CLINICAL AND LABORATORY STANDARDS INSTITUTE®

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M40-A2

Quality Control of Microbiological Transport Systems; Approved Standard—Second Edition

This document provides criteria to assist manufacturers and end users of transport devices in providing and selecting dependable products for the transport of microbiological clinical specimens.

A standard for global application developed through the Clinical and Laboratory Standards Institute consensus process.

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Abstract

Clinical and Laboratory Standards Institute document M40-A2—*Quality Control of Microbiological Transport Systems; Approved Standard—Second Edition* presents the criteria that shall be considered when choosing a microbiological transport device to facilitate sample preservation. QC considerations for the manufacturer and testing laboratory are presented, as well as techniques, control microorganisms, and acceptability criteria. This document provides a consistent protocol for initial testing of microbiological transport devices by manufacturers and a method by which laboratories can validate manufacturer claims and compare devices.

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Foreword

In 1893, Councilman first described preparing transport swabs by wrapping cotton pledgets around the ends of wires, enclosing these wires in test tubes, and sterilizing them in a hot air sterilizer.[1] After sterilization, the test tubes were taken to wards where a wire was removed and used to rub the pharyngeal membranes of patients suspected of being infected with diphtheria. After collection, the test tubes were labeled and sent to a laboratory where specimens were inoculated on a culture medium.

The development of transport devices was a result of public health concerns.[2] Maintaining microorganism viability during transport to the public health laboratory was imperative for the isolation and identification of the agents responsible for relevant infectious diseases. During the 1930s, 1940s, and 1950s, such infections, particularly gonorrhea and bacterial diarrhea, were the driving forces behind the development of transport media and devices.[3] Most studies focused on evaluation of performance rather than establishment of an acceptable standard of expected performance.[4] It is difficult to determine when systematic QC began to be applied to transport systems. However, it was Rubbo, Benjamin, and Stuart[5] who noted that certain batches of cotton wool used on swabs were associated with faster microbial death rates than others and that this phenomenon (toxicity) could be countered by the addition of serum onto the transport swabs.[6] Additionally, the important contributions of Amies, Cary, and Blair for transport medium should be acknowledged.[7,8]

Within the hospital setting, use of transport devices for various "routine cultures" began as investigators determined variability in recovery from specimens plated at the bedside compared to those routed to the laboratory via established mechanisms.[5] Currently, a number of factors contribute to the increasing emphasis on the use of transport devices to maintain specimens for microbiological testing. These factors include an increased use of outpatient treatment that has accompanied shortened hospital stays, and the centralization of laboratory services due to both managed care and a shortage of individuals with expertise in clinical microbiology.

As new technologies provide the opportunity to redefine the method of recovery or detection of microorganisms of interest, standardizing the QC testing and acceptance criteria will become important in order to assure the highest level of care to patients. This document on QC of transport devices will assist in the standardization of the performance of these devices.

Since the publication of the first edition of this document, many studies have followed its recommendations.[9,10-17] In revising M40, the committee updated the document where appropriate, using data generated from studies performed using the protocols that were published in the first edition. Testing protocols were updated to accommodate new types of swab collection devices that have been introduced since the first edition was published, and temperatures under which QC testing and specimen transport are conducted were better defined. Lastly, the committee added to, or expanded sections related to, QC of transport devices used for viruses, urine, and fecal specimens.

In the United States, basic manufacturing requirements for medical devices, including *in vitro* diagnostic devices, were established via the Medical Device Amendments of 1976. This legislation gave the US Food and Drug Administration (FDA) authority to regulate medical devices (premarket notification, [510(k)] and premarket approval), and develop consistent manufacturing requirements (good manufacturing practices [GMP]). GMP include the requirement to perform product QC testing before distribution. Each manufacturer is required to establish the type of testing to be performed, as well as acceptance criteria based on the product and its intended use. Additionally, the European Union has adopted the Medical Devices Directive 93/42/EEC[18] and the *In Vitro* Diagnostic Device Directive 98/79/EC,[19] which have requirements very similar to those in the United States. These directives include provisions to use harmonized standards as a method of demonstrating conformity to the directive requirements. Likewise, the FDA has formalized the use of these types of standards by manufacturers to

demonstrate performance in premarket submissions. Further discussion of regulatory considerations for these markets can be found in Appendix B.

Key Words

Acceptable performance, acceptance criteria, biological properties, control strains, microbiological, microbiological testing, molecular transport, performance criteria, quality control, regulatory considerations, specimen transport, standards, storage conditions, transport devices, transport medium, transport temperature, viral transport

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1 Scope

The transport of clinical specimens is a critical component for accurate diagnosis. Preservation of inherent, interpretive attributes of microorganisms and/or nucleic acids can be quickly compromised when the transport conditions or transport devices are suboptimal. The advent of antigen detection methods, methods for amplification and detection of genetic elements, and the requirement for local or distant transport of these specimens to a testing facility has imposed further considerations on manufacturers to provide products that will not compromise reporting of clinically relevant laboratory data to physicians. Clinicians should be able to collect and submit specimens to the laboratory and laboratorians should be able to retrieve specimens from containers, devices, and transport media with a reasonable assurance that the viability of microorganisms and/or preservation of nucleic acids present in the specimen will be maintained.

This standard provides criteria to the manufacturers and end users of transport devices to assist in providing and choosing dependable products for the transport of microbiological clinical specimens. Manufacturers will be able to state whether or not the performance characteristics for specific groups of microorganisms and transport devices of a particular product satisfy the performance standards as specified in this document. Furthermore, manufacturers shall state whether or not any additional testing is required before the use of a particular product.

Secondary distributors and end users must assume the responsibility for storage and transport conditions of specimen collection devices before and after use, by adhering to the conditions specified by the manufacturer or those deemed optimum by the laboratory in order to ensure microorganism viability/stability.

In this document, except as specifically noted, QC consists of an assessment of the performance characteristics of a complete device, and not the individual components. There are multiple variables involved in the manufacture of a transport device, including, but not limited to, the container, transport medium, collection device, packaging, and environment. It is fundamental that the assessment of the device be based on measurable performance characteristics for the particular device.

This document is not intended to provide proprietary information on product development, but rather to provide assurance to the device's user that manufacturer claims are met following standardized testing and acceptance criteria. It provides guidance to the manufacturer in addressing critical issues related to specimen integrity specific to the type of testing to be performed, eg, bacterial and viral culture, or nucleic acid detection. This document does not address the technique of transport device manufacturing, but focuses on the methods for QC testing and acceptance criteria in order to provide a product suitable for the analysis of clinical specimens for agents of disease.

Transport devices are essential components of the preexamination process of microbiology laboratory testing. It is recognized that these early steps in the total testing process are critical to the production of clinically relevant information. Patients, physicians, health care providers, and laboratorians expect products that meet the highest standards of laboratory practice. This document will facilitate this goal.[a] And while it is beyond the scope of this document to address the design of devices, it is imperative that

[a] In the United States, the Clinical Laboratory Improvement Amendments guidelines place the responsibility for acceptance of quality specimens on the laboratorian.