

Supplementary table 1. GAS strains used in this study

Strains	Genotype/characteristics	Reference
JRS4	Wild type, M6 <sup>+</sup> F1 <sup>-</sup> , a streptomycin-resistant derivative of a clinical isolate	Nakagawa I et al., 2004
$\Delta$ ng $a$	$ng a$ deletion mutant of JRS4	This study
$\Delta$ s $l o$	$s l o$ deletion mutant of JRS4	This study
$\Delta$ ng $a\Delta$ s $l o$	Double ( $ng a$ and $s l o$ ) gene deletion mutant of JRS4	This study
$\Delta$ ng $a$ -complement	Genomic $ng a$ gene-complemented mutant of $\Delta$ ng $a$	This study
$\Delta$ s $l o$ -complement	Genomic $s l o$ gene-complemented mutant of $\Delta$ s $l o$	This study
JRS4-Nga <sup>R289K/G330D</sup>	Genomic ng $a$ mutant of JRS4, Lys substitution at Arg289 and Asp substitution at Gly330, catalytically inactive	This study
JRS4-Nga <sup>W81A</sup>	Genomic ng $a$ mutant of JRS4, Ala substitution at Trp81, putative carbohydrate binding residue	This study
JRS4-Nga <sup>E389A/E391A</sup>	Genomic ng $a$ mutant of JRS4, Ala substitution at Glu389 and Glu391, an ADP-ribosylating turn-turn motif	This study