

Best Practices for Third Party Testing of Dietary Supplements

Introduction

Dietary supplements usage by consumers in the United States can be traced back to the mid-20th century when essential vitamins began to be isolated and synthesized. Plant materials and extracts have of course been used for centuries around the world as medicinal products. As we learned more about vitamins and other nutrients, the complexity and composition of supplements expanded exponentially.

For many years, dietary supplements were regulated and treated as “food” products. Finally, the Dietary Supplement Health and Education Act was passed into law in 1994. This law officially defines dietary supplements as “a product (other than tobacco) intended to supplement the diet that bears or contains one or more of the following dietary ingredients: a vitamin; a mineral; an herb or other botanical; an amino acid; a dietary substance for use by man to supplement the diet by increasing the total dietary intake; or a concentrate, metabolite, constituent, extract, or combination of any ingredient described.”

In 2007, the FDA issued Good Manufacturing Practices (GMPs) for dietary supplements, a set of requirements and expectations by which dietary supplements must be manufactured, prepared, and stored to ensure quality. Manufacturers are required to guarantee the identity, purity, strength, and composition of their dietary supplements. These regulations initiated a large demand for testing services from contract research organizations.

As the industry continued to grow and expanded testing was required, laboratories strove to meet this demand and to develop appropriate testing methodologies. The American Council of Independent Laboratories (ACIL) came together with its members and developed the following “best practices” document to help contract laboratories understand the expectations and requirements that they should be aware of in this business.

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Laboratories that offer contract-testing services to the Dietary Supplement Industry shall maintain ISO 17025 Accreditation¹

- ISO 17025 scope of accreditation should cover all major test methods used by the laboratory to support industry
- Scope of accreditation should be made available to all customers
- If certain routine methods are not included in the ISO 17025 scope, a justification for exclusion shall be provided. (*justification checklist to be developed, contact ALAC for DS appendix*)

Laboratories that offer contract-testing services to the Dietary Supplement Industry shall utilize test methods that are scientifically valid²

- A test method is considered scientifically valid if one of the following criteria are met:
 - The test procedure is a published compendial method from AOAC INTERNATIONAL (AOAC)³, United States Pharmacopeia (USP)⁴, or other standard setting organization. These methods shall be used within the published scope of method applicability, and shall be documented in a company Standard Operating Procedure (SOP).
 - The test method is a fully validated method. This validation shall follow published guidelines from AOAC⁵, USP⁶, or other standard setting organization, and the validation study shall be documented.
 - The test method is validated using an “in-house” validation procedure. The validation procedure shall be documented in a company Standard Operating Procedure (SOP) and the results of the validation shall be documented.

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- The test method is demonstrated to be scientifically valid and fit for purpose using an in-house protocol. This protocol shall be documented in a company SOP and contain the following:
 - Demonstration of method precision
 - Demonstration of method accuracy
 - Demonstration of the method specificity
 - Document range applicable concentrations
 - Document matrices used in validation
- If the test method in use does not meet the criteria listed above, there shall be adequate justification and documentation to explain the reasons.

Laboratory Transparency

- It is recommended that laboratories provide demonstration of scientific validity for all test methods used in the analysis of dietary supplements.

Glossary of terms

- Validation - documented procedure for obtaining, recording and interpreting the results required to establish that a process will consistently yield product complying with predetermined specifications. [SOURCE: ISO/TS 11139:2006, definition 2.55]
- Precision - measurement precision- closeness of agreement between measurement indications or measured quantity values obtained by replicate measurements on the same or similar objects under specified conditions

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- Note 1 to entry: Measurement precision is usually expressed numerically by measures of imprecision, such as standard deviation, variance or coefficient of variation under the specified conditions of measurement.
 - Note 2 to entry: The specified conditions can be, for example, repeatability conditions of measurement, intermediate precision conditions of measurement, or reproducibility conditions of measurement (see ISO 5725-5^[78]).
 - Note 3 to entry: Measurement precision is used to define measurement repeatability, intermediate measurement precision, and measurement reproducibility.
 - Note 4 to entry: Replicate measurements means measurements that are obtained in a manner not influenced by a previous measurement on the same or similar sample.
 - [SOURCE: ISO/IEC Guide 99:2007, definition 2.15]
- Accuracy - measurement accuracy, accuracy of measurement - closeness of agreement between a measured quantity value and a true quantity value of a measurand
 - Note 1 to entry: The concept "measurement accuracy" is not a quantity and is not given a numerical quantity value. A measurement is said to be more accurate when it offers a smaller measurement error.
 - Note 2 to entry: The term "measurement accuracy" should not be used for measurement trueness and the term measurement precision should not be used for 'measurement accuracy', which, however, is related to both these concepts.
 - Note 3 to entry: "Measurement accuracy" is sometimes understood as closeness of agreement between measured quantity values that are being attributed to the measurand.
 - [SOURCE: ISO/IEC Guide 99:2007, 2.13, modified — "accuracy" is used as the preferred term.]
- Specificity - analytical specificity - capability of a measuring system, using a specified measurement procedure, to provide measurement results for one or more measurands (3.28) which do not depend on each other nor on any other quantity in the system undergoing measurement
 - Note 1 to entry: Lack of analytical specificity is called analytical interference (see ISO 18113-1:2009, A.3.2^[21]).
 - [SOURCE: ISO 18113-1:2009, A.3.4]

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References

1. ISO/IEC 17025:2017 — General requirements for the competence of testing and calibration laboratories
2. USFDA United States Code of Federal Regulations 21 CFR Part 111 – cGMP for Dietary Supplements
3. Official Methods of Analysis of AOAC INTERNATIONAL, <http://eoma.aoac.org>
4. United States Pharmacopoeia and National Formulary (USP/NF), <http://www.uspnf.com/uspnf/login>
5. AOAC Guidelines for Method Validation: [AOAC Guidelines for Single Laboratory](#)
AOAC International Guidelines for Laboratories Performing Microbiological and Chemical Analyses of Food, Dietary Supplements, and Pharmaceuticals – An Aid to Interpretation of ISO/IEC 17025:2017. ALACC. August 2018
6. USP 30-NF 25, General Chapter <1225> Validation of Compendial Methods
http://ftp.uspbep.com/v29240/usp29nf24s0_c1225.html