

# Rise and Persistence of Global M1T1 Clone of *Streptococcus pyogenes*

## Technical Appendix

Table 1. Range of GAS infections:\*

A) According to the pathological pattern and mechanism of pathogenesis			
Localized	Invasive	Nonsuppurative postinfection sequelae	
Pharyngitis	Cellulitis	Acute rheumatic fever	
Tonsillitis	Bacteremia	Rheumatic carditis	
Impetigo	Meningitis	Acute glomerulonephritis	
Otitis media	Myositis	Rheumatic heart disease	
Sinusitis	Peritonitis	Sydenham's chorea	
Septic arthritis	Scarlet fever	PANDAS	
Vaginitis	STSS		
	NF		
	Erysipelas		
	Other infections†		

  

B) According to the extent of infection			
Asymptomatic	Noninvasive	Invasive	
		Nonsevere	Severe
Colonization	<u>Mucous membranes:</u>	Cellulitis	STSS
	Pharyngitis	Mild bacteremia	NF
	Tonsillitis	Erysipelas	STSS + NF
	Otitis Media	Myositis	Meningitis
	Sinusitis		
	Vaginitis		
	<u>Skin:</u>		
	Impetigo/pyoderma		

\*GAS, group A streptococcal; PANDAS, pediatric autoimmune neuropsychiatric disorders associated with *Streptococcus*; STSS, streptococcal toxic-shock syndrome; NF, necrotizing fasciitis.

†GAS can also cause pneumonia, puerperal sepsis, and osteomyelitis.

Table 2. Examples of epidemiological studies performed in the last two decades to characterize GAS diseases\*

Where	Period	No. patients	M1T1 percentage	Notes	Ref.
Rocky Mountain Area, USA	1986–1988	20			(1)
USA (CDC)	1972–1988	5193	7.1% of all cases and 36% of sepsis cases		(2)
USA	1986–1990	34	74% M1 and M3	All were STSS cases	(3)
USA	1986–1990	108	28.7%		(4)
Pima County, AZ, USA	1985–1990	128	19%	High incidence in Native Americans	(5)
New Zealand	1980–1991	9389	7% (became 15.2% in 1984–1985)		(6)
Ontario	1991–1993	323† (258 isolates)	24%		(7)
Ontario	1991–1995	77†	35%	NF cases	(8)
Finland	1988–1995	4597	100%		(9)
Sweden	1983–1995	132	20%	92% of M1 were clonal	(10)
Japan	1981–1997	128	NA		(11)
Israel	1997–1998	409†	1.2% M1	Jewish Orthodox susceptible	(12)
Japan	1992–1995	44	33%	M3 isolates: 33%	(13)
	1992–1996	55	60%	M3 isolates: 4%	(13)

\*Most early studies were retrospective, which made them less conclusive. However, some studies (marked by a dagger, †) have been performed prospectively with population-based surveillance in which almost every GAS case was reported, regardless of the case severity. GAS, group A streptococcal; M1, M1 serotype; Ref., reference; CDC, Centers for Disease Control and Prevention; STSS, streptococcal toxic-shock syndrome; M3, M3 serotype; NF, necrotizing fasciitis; NA, data not available.

Table 3. Studies on M1T1 clonality

No. patients	Where	Period	Typing methods	Name given to clonal M1T1	M1T1 percentage*	Ref.
19 serious, 37 mild 665	WHO (USA patients) New Zealand	1979–1990 1980–1991	REA RFLP coupled with PFGE	M1-inv Type 1a	Serious, 90%; mild, 44% 74%	(14) (6)
126	13 countries	NA	RFLP, <i>emm</i> typing, MLEE	ET1/RFLP pattern 1a	91% ET1 and 66% ET1s/RFLP 1a	(15)
98	Finland	1988–1995	REA, ribotyping, and RAPD, PFGE	NA	100% clonal (including 66% identical)	(9)
39	NC, USA	1994–1995	PFGE	PFGE pattern A	90% during outbreak	(16)
34	Japan	1981–1988 1989–1997	PFGE PFGE	PFGE2aB1/Biotype 1	0% (0/39) 70% (24/34)	(11)

\*M1T1, global M1T1 clone; REA, restriction endonuclease; RFLP, restriction fragment length polymorphism; PFGE, pulsed-field gel electrophoresis; MLEE, multilocus enzyme electrophoresis; NA, data not available.

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