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Commentary

Does group A strep have any skin in the ARF game?

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Group A streptococci (GAS) (*Streptococcus pyogenes*) are a cause of several diseases with the most common being pharyngitis and skin/soft tissue infections such as superficial pyoderma. While it is known that an important sequelae of GAS pharyngitis is acute rheumatic fever (ARF), whether GAS skin infections also lead to ARF is not completely clear [1].

It is known that ARF is the result of an autoimmune response directed against GAS antigens during streptococcal pharyngitis [1]. This autoimmune response, which typically occurs after pharyngitis has resolved, may cause damage to the mitral and/or aortic heart valves leading to a long-term disease known as rheumatic heart disease (RHD) [1]. ARF has been taught in medical schools for decades to be a disease which is a sequelae of acute GAS pharyngitis. However, evidence is beginning to suggest that there is also an association of ARF with GAS skin infections in some populations [1–3].

We know that the rates of ARF are disproportionately high in indigenous communities located in tropical and subtropical parts of the world [1]. This has been documented in groups such as the Aboriginal populations in Australia and the Māori and Pacific Islander populations of New Zealand [1,4]. In New Zealand, ARF and RHD have been shown to be diseases principally affecting the Māori and Pacific Islander populations in contrast to other groups such as Asian and Europeans [5]. It is these groups that are also severely economically disadvantaged with high rates of poverty and overcrowded housing, conditions known to predispose individuals to GAS skin infections and ARF [5]. The rates of ARF in Māori children aged 5–14 years from 2000 to 2009 have been reported as high as 40.2/100 000 and in the Pacific Islander population as high as 81.2/100 000 [6]. These rates sharply contrast with the non-Māori non-Pacific Islander population rate of 2.1/100 000. In 2011 the New Zealand government created the Rheumatic Fever

Prevention Programme with the goal of reducing the incidence of ARF in this country [7]. This program had success early on through targeting the reduction of GAS pharyngitis in school aged children. However, after a period, ARF rates started to rise again suggesting treating only GAS infected sore throats may not be the complete answer.

Proving a clear linkage of GAS skin infections as a cause of ARF has not been straightforward. In this study, Julie Bennett and colleagues collected data on over 377 000 skin swabs over a seven-year period in northern New Zealand for which a significant proportion were GAS positive (13%) [8]. These investigators found that the skin infections in children caused by GAS were predominately in the Māori (9.7 per 1000 person years) and Pacific Islander populations (15.9 per 1000 person years) as opposed to other ethnicities (0.8 for Asian and 2.2 for European/other). The study went further and looked at rates of ARF over this same time. They found that ARF rates in Pacific Islanders under 20 years of age were 70 times higher than other ethnicities [8].

Interestingly, a parallel study analyzing the rates of GAS pharyngitis in the same population found similar GAS pharyngitis rates regardless of ethnicity [6]. This contrasts with the high rates of GAS skin disease identified in the Māori and Pacific Islander populations and lower rates in other ethnic populations.

High GAS skin infection positivity rates and high rates of ARF in the Pacific Islanders and Māori populations suggest GAS skin infections maybe drivers of ARF and, later in life, RHD in these populations. While studies suggest this to be the case, conclusively proving this though is no simple task.

How does this work influence clinical practice? Based on the findings in the accompanying article as well as previous investigations, skin infections in New Zealand (especially in Pacific Islanders and Māori), need to be investigated for a causative bacterial agent and if GAS are present, be treated with antibiotics until the infection is resolved. The potential risk of ARF in these populations is too high not to investigate and if GAS is causing a skin infection,

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treat. Work to clinically resolve skin infections should receive the same attention as treating other infections, especially in regions where elevated rates of ARF have been documented.

The findings from the accompanying article adds to the growing evidence that GAS skin infections likely contribute to high rates of ARF in disadvantage populations in New Zealand. Drawing a definitive link is not easy though and clearly more research needs to be done to conclusively tie the two diseases together.

Important questions yet to be answered regarding GAS skin infections and ARF include: Does reducing the burden of GAS skin infections in populations such as Māori and Pacific Islanders also reduce the prevalence of ARF and subsequent RHD? If GAS skin infections are the prevalent cause of ARF in New Zealand's indigenous populations, what is the immunological mechanism for this?

Declaration of Competing Interest

No conflict of interest.

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