Current system of *Salmonella* nomenclature used by WHO, CDC, and ASM

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Salmonella is named after an American bacteriologist, D. E. Salmon, who first isolated *Salmonella choleraesuis* from porcine intestine in 1884 (1). Salmonellae are a group of bacterial organisms with a high genetic similarity and are differentiated by their serotyping results. The antigenic classification system of various *Salmonella* serotypes used today is a result accumulated from many years of studies on antibody interactions with surface antigens of *Salmonella* organisms established by Kauffman and White almost a century ago. All antigenic formulae of recognized *Salmonella* serotypes are listed in a document called the Kauffmann-White scheme (2). The World Health Organization Collaborating Centre for Reference and Research on *Salmonella* at the Pasteur Institute, Paris, France (WHO Collaborating Centre) is responsible for the updating of the scheme. Every year newly recognized serotypes are reported in the Research in Microbiology by Popoff *et al.* and in the latest report published in 2004, there are a total of 2,541 serotypes in the genus *Salmonella* (3). The terms "serotype" and "serovar" are both frequently used, but according to the Rules of the *Bacteriological Code* (1990 Revision) established by the Judicial Commission of the International Committee on the Systematics of Prokaryotes, the term serovar is preferred to the term serotype. Thus "serovar" is used in the Kauffmann-White scheme.

Salmonella nomenclature is complex and still evolving. Currently, the nomenclature system used at the Centers for Disease Control and Prevention (CDC) for the genus *Salmonella* is based on recommendations from the WHO Collaborating Centre. According to the CDC system, the genus *Salmonella* contains two species, *S. enterica*, the type species, and *S. bongori*. On March 18, 2005, a new species, "*Salmonella subterranean*" was validly approved by the Judicial Commission (4); CDC may incorporate the species in their system in the near future. *S. enterica* consists of six subspecies (2,5): I, *S. enterica* subsp. *enterica*; II, *S. enterica* subsp. *salamae*; IIIa, *S. enterica* subsp. *arizonae*; IIIb, *S. enterica* subsp. *diarizonae*; IV, *S. enterica* subsp. *houtenae*; and VI, *S. enterica* subsp. *indica*.

In subspecies I, serotypes (or serovars) are designated by a name usually indicative of the associated diseases, their geographic origins, or their usual habitats. In the remaining subspecies as well as those of *S. bongore*, antigenic formulae determined according to the Kauffmann-White scheme (2) are used for those unnamed serotypes. Some members of these subspecies may have been named before 1966 and thus their names are retained and cited as those in the subspecies I.

To avoid confusion between serotypes and species, the serotype name is not italicized and starts with a capital letter. When cited at the first time in a report, the genus name is given followed by the word "serotype" (or the abbreviation "ser.") and then the serotype name, e.g., *Salmonella* serotype or ser. Choleraesuis, and *Salmonella* serotype or ser. Typhi. Afterward the name may be shortened with the genus name followed directly by the serotype name, e.g., *Salmonella* Choleraesuis or *S.* Choleraesuis, and *Salmonella* Typhi or *S.* Typhi (3). Because the type species name, *enterica*, has not been approved before 2005, serotype names are used directly after the genus name without the mention of the species. Following the officially approval of "*enterica*" as the type species name from January 2005 (6), further amendment to include species name in the *Salmonella* nomenclature by CDC may be expected.

For those designated by their antigenic formulae, the subspecies name is written in Roman letters (not italicized) followed by their antigenic formulae, including O (somatic) antigens, H (flagellar) antigens (phase 1),

and H antigens (phase 2, if present). A colon is used in between each antigen, e.g., *Salmonella* serotype II 39:z_{10}: z_6. For serotypes in *S. bongori* (previously belongs to subgenous V), V is still used for consistency, e.g., *S.* V 13,22:z_{35}:- (3).

In publications of the American Society for Microbiology (ASM), the *Salmonella* nomenclature used at CDC was accepted as the standard form by the Publications Board in the 1999 meeting and the Instruction to Authors has been updated to include this information since 2000 (7). The 2006 ASM Instruction to Authors indicated that, for the species, "*Salmonella enterica*" is used at the first time, and "*S. enterica*" thereafter; for the subspecies, "*Salmonella enterica* subsp. *arizonae*" is used at first, and "*S. enterica* subsp. *arizonae*" thereafter. Serotype names should be in Roman type with the first letter capitalized, e.g., *Salmonella enterica* serotype Typhimurium. After the first use, the serotype may be used without a species name, e.g., *Salmonella* serotype Typhimurium.

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