



Draft Genome Sequences of 64 Type Strains of 50 Species and 25 Subspecies of the Genus *Staphylococcus* Rosenbach 1884

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ABSTRACT Members of the genus *Staphylococcus* have been isolated from humans, animals, and the environment. Accurate identification with whole-genome sequencing requires access to data derived from type strains. We provide sequence data for type strains of 64 taxa in the genus that at the time of this writing have standing in the nomenclature.

The term “*Staphylococcus*” was introduced by Sir Alexander Ogston in reference to the bunch-of-grapes-like appearance that distinguishes these organisms from streptococci (1). Friedrich Rosenbach subsequently described “*Staphylococcus pyogenes aureus*” and “*Staphylococcus pyogenes albus*” (2). At the time of this writing, the genus includes 51 species plus additional subspecies. They are nonmotile, facultatively or obligatory anaerobic, Gram-positive cocci (3–5). Most are catalase positive (4–6). Members of the genus include human and animal pathogens and commensals, and they have been isolated from foodstuffs and environmental sources (7, 8). *S. aureus* is a well-known human pathogen, and the genome sequence of the type strain was published by Kim et al. in 2014 (9) and Shiroma et al. in 2015 (10). Other staphylococci are increasingly becoming recognized as clinically important (7, 11) and are being investigated accordingly (12, 13).

Here we give information for genome sequences of 64 type strains (Table 1) representing 50 species in the genus *Staphylococcus* that have standing in the nomenclature at the time of writing plus a number of subspecies. This catalogue of sequences can be employed as a resource for taxonomic study and to identify test isolates.

Organisms were obtained from the National Collection of Type Cultures, United Kingdom (NCTC), Deutsche Sammlung von Mikroorganismen und Zellkulturen, Germany (DSMZ), and Culture Collection, University of Göteborg, Sweden (CCUG).

Isolates were cultured on a Columbia agar and horse blood (CBA) plate (Oxoid Ltd., Basingstoke, UK) and incubated aerobically or anaerobically at 35°C overnight. Bacterial biomass was scraped from cultured plates for DNA extraction. DNA was extracted and purified with a QuickGene DNA tissue kit (AutoGen, Holliston, MA, USA). Extracted DNA was prepared for sequencing following NexteraXT (Illumina, San Diego, CA, USA) protocols and sequenced as 150-bp paired-end reads on the Illumina MiSeq platform. Reads were stripped of adaptors with BBDuk 34.38 (14). Illumina reads were quality controlled by calling bases only when 5 or more were present at a position and supported by at least 1 high-quality read in forward and reverse directions. Reads were

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TABLE 1 Accessions and genomic characteristics of 64 type strains of the genus *Staphylococcus* Rosenbach 1884

Species	Strain	No. of total reads	No. of contigs	Contig N ₅₀ value (bp)	G+C content (%)	Depth (×)	Length (bp)	No. of genes
<i>Staphylococcus agnetis</i> Taponen et al. 2012	DSM 23656	1,978,702	164	38,640	34.6	66.4	2,491,359	2,514
<i>Staphylococcus argensis</i> Heß and Gallert 2015	DSM 29875	1,430,626	19	98,914	40.8	24.75	2,452,468	2,350
<i>Staphylococcus argenteus</i> Tong et al. 2015	DSM 28299	1,686,623	48	96,207	35.1	31.51	2,759,629	2,741
<i>Staphylococcus arlettae</i> Schleifer et al. 1985	NCTC 12413	1,992,335	33	66,907	36.2	26.57	2,665,344	2,600
<i>Staphylococcus aureus</i> subsp. <i>anaerobius</i> De La Fuente et al. 1985	DSM 20714	1,949,112	400	14,564	33.2	56.12	2,575,746	2,738
<i>Staphylococcus aureus</i> subsp. <i>aureus</i> De La Fuente et al. 1985	NCTC 08532	2,207,024	41	66,458	34.9	32.75	2,749,019	2,887
<i>Staphylococcus auricularis</i> Kloos and Schleifer 1983	NCTC 12101	1,517,960	103	39,462	37.6	38.94	2,201,622	2,416
<i>Staphylococcus capitis</i> subsp. <i>capitis</i> Bannerman and Kloos 1991	NCTC 11045	2,331,749	51	101,914	36	38.76	2,434,909	2,419
<i>Staphylococcus capitis</i> subsp. <i>urealyticus</i> Bannerman and Kloos 1991	DSM 6717	1,467,277	184	42,481	35.7	35.79	2,468,245	2,500
<i>Staphylococcus caprae</i> Devriese et al. 1983	NCTC 12196	2,647,473	101	62,212	33.6	62.25	2,606,761	2,551
<i>Staphylococcus carnosus</i> subsp. <i>carnosus</i> Probst et al. 1998	DSM 20501	1,442,326	70	247,399	37.7	90.42	2,434,039	2,447
<i>Staphylococcus carnosus</i> subsp. <i>utilis</i> Probst et al. 1998	DSM 11676	1,834,824	444	11,755	33.4	36.49	2,622,255	2,702
<i>Macrococcus caseolyticus</i> Schleifer et al. 1982	DSM 20597	1,614,157	122	46,917	35.5	70.8	2,171,833	2,341
<i>Staphylococcus chromogenes</i> Hájek et al. 1987	NCTC 10530	1,169,641	117	55,359	38.5	35.94	2,276,768	2,265
<i>Staphylococcus cohnii</i> subsp. <i>cohnii</i> Kloos and Wolfshohl 1991	NCTC 11041	1,727,741	69	107,943	34.9	26.83	2,637,875	2,588
<i>Staphylococcus cohnii</i> subsp. <i>urealyticus</i> Kloos and Wolfshohl 1991	DSM 6718	1,780,154	189	26,500	33.8	49.2	2,670,427	2,647
<i>Staphylococcus condimenti</i> Probst et al. 1998	DSM 11674	1,493,311	211	32,221	35.8	23.6	2,615,688	2,604
<i>Staphylococcus delphini</i> Varaldo et al. 1988	NCTC 12225	1,499,070	227	42,122	37.1	52.47	2,751,077	2,716
<i>Staphylococcus devriesei</i> Supré et al. 2010	CCUG 58238	2,004,126	129	49,574	35.6	44.18	2,379,883	2,392
<i>Staphylococcus epidermidis</i> Kloos and Schleifer 1975	NCTC 11047	1,852,043	62	55,347	35.8	38.72	2,442,385	2,438
<i>Staphylococcus equorum</i> subsp. <i>equorum</i> Place et al. 2003	NCTC 12414	1,523,028	93	44,027	33.2	87.8	2,350,071	2,590
<i>Staphylococcus equorum</i> subsp. <i>linens</i> Place et al. 2003	DSM 15097	1,911,830	101	55,558	34	45.91	2,768,268	2,739
<i>Staphylococcus felis</i> Igimi et al. 1989	DSM 7377	1,572,866	244	24,395	36.1	45	2,409,047	2,389
<i>Staphylococcus fleuretii</i> Verzozy-Rozand et al. 2000	DSM 13212	1,811,506	156	38,940	31.7	90.36	2,473,007	2,489
<i>Staphylococcus haemolyticus</i> Kloos and Schleifer 1975	NCTC 11042	1,975,151	92	55,720	36	35.24	2,472,399	2,466
<i>Staphylococcus hominis</i> subsp. <i>hominis</i> Kloos et al. 1998	NCTC 11320	2,793,372	30	144,174	39.1	47.59	2,204,528	2,214
<i>Staphylococcus hominis</i> subsp. <i>novobiosepticus</i> Kloos et al. 1998	CCUG 42399	2,349,019	166	35,627	33.4	54.32	2,422,390	2,498
<i>Staphylococcus hyicus</i> Hájek et al. 1987	CCUG 6509	2,111,770	134	37,537	37.7	91.88	2,633,558	2,222
<i>Staphylococcus intermedius</i> Hájek 1976	NCTC 11048	2,212,778	176	51,566	37.8	41.45	2,801,199	2,797
<i>Staphylococcus kloosii</i> Schleifer et al. 1985	NCTC 12415	2,000,256	134	36,209	33	74.73	2,607,914	2,642
<i>Staphylococcus lentus</i> Schleifer et al. 1983	NCTC 12102	3,158,427	79	86,117	32.7	93.32	2,546,437	2,579
<i>Staphylococcus lugdunensis</i> Freney et al. 1988	NCTC 12217	2,272,326	20	94,638	39.8	35.15	2,519,514	2,409
<i>Staphylococcus lutrae</i> Foster et al. 1997	DSM 10244	1,461,603	200	41,148	37.8	42.6	2,429,515	2,354
<i>Staphylococcus massiliensis</i> Al Masalma et al. 2010	CCUG 55927	2,070,218	212	32,379	35	41.69	2,348,540	2,305
<i>Staphylococcus microti</i> Nováková et al. 2010	DSM 22147	1,582,916	191	38,659	39.1	53.13	2,409,945	2,429
<i>Staphylococcus muscae</i> Hájek et al. 1992	DSM 7068	1,986,642	183	32,200	37.4	63.32	2,049,263	2,075
<i>Staphylococcus nepalensis</i> Spergser et al. 2003	DSM 15150	2,186,623	412	13,339	32.9	50.09	2,860,226	2,790
<i>Staphylococcus pasteurii</i> Chesneau et al. 1993	DSM 10656	1,952,357	233	25,197	31.4	89.61	2,605,275	2,277
<i>Staphylococcus petrasii</i> subsp. <i>croceilyticus</i> Pantůček et al. 2013	CCUG 62728	1,665,214	147	36,044	34.6	55.76	2,380,571	2,346
<i>Staphylococcus petrasii</i> subsp. <i>jettensis</i> De Bel et al. 2014	CCUG 62657	1,923,933	266	23,568	34.7	45.4	2,709,801	2,730
<i>Staphylococcus petrasii</i> subsp. <i>petrasii</i> Pantůček et al. 2013	CCUG 62727	2,674,384	139	46,072	34.1	58.57	2,486,611	2,508
<i>Staphylococcus petrasii</i> subsp. <i>pragensis</i> Švec et al. 2015	DSM 102853	2,071,432	493	11,863	33	87.81	3,094,570	3,040
<i>Staphylococcus pettenkoferi</i> Trülsch et al. 2007	CCUG 51270	1,933,064	122	62,580	37.2	46.82	2,455,272	2,399
<i>Staphylococcus piscifermentans</i> Tanasupawat et al. 1992	DSM 7373	1,828,752	147	37,718	37	91.44	2,711,458	2,470
<i>Staphylococcus pseudintermedius</i> Devriese et al. 2005	CCUG 49543	1,307,526	245	32,222	37.3	33.7	2,507,403	2,482
<i>Staphylococcus pulvereri</i> Zakrzewska-Czerwińska et al. 1995	DSM 9930	1,085,309	252	21,767	32.8	91.9	2,507,841	2,321
<i>Staphylococcus rostri</i> Riesen and Perreten 2010	DSM 21968	1,857,275	167	39,749	37.6	72.78	2,341,022	2,342
<i>Staphylococcus saccharolyticus</i> Kilpper-Bälz and Schleifer 1984	NCTC 11807	1,735,439	93	46,092	34.5	91.58	2,462,952	2,724
<i>Staphylococcus saprophyticus</i> subsp. <i>bovis</i> Hájek et al. 1996	CCUG 38042	1,774,718	289	16,602	32.9	48.26	2,709,959	2,757
<i>Staphylococcus saprophyticus</i> subsp. <i>saprophyticus</i> Hájek et al. 1996	NCTC 7292	2,626,126	123	46,677	33.3	90.52	2,589,171	2,567
<i>Staphylococcus schleiferi</i> subsp. <i>coagulans</i> Igimi et al. 1990	DSM 6628	1,893,687	155	54,157	36.2	41.27	2,443,567	2,378
<i>Staphylococcus schleiferi</i> subsp. <i>schleiferi</i> Igimi et al. 1990	NCTC 12218	3,174,090	98	67,466	37.6	90.54	2,896,454	2,368
<i>Staphylococcus schweizeri</i> Tong et al. 2015	DSM 28300	1,956,713	52	65,148	35.5	37.08	2,743,713	2,725
<i>Staphylococcus sciuri</i> subsp. <i>carnaticus</i> Kloos et al. 1997	CCUG 39509	1,454,961	182	40,393	33.6	51.84	2,877,673	2,983
<i>Staphylococcus sciuri</i> subsp. <i>rodentium</i> Kloos et al. 1997	CCUG 37923	925,469	82	62,754	36.6	91.96	2,449,200	2,919
<i>Staphylococcus sciuri</i> subsp. <i>sciuri</i> Kloos et al. 1997	NCTC 12103	2,205,792	37	123,278	38.7	32.97	2,768,322	2,760
<i>Staphylococcus simiae</i> Pantucek et al. 2005	CCUG 51256	2,569,797	159	45,657	34.3	77.79	2,598,081	2,523
<i>Staphylococcus simulans</i> Kloos and Schleifer 1975	NCTC 11046	1,359,349	99	84,647	37.2	48.33	2,735,408	2,699
<i>Staphylococcus stepanovicii</i> Hauschild et al. 2012	DSM 26319	1,676,662	140	42,374	35.1	36.62	2,406,018	2,468
<i>Staphylococcus succinus</i> subsp. <i>casei</i> Place et al. 2003	DSM 15096	1,816,917	169	29,746	34.8	56.18	2,871,374	2,802
<i>Staphylococcus succinus</i> subsp. <i>succinus</i> Place et al. 2003	DSM 14617	1,805,866	339	18,694	32.2	29.39	2,786,115	2,764
<i>Staphylococcus vitulinus</i> Webster et al. 1994	DSM 15615	1,414,448	259	23,873	32.5	57.23	2,595,808	2,674
<i>Staphylococcus warneri</i> Kloos and Schleifer 1975	NCTC 11044	1,997,389	31	115,611	38	35.2	2,401,190	2,353
<i>Staphylococcus xylosus</i> Schleifer and Kloos 1975	NCTC 11043	1,802,579	226	25,849	34.4	51.79	2,725,582	2,615

assembled using Velvet 1.2.10 (15) with kmer size and coverage estimated with VelvetOptimiser 2.1.7 (15). To ensure assembly quality, at least 97% of the total assembly was required to be in contigs larger than 1 kb. Draft genome sequences were annotated with Prokka 1.12 (16).

Genome sizes varied between 2.1 million and 3.1 million base pairs across the genus,

with G+C contents ranging from 31.4% to 40.8%. The genome sequences contained a range of 2,075 to 3,040 annotated genes.

Data availability. All sequences discussed here have been deposited in GenBank as BioProject number [PRJNA339206](https://www.ncbi.nlm.nih.gov/bioproject/PRJNA339206). Table 1 lists individual accession numbers by taxon. These Sequence Read Archive deposits can be found under the study number [SRP093495](https://www.ncbi.nlm.nih.gov/sra/SRP093495).

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