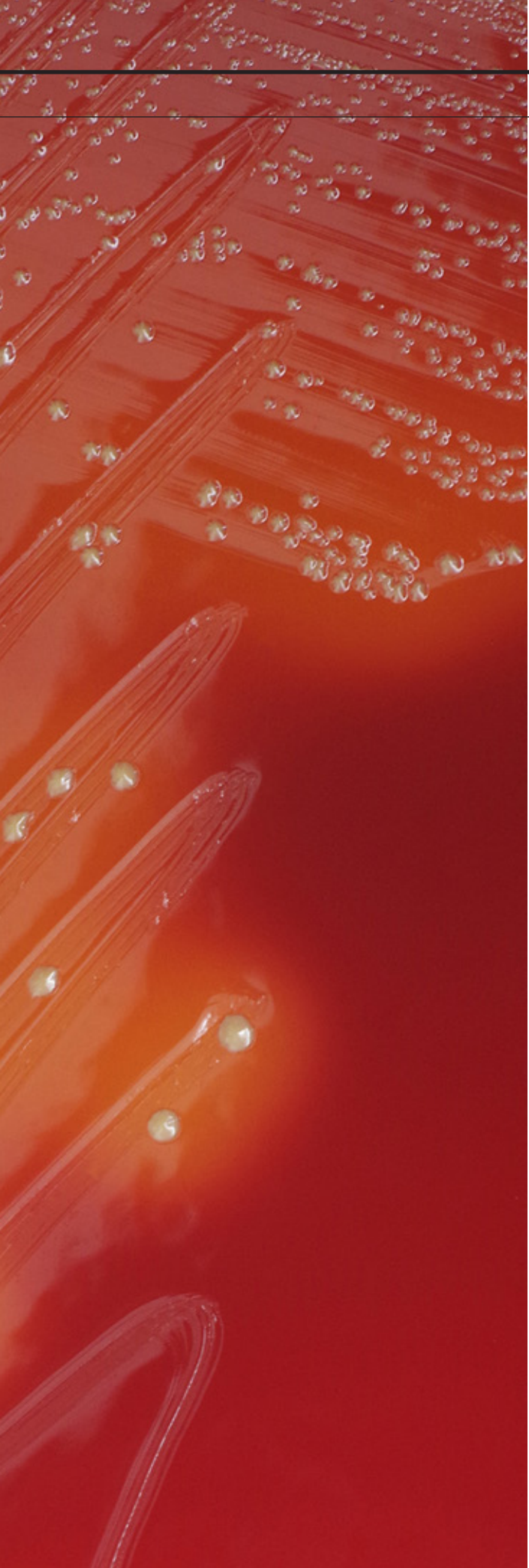


GROUP A STREP ON THE RISE:

How Laboratory
Professionals at Interior
Health Authority
Responded to the Surge
in iGAS Disease



By switching from culture to PCR, the lab significantly improved turnaround time and facilitated faster diagnosis and treatment of streptococcal throat infections, helping to stop the spread of the bacteria responsible for the spike in iGAS disease.

A recent spike in cases of invasive Group A streptococcal (iGAS) disease following the COVID-19 pandemic has drawn international attention. First noted in late 2022, the increase continues into 2024.¹ While serious cases remain rare, iGAS can be a life-threatening infection of the blood, muscles, fat, or lungs with Group A streptococcus bacteria.

Here in Canada, a group of medical laboratory professionals at Interior Health Authority in British Columbia rapidly mobilized a new throat swab protocol in response to the increase in Group A streptococcal disease. By switching from culture to PCR, the lab significantly improved turnaround time and facilitated faster diagnosis and treatment of streptococcal throat infections, helping to stop the spread of the bacteria responsible for the spike in iGAS disease.

The new method also supports the broader goal of antimicrobial stewardship, an initiative that aims to use antibiotics more judiciously to reduce the development of antimicrobial-resistant organisms. By rapidly and accurately identifying which throat infections are bacterial versus viral, doctors can be sure they are using antibiotics in the right situations.

What is invasive Group A streptococcal (iGAS) disease?

Group A streptococcus (*S. pyogenes*) is a type of bacteria commonly found on the skin and in the throat.² In addition to iGAS, Group A streptococcus bacteria can also cause mild infections such as strep throat, scarlet fever, and impetigo. Many people carry the bacteria without any signs of infection.

iGAS disease is a severe, sometimes life-threatening infection caused by the invasion of Group A streptococcus bacteria into the blood, deep muscle, fat tissue, or lungs. There are different kinds of invasive Group A streptococcal infections. Necrotizing fasciitis, or flesh-eating disease, is infection of the muscle and fat tissue with bacteria such as GAS. Streptococcal toxic shock syndrome is an iGAS infection that causes sudden onset of shock, hypotension, and organ failure.³



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Like many infections, iGAS infection is more common in young children and the elderly, as well as those with certain medical conditions. Several risk factors for developing iGAS have been identified, including alcohol use disorder, heart disease, diabetes, chronic lung disease, skin infections, and being immunocompromised.⁴ Recent infection with varicella (also known as chickenpox) is also a risk factor because of the skin lesions it causes.² However, even with the recent increase in cases, iGAS remains rare overall, with just 7.4 cases per 100,000 population in British Columbia in 2022.⁴

In most cases of iGAS, doctors do not know how the bacteria got into the body. For streptococcal toxic shock syndrome, the main sites of entry include the vagina, pharynx, mucosa, and skin.³ Any wound can allow the bacteria into the body and potentially lead to invasive disease. Additionally, a mild streptococcal infection such as strep throat can, in rare cases, become invasive.

Changes in incidence following the pandemic

The incidence of iGAS has been slowly increasing in recent decades — since well before the pandemic — and there are many theories as to why.⁵ According to a 2022 report from Health Canada, changes in the prevalence of certain *emm* types, or strains of GAS bacteria, may be responsible for increased virulence. The growing problem of antimicrobial resistance may also play a role.

A significant further increase in iGAS has been noted worldwide following the release of pandemic-related restrictions. In Denmark, case numbers increased rapidly starting in November 2022, peaking in January 2023.⁶ In England, iGAS infections were up 28% in November 2022.⁷ In Ontario, epidemiologists observed an increase in iGAS case counts from January to May 2023 before a decline.⁸ A similar trend was noted in British Columbia.⁴

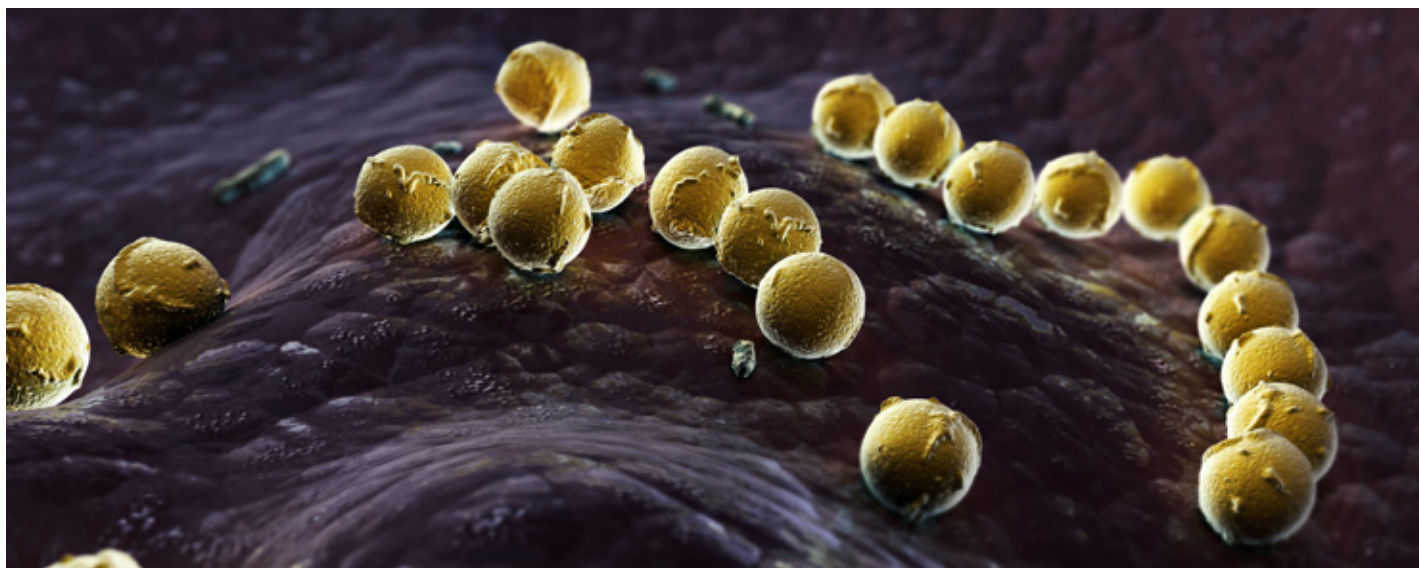
Irene Martin is head of the Streptococcus and Sexually Transmitted Infections (STI) Unit at the Public Health Agency of Canada's National Microbiology Laboratory (NML). Martin and her team witnessed the increase in iGAS in Canada firsthand.

"In Canada, invasive Group A streptococcus (iGAS) is nationally notifiable through the Canadian Notifiable Disease Surveillance System (CNDSS), meaning that it... must be reported to the public health authorities," Martin says.

During the pandemic, Martin explains, fewer iGAS cultures were submitted to the NML. But as restrictions were lifted starting in the fall of 2022, the NML started to see a surge in iGAS cultures, which persisted through 2023.

"As of January 9, 2024, the total number of iGAS cultures submitted to the NML in 2023 has surpassed 4,600, which is now the highest annual iGAS total," Martin says.

It's unclear if and how the increase in iGAS is related to the pandemic. Some experts believe a lack of immunity is at play,



because of reduced exposure to the bacteria during the pandemic.⁹ People may also have impaired immunity following infection with influenza, COVID-19, or another virus, which leaves their defences lowered against GAS.

Increased virulence also likely plays a role in the post-pandemic rise in the severity and fatality of iGAS. M1UK is a mutant strain of GAS first identified in the UK but now found in other parts of the world.¹⁰ The mutation causes the bacteria to make more toxin, which could make invasive infections deadlier.



Innovation within Interior Health Authority

As hospitals around the world experienced unprecedented numbers of iGAS cases, medical laboratory professionals played an important role in the diagnosis of both invasive and non-invasive Group A streptococcal disease.

In 2022 and 2023, at Interior Health Authority, an increase in throat culture volume coupled with a long turnaround time led to delayed diagnosis of Group A streptococcal disease and a significantly increased workload with the heightened volume of throat swabs to be processed. This sparked a collaborative effort with the goal of expediting the diagnostic process to improve patient outcomes, with medical laboratory professionals at the forefront.

Dr. Amanda Wilmer is a medical microbiologist at Kelowna Regional Hospital (KGH) within B.C. Interior Health, a regional health authority that serves the southern interior region of British Columbia.

“Interior Health [saw an] increase in throat culture volume... for emergency department and admitted patients, up to 7,039 specimens in 2022, nearly doubled from what was collected during 2020 and 2021,” Wilmer explains.

With a growing workload, the team decided to explore more rapid diagnostics. Before the changes were implemented, throat swab culture was used to investigate for Group A Streptococcus, says Andrea Ward, a technical specialist at B.C. Interior Health at KGH. The turnaround time for culture was averaging 44 hours, which significantly delayed diagnosis.

Change would support the hospital’s long-term goals, too.

“In addition to more rapid identification... the group was also interested in gains for antimicrobial stewardship, as well as access and flow related to more rapid turnaround times for testing,” Wilmer adds.



Switching from culture to PCR

After considering their options and collaborating with other teams within the hospital, the Interior Health Medical Microbiology working group settled on a simple solution: perform PCR testing on all emergency department and inpatient specimens with the goal of expediting diagnosis. Outpatient swabs continued to be tested by culture.

“Due to the comparatively high cost of the PCR assay, PCR testing is restricted to patients who present to the hospital,” Ward says.

The team decided to use the Cepheid Xpert® Express Strep A assay, which uses the GeneXpert Xpress System. The labs were already familiar with the GeneXpert system, says Ward, which helped ease the transition.

“It was used for other testing such as *C. difficile*, influenza, Respiratory Syncytial Virus (RSV), and Methicillin-resistant Staphylococcus Aureus (MRSA), and it was the first method we implemented regionally for COVID,” she explains.

Interior Health uses two types of swabs for throat culture specimen collection: Copan Eswabs, which are a Health Canada-approved specimen type for the strep A assay, and Copan M40 gel swabs, which were not an approved specimen type.

As part of the implementation process, the team had to validate the GeneXpert assay and the Copan M40 gel swabs. All in all, this took around three months, says Ward.

“The sensitivity and specificity of the GeneXpert assay were found to be excellent during our validation study,” Ward says.

“[We performed an extensive validation,] which demonstrated good performance of the [Copan M40 gel] swabs once eluted in saline,” Ward explains. “This data will be presented at the AMMI CACMID conference in Vancouver in April. Since [the hospital] did not have to change swab types for testing, the implementation went very smoothly.”

Faster Turn Around Time (TAT) to stop the spread

Since implementing the new PCR method, turnaround time has decreased to 11 hours, down significantly from 44 hours for culture. Although throat swabs do not diagnose invasive Group A streptococcal disease — that would involve testing the blood, Cerebrospinal Fluid (CSF), or tissues — faster processing of throat swabs leads to earlier treatment of streptococcal throat infections.

Treating strep throat earlier means lower organism loads and less spread of the bacteria in the community. With less GAS spread in the community, there is less opportunity for iGAS to take hold in those who are vulnerable, especially because person-to-person contact is a major driver of spread.

While iGAS remains rare, it is life-threatening, with a 10%–15% case fatality rate.² So preventing even one case of invasive disease could potentially save a life. By switching to PCR testing to help diagnose and treat streptococcal throat infections early, medical laboratory professionals within Interior Health Authority are doing all they can to fight this disease.

Looking to the future

Martin says medical laboratory professionals can play an important role in monitoring and disease surveillance.

“Medical laboratory professionals can continue to contribute to *S. pyogenes* surveillance by identifying GAS cultures and supporting the process of routing these to the NML for additional characterization,” she says. “Depending on work processes, medical laboratory professionals may be receiving *emm* typing results and would be the first to notice emerging regional trends.”

At Interior Health Authority, the changes were implemented in September 2023, and the rollout process went smoothly.

“Interestingly, after very high testing volumes over the summer, the monthly number of tests has decreased since introduction of the molecular testing in September,” Wilmer explains. However, the changes mean the hospital is well-equipped to handle the expected seasonal increase in throat culture volume during the winter months.

Overall, the team feels the change was positive and that it supports many worthwhile goals. In addition to improving patient outcomes, the changes also help the hospital use antibiotics more wisely in confirmed cases, which contributes to the shared goal of antimicrobial stewardship.

“This was a valuable experience in that it showcased the importance of innovation and rapid diagnostics in improving patient care, in collaboration with multiple different laboratory, clinical, and administrative groups within our region. Everyone shared the same vision of optimized patient care,” Wilmer says.

As 2024 unfolds, the inevitable throat infections that come through the doors of Interior Health hospitals will be diagnosed quickly and accurately, helping patients get better faster and stopping the spread of the bacteria causing the spike in invasive Group A streptococcal disease. All of this is thanks to the tireless work of medical laboratory professionals, who have always played an important role in diagnostic innovation. ■



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