



Novel observations of genotypic and metabolic characteristics of three subspecies of *Streptococcus gallolyticus*

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(Citation)

Journal of Clinical Microbiology, 42(10):4912-4913

(Issue Date)

2004-10

(Resource Type)

journal article

(Version)

Version of Record

(URL)

<https://hdl.handle.net/20.500.14094/90000325>



Letters to the Editor

Novel Observations of Genotypic and Metabolic Characteristics of Three Subspecies of *Streptococcus gallolyticus*

Streptococcus gallolyticus is often found as a normal member of the gut microflora of various animals, while it has been reported to cause mastitis in cattle, septicemia in pigeons, and meningitis, sepsis, and endocarditis in humans (2). The species, which includes strains formerly identified as *Streptococcus bovis* biotype I and *S. bovis* biotype II/2, can be distinguished from other related taxa or biotypes (i.e., *Streptococcus equinus* and *S. bovis* biotype II/1) based on the results of DNA-DNA reassociation experiments (3). Recently, Schlegel et al. (6) demonstrated that *S. gallolyticus*, *S. bovis* biotype II/2, *Streptococcus macedonicus*, and *Streptococcus waius* form a single DNA cluster and thus proposed *S. gallolyticus* subsp. *gallolyticus* subsp. nov., *S. gallolyticus* subsp. *macedonicus* subsp. nov., and *S. gallolyticus* subsp. *pasteurianus* subsp. nov. within this species.

Meanwhile, Poyart et al. (4) demonstrated that a partial sequence of the manganese-dependent superoxide dismutase gene (*sodA*) provides a useful approach for species differentiation within the so-called *S. bovis*-*Streptococcus equinus* group. Consequently, Sasaki et al. (5) has developed a novel PCR-based assay targeting a partial sequence of *S. gallolyticus* specific *sodA* for species identification. We therefore performed

this PCR assay on type or reference strains of the three subspecies of *S. gallolyticus* and closely related species, including *S. equinus* and *Streptococcus infantarius*. As shown in Table 1, the species-specific PCR product was only detected in the three subspecies, supporting the view of Schlegel et al. (6) that these subspecies forms a distinct single taxon at the species level.

Most, if not all, of the strains belonging to *S. gallolyticus* are able to decarboxylate gallate as well as produce tannase, by which a hydrolyzable tannin (i.e., gallotannin) is hydrolyzed to release gallic acid, which is subsequently decarboxylated to pyrogallol (3). Recently, Chamkha et al. (1) demonstrated that *S. gallolyticus* ACM 3611^T also decarboxylated other aromatic compounds, including protocatechuic acid, *p*-coumaric acid, caffeic acid, and ferulic acid. In this context, we examined the metabolism of these phenolic acids by type strains of the three subspecies of *S. gallolyticus*, their respective reference strains, and closely related species, including *S. equinus* and *S. infantarius*. Tannase and gallate-decarboxylating activities of the strains were determined by the methodology described previously (3). Metabolism of protocatechuic, *p*-coumaric, caffeic, and ferulic acids by the strains were detected spectrophotometrically.

TABLE 1. Genotypic and metabolic characteristics of strains belonging to three subspecies of *S. gallolyticus* and its closely related species

Strain designation ^a	Former classification	<i>S. gallolyticus</i> species specific <i>sodA</i> targeted PCR product ^b	Aromatic acid metabolized ^c					
			Tannic	Gallic	Protocatechuic	<i>p</i> -Coumaric	Caffeic	Ferulic
<i>S. gallolyticus</i> subsp. <i>gallolyticus</i>								
ACM 3611 ^T (HDP 99204 ^T)	<i>S. gallolyticus</i> type strain	+	+	+	+	+	+	+
ACM 3546 (NCDO2019)	<i>S. bovis</i> biotype I	+	+	+	+	+	+	+
ACM 3902 (CDC002)	<i>S. bovis</i> biotype I	+	+	+	+	+	+	+
<i>S. gallolyticus</i> subsp. <i>macedonicus</i>								
HDP 98362 ^T (ACA-DC 206 ^T)	<i>S. macedonicus</i> type strain	+	—	—	—	+	+	—
HDP 99050 (ACA-DC 207)	<i>S. macedonicus</i>	+	—	—	—	+	+	—
HDP 99422 (NZRCC 20100)	<i>S. waius</i> type strain	+	—	—	—	+	+	—
<i>S. gallolyticus</i> subsp. <i>pasteurianus</i>								
HDP 90084 (Api 79.04.159)	<i>S. bovis</i> biotype II/2	+	—	+	+	+	+	+
ACM 3870 (CDC1723-81)	<i>S. bovis</i> biotype II/2	+	—	+	+	+	+	+
ACM 3869 (CDC2266-81)	<i>S. bovis</i> biotype II/2	+	—	+	+	+	+	+
<i>S. infantarius</i> subsp. <i>infantarius</i>								
HDP 90056 ^T (NCDO 599 ^T)		—	—	—	—	—	—	—
HDP 90104		—	—	—	—	—	—	—
<i>S. infantarius</i> subsp. <i>coli</i>								
HDP 90246 ^T (NCDO946 ^T)		—	—	—	—	—	—	—
<i>S. equinus</i>								
ACM 3541 ^T (NCDO1037 ^T)		—	—	—	—	—	—	—
ACM 3544 (NCDO2445)		—	—	—	—	—	—	—
ACM 3545 (NCDO2446)		—	—	—	—	—	—	—
ACM 3539 (NCDO597)	<i>S. bovis</i> type strain biotype II/1	—	—	—	—	—	—	—
ACM 3540 (NCDO598)	<i>S. bovis</i> biotype II/1	—	—	—	—	—	—	—
ACM 3542 (NCDO1251)	<i>S. bovis</i> biotype II/1	—	—	—	—	—	—	—
ACM 3543 (NCDO2128)	<i>S. bovis</i> biotype II/1	—	—	—	—	—	—	—

^a HPD strains were generously gifted from A. Bouvet of Centre National de Référence des Streptocoques, Service de Microbiologie, Université Paris VI, Paris, France. Culture collection: ACA-DC, Culture Collection of the Laboratory of Dairy Research, Agricultural University of Athens, Athens Greece; ACM, Australian Collection of Microorganisms, University of Queensland, Brisbane, Australia; Api, AP1-bioMérieux Collection, La Balme-les-Grottes, France; CDC, Centers for Disease Control, Atlanta, Ga.; HDP, Centre National de Référence des Streptocoques, Service de Microbiologie, Université Paris VI, Paris, France; NCDO, National Collection of Dairy Organisms, Reading, United Kingdom; NZRCC, New Zealand Reference Culture Collection, Palmerston North, New Zealand.

^b Following the methodology of PCR described by Sasaki et al. (5).

^c Following essentially the analytic method described by Osawa et al. (3) for tannic and gallic acids and Chamkha et al. (1) for protocatechuic, *p*-coumaric, caffeic, and ferulic acids.

metrically, as described by Chamkha et al. (1). Our results showed that all *S. gallolyticus* strains tested, inclusive of the three subspecies strains, decarboxylated *p*-coumaric acid and caffeic acid, while the closely related species did not decarboxylate any of the substrates (Table 1). It should also be noted that the strains belonging to *S. gallolyticus* subsp. *macedonicus* did not decarboxylate either protocatechuic acid or ferulic acid, which may prove to be useful phenotypic characteristics for identification at the subspecies level.

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