DETERMINATION OF PRODUCT SHELF LIFE AND ESTABLISHMENT OF EXPIRATION DATES

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Abstract:

One of the requirements of ISO Guide 34 accredited reference material manufacturers is to perform comprehensive stability studies in order to ensure that the best products possible are available to customers. A stability study looks at many quality factors in an effort to determine how long the product will maintain its integrity once it is out of the controlled conditions of the laboratory. Ultimately, it allows the manufacturer to accurately determine shelf life. This short paper highlights the process ERA follows in determining a product shelf life and how expiration dates are selected and defended.

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Stability studies may include a number of different types of physical, chemical and microbiological tests, with the focus in the case of certified reference materials (CRMs) being on analyte certified values. In early stages, accelerated stability testing (at relatively high temperature and/or humidity) can be used as a "worst case" evaluation tool. Testing under more gentle conditions (those recommended for long-term shelf storage) are used to determine a product's shelf life and expiration dates. Control dates dictate when products should be removed from a manufacturers' active inventory, while stability dates dictate when products should no longer be used by customers.

For ERA single-use TOC products (30-60 mL), we use the following product example to illustrate the determination of stability date (actual data from components of a single-use 40 mL USP system suitability test kit; USP Sucrose and USP 1,4-benzoquinone):

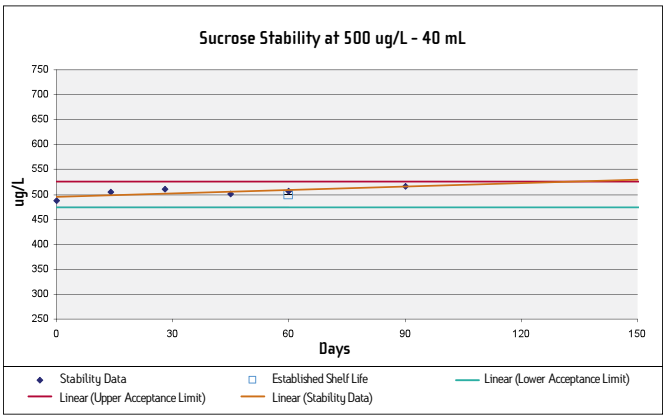

Figure 1.

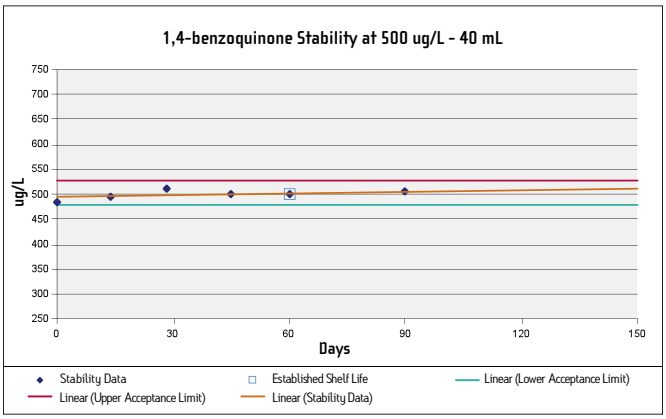

Figure 2.

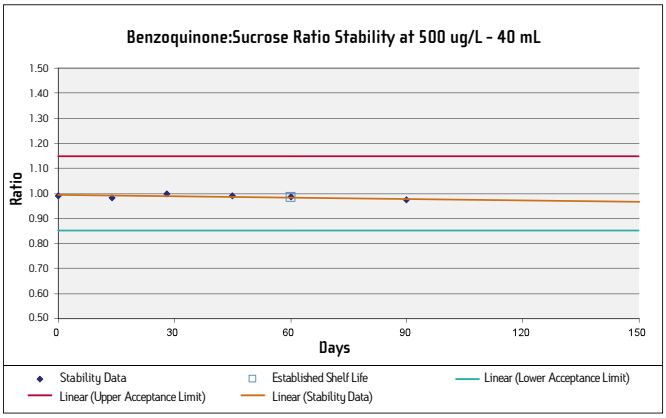

Figure 3.

Data collected beyond 90 days individually for sucrose (Fig. 1) and 1,4-benzoquinone (Fig. 2) and for the ratio test itself (Fig. 3) are shown to be excellent. In this case, where the expiration period is less than one year, the control date would equal the stability date. For this 40 mL system suitability product shelf is defensible at 120 days – twice the stated shelf life of 60 days.

Data presented here were acquired using CRMs stored at 4°C ± 2°C over the course of the study.

Understanding that customers must comply with the USP acceptance criteria of 100% ± 15% as set forth in USP chapter <643> for system suitability test results, acceptance criteria for sucrose and 1,4-benzoquinone is set at ± 5% of made-to values to remain within 10% when compounded.

For ERA bulk TOC products (125-1000 mL), we use the following product example to illustrate the determination of stability date (actual data from components of a single-use 125 mL USP system suitability test kit; USP Sucrose and USP 1,4-benzoquinone):

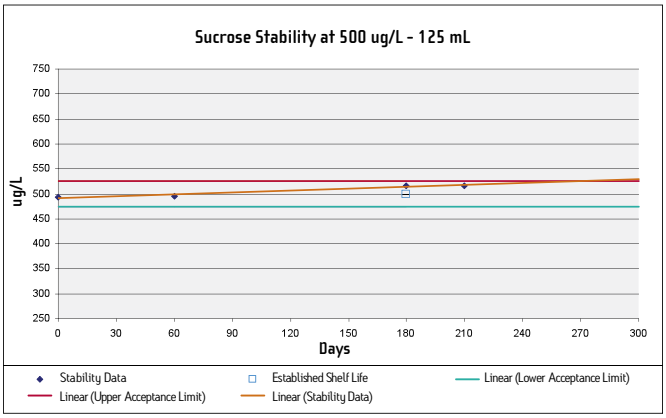

Figure 4.

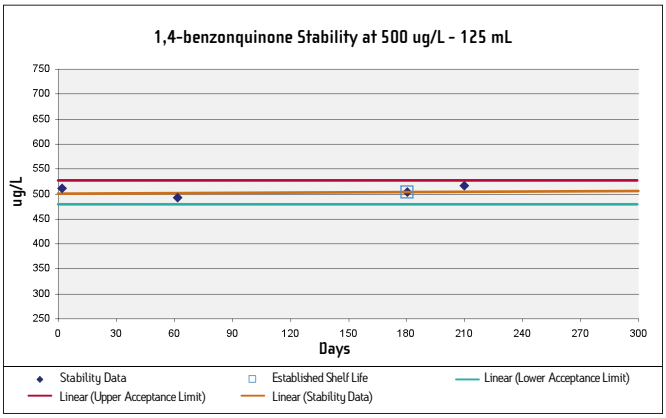

Figure 5.

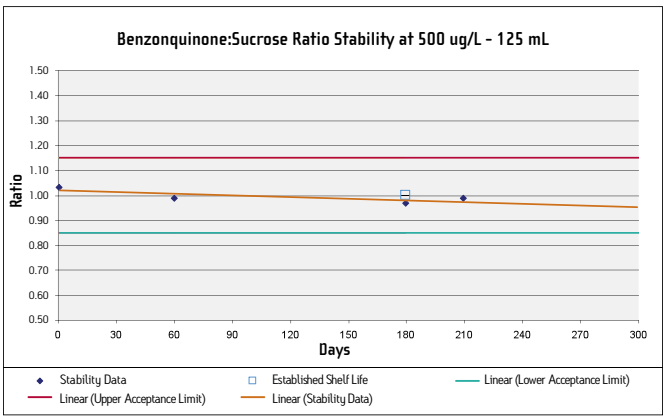

Figure 6.

Again, data collected beyond 180 days individually for sucrose (Fig. 4) and 1,4-benzoquinone (Fig. 5) and for the ratio test itself (Fig. 6) are shown to be excellent. With an expiration period of less than one year, the control date would again equal the stability date. For this 125 mL system suitability product, shelf life is defensible beyond 360 days – twice the stated shelf life of 180 days.

As with the single-use products, data presented for bulk CRMs were acquired using bulk products stored at 4°C ± 2°C over the course of the study.

With the USP acceptance criteria of 100% ± 15% from USP chapter <643> for system suitability test results, acceptance criteria for sucrose and 1,4-benzoquinone are set at ± 5% of made-to values to remain within 10% when compounded.

SUMMARY

In accordance with regulatory requirements, ISO Guide 34 accredited reference material producers must conduct long-term stability testing programs that include the determination of stability/expiration dates (the date after which the product should not be used by the customer) and the setting of control dates (the date after which a product should not be sold) for products. The calculation of stability dates requires creating a process that includes components such as determination of the scope of data collection, establishing a testing schedule, collecting data, statistical analysis of data and the determination of data acceptance limits.

CONCLUSION:

In the process of selecting a provider of CRMs, understand that using their products and services means you will be integrating their quality levels into your laboratory processes as well. You should be discriminating in your evaluation process and consider seriously their demonstrated commitment to quality. Accreditations like ISO Guide 34 and ISO 17025 are excellent indicators of commitment to quality and overall scientific capabilities.

DEFINITIONS:

Control Date: The date after which a product should not be sold.

Stability Date: The date at which the best graphical line for the stability data crosses the acceptance criteria.

Shelf Life: The time between manufacturing of the product and the stability date.

Expiration Date: The date after which the product should not be used by the customer.

ERA'S ACCREDITATIONS

ERA is accredited as a provider of proficiency testing and certified reference material products.

Our two facilities in the U.S. and UK are registered to ISO 9001:2008 and accredited to ISO Guide 34, ISO 17025 and ISO 17043.*

ISO 9001

ISO 9001 is a quality management standard that applies to all types of organizations regardless of size or function. This international standard helps both product and service oriented organizations achieve standards of quality that are recognized and respected throughout the world. This is accomplished mostly through quality management practices that extend into all areas of an organization. ISO 9001 registered companies must have written procedures and training documentation in the areas of customer service, complaint handling, product design, purchasing, manufacturing, product evaluation, packaging and shipping. Included on our ISO 9001:2008 accreditation scope are Synthetic Reference Materials and Quality Control Standards.

nqa. ISO 9001 Registered
ISO 9001:2008 CERTIFICATE NO. 10551

LRQ 4004695

ISO 17025

ISO 17025:2005 certification, covering the competence of testing and calibration laboratories, ensures that a company's laboratory tests are performed correctly, and that attestations of product quality are appropriate and defensible. All aspects of raw material, in-process and final product verification are covered by this accreditation. It certifies the company's ability to demonstrate the robustness of their quality program through comprehensive and accurate product testing.

ISO/IEC 17025:2005
ACCREDITED
CHEMICAL TESTING LABORATORY CERTIFICATE NO. 1539.02

UKAS TESTING
No. 4604

ISO Guide 34

Our ISO Guide 34:2008 accreditation is targeted specifically to Certified Reference Material (CRM) manufacturers. For a manufacturer to become ISO Guide 34 registered, the policies and processes employed to design, manufacture and certify reference materials must be validated and proven to be accurate and robust. For CRMs, ISO Guide 34 also requires that each Certificate of Analysis (C of A) include an uncertainty statement that reflects all sources of error involved in certifying the standard, including measurements and material purity; it must allow for complete traceability of the CRM. In fact, the C of A itself must also conform to a strict set of criteria.

ISO/IEC GUIDE 34:2009
ACCREDITED
REFERENCE MATERIAL PRODUCER CERTIFICATE NO. 1539.03

UKAS REFERENCE MATERIALS
No. 4604

ISO 17043

ISO 17043 is designed specifically for Proficiency Testing providers. ISO 17043 specifies the essential activities that need to be evaluated when conducting inter-laboratory testing comparisons. ISO 17043 defines the criteria related to study design, sample manufacture and the ensuring of homogeneity and stability, which must be taken into account in the design and execution of proficiency testing schemes.

ISO/IEC 17043:2010
ACCREDITED
PROFICIENCY TESTING PROVIDER CERTIFICATE NO. 1539.01

* *ERA's U.S. facility is accredited to ISO Guide 34, ISO 17025 and ISO 17043 by American Association of Laboratory Accreditation (A2LA) and registered to ISO 9001:2008 by National Quality Assurance (NQA).*

ERA's UK facility is accredited to ISO Guide 34 and ISO 17025 by United Kingdom Accreditation Society (UKAS) and registered to ISO 9001:2008 by Lloyd's Register Quality Assurance (LRQA).

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