

SRMs for Organic Contaminants in Human Serum

NIST has developed serum-matrix Standard Reference Materials (SRMs) for the past 25 years, primarily for measurements of clinically-important analytes (e.g., cholesterol, glucose, and creatinine). In 2004, NIST began collaborating with the CDC Division of Laboratory Sciences, Analytical Toxicology Branch to develop two new SRMs to meet the expanding needs for the measurement of organic contaminants in human serum; one of these materials, SRM 1957, is a natural level (unspiked) and the second, SRM 1958, is a spiked material.

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SRM 1589 Polychlorinated Biphenyls (as Aroclor 1260) in Human Serum was issued in 1985. It was the first serum-based SRM for the measurement of organic contaminants and was prepared by fortifying human serum with Aroclor 1260 prior to freeze-drying. This material was replaced in 2000 with SRM 1589a PCBs, Pesticides and Dioxin/Furans in Human Serum, which contained only the natural levels of these constituents. SRM 1589a has found widespread use as a control material in human monitoring programs such as the Center for Disease Control and Prevention's (CDC's) National Health and Nutrition Examination Surveys (NHANES). Since the concentrations of polychlorinated biphenyls (PCBs), pesticides and dioxins/furans in the human population have decreased by approximately 50% since SRM 1589a was prepared in 1996, a more contemporary serum SRM is needed to represent these lower levels. In addition, there is a wide range of new organic contaminants and contaminant metabolites that should be value assigned in a human serum SRM.

Approximately 200 L of human serum was procured from various locations around the US, combined, and homogenized. Half of this serum was dispensed and freeze-dried as SRM 1957. The remaining approximately 100 L was spiked with a solution containing selected chlorinated dioxins and furans, brominated dioxins and furans, pesticides, polychlorinated biphenyls, brominated flame retardants, polychlorinated naphthalenes, phenols, and toxaphenes at concentrations approximately 10 times higher than median concentrations found in the US population during the 2003 NHANES study.

SRM 1957, with natural contaminant levels, will be representative of a serum with concentrations of contaminants currently found in the US population and will complement the currently available SRM 1589a. SRM 1958, spiked at 10 times higher than the natural level, will be useful for the development of analytical methods for emerging contaminants and other classes of compounds.

Future Plans: The value assignment of SRM 1957 and SRM 1958 will include measurements made at NIST and CDC as well as data from an interlaboratory study that is being organized by CDC.