

determine whether a dietary ingredient or dietary supplement is adulterated.

Criteria for establishing appropriate specifications must be specific to the component, dietary ingredient, or dietary supplement. The specifications are the parameters that you must meet. For example, for ascorbic acid, your specifications would include all the criteria that you want your incoming dietary ingredient or for your finished product to meet. For example, you might establish criteria for the appearance, color, odor, identity using one or more tests, heavy metals (*e.g.*, lead, arsenic, mercury), and organic volatile impurities.

Similarly, criteria for selecting appropriate test and examination methods include parameters such as type of tests and examinations needed based on the component you receive. For example, you might use morphological characters and organoleptic characteristics in some cases to identify botanical dietary ingredients at the time of collection or for unprocessed botanicals. When sufficient morphological characters are present to separate the plant species from other plant species, an accurate identification can be made since morphological characters are the sole basis of distinguishing most of the world's plant species. However, unprocessed botanicals that do not contain all the plant parts necessary to include adequate morphological characters to assure the correct species should have other identity aids or tests to assure the identity of the botanical. It is possible to use only a picture as an identity standard for whole fresh Ginkgo leaf from a cultivated field because the Ginkgo leaf is not easily confused with the leaf shape, venation, and color of other leaves that could be present in the field. In contrast, powdered Ginkgo leaf is a different form of the dietary ingredient and would require microscopic and/or chemical analysis. Ginkgo extracts have no morphological or anatomical features, and it is possible that extracts may include a number of chemical compounds at different ratios and concentrations that would require a different chemical test to assure the identity of the dietary ingredient. Botanical dietary ingredients that come from wild rather than cultivated sources may grow among and be unintentionally harvested with "poisonous" plants; therefore, an identity test also would need to show whether a botanical dietary ingredient is adulterated with another substance or a poisonous plant.

To illustrate this point, a specification may contain a simple identity test, and these tests may show whether a dietary

ingredient is adulterated with another substance or is a poisonous plant that should not be ingested.

Misidentification or a mixup of botanical ingredients can cause a product to be adulterated (Refs. 6 and 69 through 73). Heavy metals may contaminate botanical and natural-occurring ingredients if a plant is grown and harvested in an area contaminated with heavy metals or even processed in a contaminated area (Refs. 74 and 75). Pesticides also may contaminate botanical ingredients; this occurs in rural areas where the botanical plant grow alongside commercial crops (Ref. 64). Therefore, you must consider what criteria you need to include for the types of testing that are needed, for example, for heavy metal or pesticide contamination, or identity testing criteria for selecting appropriate test methods, for example, whether to use organoleptic or chemical analyses for identity testing. In addition, you must establish criteria for specifications for the tests and examinations used. Establishing such criteria for specifications and appropriate test and examination methods will provide you with internal processes that will help prevent misidentification and contamination.

Proposed § 111.60(b)(1)(iii) would require your laboratory control processes to include use of sampling plans for obtaining representative samples of:

- Components, dietary ingredients, and dietary supplements received;
- Inprocess materials during the batch manufacturing when testing or examination is required in the master manufacturing record;
- Each batch of dietary ingredient or dietary supplement manufactured to determine that the dietary ingredient or dietary supplement meets specifications;
- Packaging and labels received to determine that the materials meet specifications; and
- Each batch of packaged and labeled dietary ingredients or dietary supplements to ensure that the label specified in the master manufacturing record has been applied.

For example, a representative sample is important to being able to have an adequate sample to detect contamination. Contamination may not be distributed evenly throughout a product and may not be detected without a representative number of units. Determining the size of a representative sample is important because the sample size must be large enough to meet your testing needs for specific types of components, dietary

ingredients, or dietary supplements, and packaging and labels. Your sampling plans should include reserve samples, too, because reserve samples will enable you to investigate and identify possible manufacturing problems in the future. The proposal would not specify any particular sampling plan; it would leave such details to your discretion so that you can develop a sampling plan that suits your products and your testing needs.

Proposed § 111.60(b)(iv) through (b)(vi) would require the laboratory control processes to include:

- Use of criteria for selecting standard reference materials used in performing tests and examinations. An authenticated plant reference material may be used as standard reference material in performing certain organoleptic examinations. An authenticated plant reference material is material that has been authenticated as the correct plant species and correct plant part(s) by a qualified plant taxonomist. As described earlier in this document, an organoleptic examination may be an appropriate examination to confirm plant identity when sufficient morphological characters are present to separate the plant species from other plant species. For microscopic and chemical tests, a reference material is a highly purified compound that is well characterized, and you would use the reference material to perform tests including calibration tests. In general, there are two types of reference materials: (1) Compendial reference standards that do not require characterization; and (2) noncompendial standards. Noncompendial standards should be of the highest purity that can be obtained by reasonable effort and should be thoroughly characterized to assure their identity, purity, quality, and strength. Ideally, you should use compendial reference standards whenever possible, but if no compendial reference standard exists, you should establish appropriately characterized inhouse materials prepared from representative lots;
- Use of appropriate test method validations. Test method validation determines whether a newly-developed or existing test method is accurate, precise, and specific for its intended purpose. We have discussed previously the terms "accurate" and "precise." Validation involves evaluating the test method on multiple occasions or in multiple test facilities. Official methods, such as AOAC International methods, are validated in collaborative studies using several laboratories under identical conditions. The AOAC International methods that are validated