The Road That Spices Travel is No Longer Silk

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Abstract: By the time the ink was dry on the Hebrew bible, spices[1] were being traded along the Silk Road from Asia to the Fertile Crescent. Over time, the variety of spices grew, but they never became inexpensive. Adulteration, whether by intention or not, was frequent. By the first century of the common era, awareness of adulteration was both common and somewhat accepted. A millennium later, fair weight and a clean product became the focus of government entities regulating trade, and a while later, both finding alternatives to the overland routes and control of the new sea routes rose in importance. Spices were a valuable commodity. By the nineteenth century, even though the relative cost of spices reduced, adulteration became a more significant issue and most transportation of spices was by sea. Awareness of the problems produced laws, starting the 1875 in England and 1906 in the United States, that addressed adulteration and labelling. Today, spices are generally clean, inexpensive, and readily available throughout the world. Adulteration has been eliminated by the enforcement of international regulations. Spices move around the world by the most efficient means available, not by fixed routes controlled by a few countries.

Standing in the giant Wukuaishi Wholesale Spice Market in Chengdu, surrounded by multi-bushel-size bags of chili peppers, I could easily believe that modernity has done little to alter the basic concepts of the spice trade. For more than two millennia, Chengdu was the eastern terminus of the Southern Silk Road to India and a secondary, eastern terminus for the Silk Road to the Middle East.[2] Neither route was a 'road' in the modern sense of the word, but 'a stretch of shifting, unmarked paths across massive expense[s] of desserts and mountains' along which people, animals, and goods could travel.[3] Spices were just one of the precious items transported in one direction or the other, and the ancient – some dating to the writing of the Hebrew bible – overland routes would over time give way to other routes as transportation improved and regional politics changed.[4] The prevalent spices of the modern Chengdu market originated in the New World a few hundred years ago. The spices of the Silk Road days are now simply a footnote.

Roman times

By the start of the common era, the Mediterranean Coasts were already a major trading region that also included South-East Asia (i.e. Malaysia, Java, and the Spice Islands), China, India, Africa, Arabia, and Persia. After silk from China, spices were a principal commodity

of Roman imports from these other regions. The culinary spices included cinnamon, cassia, saffron, turmeric, cloves, nutmeg, ginger, and long and round pepper.[5]

Since spices were first gathered, the degree and type of adulteration, whether by happenstance or intentional, have been an issue. Spices, by their nature as dried organic matter, innately have a low water activity level and cannot support the growth of most bacteria, mould, or fungus. Should a spice become slightly moist, mould and fungus may contaminate it.[6] Improper handling or storage could damage a spice at any point from gathering to use. Intentional adulteration was another issue.

Spices were a valuable commodity in the Roman Empire.[7] Although there are claims of a rare specimen selling for 1000 denarii per pound, the prices of common spices were more reasonable. Per Pliny, the price of long pepper 'is fifteen denarii per pound, while that of white pepper is seven, and of black, four'. If the spice merchant could reduce his expenses by supplementing his product with a bit of a less expensive item, he certainly could choose to do so. 'Long pepper is very easily adulterated with Alexandrian mustard.' 'Pepper is adulterated with juniper berries, which have the property, to a marvellous degree, of assuming the pungency of pepper.'[8] Cinnamon was probably adulterated with cassia, which could easily be one-third the price.[9] Cassia in turn could be 'adulterated with storax, and, in consequence of the resemblance of the bark, with very small sprigs of laurel'.[10]

The Middle Ages

By the Middle Ages, the trade routes extended well north into France and Britain. In England, the 'Spicers' were mostly dealing with spices for medicinal purposes. 'Pepperer' was the term self-adopted by the merchants that imported a range of goods from the Mediterranean region that included spices. In 1180, the Pepperers formed London's first mercantile guild. An act for which they were fined 16 marks since they failed to get a license from the king prior to organizing.[11] Before long, the Pepperers took over the 'Grocers' and became the Grocers Company or Guild.[12] The Grocers were placed in charge of the Great Beam and the Small Beam, the official standards for weighing, by Henry III. The guild's members were appointed 'weighers' by the Crown.[13] As can be seen in Figure 1, the prices that spices brought required accurate weight.[14]

The guild established the profession of 'garbelers', the first public food inspectors in England. 'Garbel', from an old Arabic word meaning 'to sift, or select', was the process of detecting and removing impurities and adulterants from spices and similar products, and certifying to their purity. In 1316, the Lord Mayor of London prohibited Grocers from 'facing' the bale 'so as to make the end of the bale contain better than the remainder of the bale'.[15]

Also in 1316, the grocers established their own ordinances pertaining to the quality of merchandise including spices such as saffron, alum, ginger, and cloves in that different batches couldn't be mixed. They also promulgated measures against adulteration, reinforced

Spice	Price per Pound	Year(s)
Pepper	1s. 1s. 6d. 1s. 10d. 2s. 6d.	1290 1337 1340 1350
Cinnamon	1s. 10d. avg	1264 to 1399
Mace	4s. 7d. avg	1264 to 1399
Ginger	1s. 6½d. avg	1264 to 1399
Saffron	4s. 9½d. to 14s. 7½d.	1300s

Work	Wages	Year(s)
Master Mason	4s. per week in summer; 3s. 4d. per week in winter	1377
Woman Field Labourer	1d. per day	1310 to 1320
Carpenter	1 to 1½d. per day 2 to 3d. per day	1317 1388

FIGURE 1. Selected prices of spices compared to selected earnings of labour. Note: In the 1300s, there were 12 pence (d.) to a shilling (s.).

the Lord Mayor's decree against 'baling', and prohibited underweighting either outright or by adding water to make the spices heavier.[16]

> By a charter of Henry VI. [c.1440s], confirmed by Charles I., the wardens of the Company, or their deputies, could, like modern excisemen, enter druggists', apothecaries', and confectioners', as well as grocers' shops, and impose fines, and even imprisonment, for deceits; always seizing the spurious articles.[17]

In Nuremberg in 1444, the penalty for violation of the rules was a bit stiffer when a spice merchant was punished for adulterating saffron by burning him at the stake using the adulterated saffron as part of the fuel. Another trio of miscreants was reportedly buried alive in saffron![18]

In 1453, the fall of Constantinople, the point where overland trade routes traversed from the Orient to the Occident, seriously stifled commerce when the Ottoman Empire greatly increased tariffs and limited trading nations.[19] Attempts to find a westerly route to the Spice Islands at the end of the century were unsuccessful, but they did result in a new source of previously unknown spice varieties. Some might say the 'discovery' of allspice, capsicum peppers, and vanilla from the Americas more than made up for finding no shortcut.[20]

Queen Elizabeth established the (British) East India Company in 1601 in an attempt to break the Dutch and Portuguese monopoly of the spice trade, but it would be a number of years until the first ship sailed to challenge their dominance.[21] In 1602, the Dutch, following two profitable sea expeditions to the East Indies at the end of the previous century, created the United East India Company by consolidating existing trading companies. It was their

attempt to further monopolize the sea lanes to India and the Spice Islands.[22] Now, the spice-trade route went from traveling mostly overland to traveling mostly by sea.

The 1800s

In 1793, the German chemist and pharmacist Frederick Accum set up a laboratory in London. He made the identification of adulterated products and the identification of their guilty producers his life's work. Starting in 1798, he began a series of short postings in *Nicholson's Journal* detailing his work.[23] His magnus opus was published in 1820: *A Treatise on Adulteration of Food and Culinary Poisons*.[24]

The spices that Accum addressed included 'Counterfeit pepper, and method of detecting it', 'White Pepper, and method of manufacturing it', 'Poisonous cayenne pepper, and method of detecting it', Adulteration of cinnamon, and method of detecting it', and 'Adulteration of mustard'.[25] The section on black pepper is as follows:

> That factitious pepper-corns [sic] have of late been detected mixed with genuine pepper, is a fact sufficiently known. Such as adulteration may prove, in many instances of household economy, exceedingly vexatious and prejudicial to those who ignorantly make use of the spurious article. I have examined large packages of both black and white pepper, by order of the Excise, and have found them to contain about 16 per cent of this artificial compound. The spurious pepper is made of oil cakes (the residue of lintseed, [sic] from which the oil has been pressed), common clay, and a portion of Cayenne pepper, formed in a mass, and granulated by being first pressed through a sieve, and then rolled in a cask. The mode of the fraud is detecting the fraud is easy. It is only necessary to throw a sample of the suspected pepper into a bowl of water; the artificial pepper-corns fall to powder, whilst the true pepper remains whole.
>
> Ground pepper is very often sophisticated by adding to a portion of genuine pepper a quantity of pepper dust, or the sweepings from the pepper warehouses, mixed with a little Cayenne pepper. The sweepings are known, and purchased in the market, under the name of P. D. signifying pepper dust. An inferior sort of this vile refuse, or the sweepings of P. D. is distinguished among venders by the abbreviation of D. P. D. denoting, dust (dirt) of pepper dust.[26]

A number of other authors quickly joined Accum's parade. Much of what they wrote seems to match, or copy, what he earlier wrote.[27] A decade or two later, authors greatly expanded the numbers of items being adulterated and provided the scientific methods necessary to determine the adulteration.[28] The outcome of the 'Lancet Committee' was the 'Adulteration of Food and Drugs Act' passed in England in 1860, but it was ineffective and

much ignored. Parliament created a Select Committee to write an effective law. The earlier law was repealed and a new law replaced it in 1875.[29]

Early twentieth century

Starting in the 1880s, the Division of Chemistry of the United States Department of Agriculture began issuing its multivolume, multiyear *Bulletin 13* which centred around the adulteration of food and how to detect it. Part 2 specifically addressed 'Spices and Condiments' and greatly increased the number of spices identified and their possible adulterations.[30] Over the sharp objections of industry, an anti-adulteration law was passed in the United States in 1906.[31] Adulteration of spices was not specifically mentioned in the law, but it did address purity of food in general.

The law was weak, but it was a start. After passage, much time was spent in the courts debating whether individual products were adulterated or misbranded by the producer for some reason other than intention. Other common issues to address were whether a package was filled sufficiently or contained the stated quantity of contents.[32] The 1906 Act redefined adulteration in terms of economics and addressed the concept of misbranding. Per the law, misbranding included misleading ingredients, incorrect weight or measure, and the failure to state the inclusion of narcotics.[33] Misbranding would go on to become the major reason for product recalls in modern times.

Within a decade after the passage of the 1906 Act, the law was strengthened by changing the method of inspection from inspecting at the point of purchase to inspecting the producer, the source of the potential violation. When the producer was also the seller, as it was leading up to the turn of the twentieth century, inspecting at a retail level was sufficient. Now, with factories spewing out products and shipping them across the country, it was more efficient to inspect at the factory before a batch of product was dispersed around the country.[34]

The 1930s

After numerous attempts to amend the 1906 Act and after five years of congressional negotiations in the 1930s, the 1906 Act was repealed and a new, more extensive act replaced it in 1938.[35] The new law: 1) widened the prohibition against economic adulteration; 2) mandated the establishment of food standards; 3) prohibited any false or misleading statement on food labels or in advertising; 4) required imitation food to be labelled as such; 5) required foods be labelled with specific information such as the name and address of the manufacturer, the net quantity of contents, the name of the food, and the statement of ingredients and authorized the FDA to require the labelling to reveal all facts material to any other representations made for the product; and 6) prohibited any container that was made, formed, or filled so as to be misleading.[36]

By the time Franklin Roosevelt signed An Act of June 25, 1938, much of the Silk Road had been replaced by sea lanes. Where overland trading was still carried out, camels and horses were replaced mostly by trucks. What at one time could take much of a year to move from supplier to customer, now took only a few weeks. Most of the eastern end of the Silk Road was now a war zone and soon most of the western end would be one, too.

Today (in the U.S.)

The 1938 Act has been amended and expanded many times since it was first enacted, but as codified in the United States Code, the Federal Food, Drug, and Cosmetic Act is still the current law.[37] From the law, federal regulations were, and still are, drafted by various departments or agencies of the government. Most fall under the purview the Food and Drug Administration under Title 21 of the Code of Federal Regulations.

Much of the federal regulation of spices comes under the same non-specific parameters as other food items – in particular, the general sections dealing with adulterated and misbranded foods – but there are a few sections that specifically refer to spices. Section 101.22 titled 'Foods; labeling of spices, flavorings, colorings and chemical preservatives' is part of the general section dealing with labelling. The important paragraphs of the section being:

> (2) The term spice means any aromatic vegetable substance in the whole, broken, or ground form, except for those substances which have been traditionally regarded as foods, such as onions, garlic and celery; whose significant function in food is seasoning rather than nutritional; that is true to name; and from which no portion of any volatile oil or other flavoring principle has been removed. Spices include the spices listed in 182.10 and part 184 of this chapter, such as the following:
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> Allspice, Anise, Basil, Bay leaves, Caraway seed, Cardamon, Celery seed, Chervil, Cinnamon, Cloves, Coriander, Cumin seed, Dill seed, Fennel seed, Fenugreek, Ginger, Horseradish, Mace, Marjoram, Mustard flour, Nutmeg, Oregano, Paprika, Parsley, Pepper, black; Pepper, white; Pepper, red; Rosemary, Saffron, Sage, Savory, Star aniseed, Tarragon, Thyme, Turmeric.
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> Paprika, turmeric, and saffron or other spices which are also colors, shall be declared as "spice and coloring" unless declared by their common or usual name.[38]

Any item identified as a spice need not be listed separately in the label's ingredient list. The generic listing of 'spices' is sufficient.

> (h) The label of a food to which flavor is added shall declare the flavor in the statement of ingredients in the following way:

> (1) Spice, natural flavor, and artificial flavor may be declared as "spice", "natural flavor", or "artificial flavor", or any combination thereof, as the case may be.[39]

Section 182.10, mentioned above, is a much more extensive list of 'Spices and other natural seasonings and flavorings' generally recognized as safe (GRAS) 'for their intended use'. The GRAS designation was introduced as part of the Food Additives Amendment of 1958, an amendment to the Federal Food, Drugs, and Cosmetic Act of 1938.

> Congress recognized that many substances intentionally used in a manner whereby they are added to food would not require a formal premarket review by FDA to assure their safety, either because their safety had been established by a long history of use in food or by virtue of the nature of the substances, their customary or projected conditions of use, and the information generally available to scientists about the substances.[40]

In all, 83 separate items – from alfalfa seed to zedoary – considered to be either spices or flavourings are listed. Because Standards of Identity, as mandated by the 1938 Act, have never been established for spices, thirty-seven are further described in the Compliance Policy Guide.[41]

In accordance with 21 CFR 110.110 Current Good Manufacturing Practice in Manufacturing, Packing, or Holding Human Food, the FDA has issued a Food Defect Levels Handbook that 'establish[es] maximum levels of natural or unavoidable defects in foods for human use that present no health hazard'.[42] Individual spices are among the items listed in the Handbook (see Figure 2).[43]

In 1974, Congress established a federal program to stop the spread of noxious weeds. The program has been revised twice since its inception.[44] Although federal and state weed lists contain hundreds of species, two species have been the emphasis of enforcement: onionweed (*Asphodelus sp.*) and dodder (*Cuscuta sp.*). The countries most likely to export spices containing noxious weed seeds are India, Pakistan, Turkey, Egypt, and China. If noxious weed seeds are found in a shipment, the options for treating and reconditioning imported spices are grinding them to a mesh size that devitalizes the noxious weed seeds or heat treating them to devitalize unwanted seeds, which also may damage the volatile oils of the spices.[45]

The importation of spices into the United States is no longer a matter of transferring cargo from the source to the destination. The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 set a requirement that the FDA receive prior notice of food importation.[46] This was modified by the Food Safety Modernization Act of 2011.[47] In May 2013, the FDA published a final rule, 'Information Required in Prior Notice of Imported Food'.[48] Essentially all food brought into the Unite States, except that brought in personal baggage for personal use, is subject to the prior notice rules.[49]

Product	Defect (Method)	Action Level
Pepper, Whole (Black & White)	Insect filth and/or insect-mold (MPM-V39)	Average of 1% or more pieces by weight are infested and/or moldy
	Mammalian excreta (MPM-V39)	Average of 1 mg or more mammalian excreta per pound
	Foreign matter (MPM-V39)	Average of 1% or more pickings and siftings by weight
	DEFECT SOURCE: Insect infested – post harvest and/or processing infestation, Moldy – post harvest and/or processing infection, Mammalian excreta – post harvest and/or processing animal contamination, Foreign material – post harvest contamination SIGNIFICANCE: Aesthetic, Potential health hazard – mammalian excreta may contain salmonella	
Pepper, Ground	Insect filth (AOAC 972.40)	Average of 475 or more insect fragments per 50 grams
	Rodent filth (AOAC 972.40)	Average of 2 or more rodent hairs per 50 grams
	DEFECT SOURCE: Insect fragments – post harvest and/or processing insect infestation, Rodent hair – post harvest and/or processing contamination with animal hair or excreta SIGNIFICANCE: Aesthetic	

FIGURE 2. Sample listing from *Food Defect Levels Handbook*. 'MPM' indicates the Macroanalytical Procedures Manual standardized method of macroscopic analysis. 'AOAC' indicates the AOAC International standardized method of analysis.

The 2002 Act also had provisions for administrative detention of imported foods; requirements for the registration of any factory, warehouse, or establishment of an importer that manufactures, processes, packs, or holds food; and requirements for the maintenance of all records relating to the manufacture, processing, packing, distribution, receipt, holding, or importation of the food.[50]

In 2007, Congress directed the FDA to establish a Reportable Food Registry.[51] The Registry is an electronic portal for reporting when there is a reasonable probability that the use of, or exposure to, an article of food will cause serious, adverse health consequences or death. Reports may be submitted by responsible parties and by public health officials. The FDA reviews and assesses the information submitted and issues an alert or notification if deemed necessary.[52]

The Food Safety Modernization Act of 2011 introduced a number of clauses that indirectly effected spices.[53] Possibly, the most important is the Foreign Supplier Verification Program (FSVP).[54] Since most spices are imported, the FSVP directly effects spice importers. As of this

writing, the FDA has only issued a Draft Guidance for how to comply with the FSVP.[55] The key requirements of the resulting rule are 1) who is covered by the rule; 2) the application of hazards analysis; 3) evaluation of food risk and supplier performance; 4) supplier verification; 5) corrective actions if something goes wrong; 6) exemptions to the rule; and 7) issuring that each, unique facility have a Data Universal Numbering System (DUNS) number.[56]

The U.S. Environmental Protection Agency is responsible for setting the maximum levels and tolerances of residual agricultural chemicals (pesticides, herbicides, fungicides, rodenticides etc.) on any imported spices, but enforcement is the responsibility of the FDA.[57] The FDA maintains a Pesticide Residue Monitoring Program that annually tests a broad range of imported and domestic commodities for approximately 700 pesticide residues.[58] Curiously, the actual inspection is the responsibility of the Animal and Plant Health Inspection Service, a division of the United States Department of Agriculture.[59] The European Commission also maintains a pesticides database for reference when importing spices into that region of the world.[60]

Today (in the rest of the world)

Much of the rules concerning the spices throughout the remainder of the world are codified in a collection of international food standards, guidelines, and codes of practice called the Codex Alimentarius. The Codex was created and is maintained by the Codex Alimentarius Commission. The Commission is the 'governing organization' of the Joint FAO/WHO Food Standards Programme, a body of the United Nations.[61] The United States is a participant in the Codex Alimentarius, and thus much of the information is similar for both entities.

In addition to government organizations regulating the spice trade, there are regional trade associations that represent their member companies before the government bodies. The European Federation of the Trade in Dried Fruit, Edible Nuts, Processed Fruit & Vegetables, Processed Fishery Products, Spices and Honey (FRUCOM); American Spice Trade Association (ASTA); European Spice Association (ESA); and India Pepper and Spice Trade Association (IPSTA) are examples of these advocacy organizations.[62] Many of these organizations also produce their own stricter standards for members to abide by.[63]

The Silk Road is no more. Explorers are no longer looking for shorter routes between the customer and the supplier. Freight forwarding companies direct the movement of spices by land, sea, and air. Although any spice not meeting international standards is termed adulterated, intentionally adulterated spices are rare. And, spices are for all consumers, not just the rich.

Notes

1. For the purpose of this paper, spices include the seeds, fruit, roots, bark, or other plant substances and the dried leaves, flowers, or stems of plants.
2. Yang Juping, 'The Relations Between China and India and the Opening of the Southern Silk Road During the Han Dynasty', *The Silk Road*, 11 (2013), 82–92; Valerie Hansen, *The Silk Road: A New*

History (Oxford: Oxford University Press, 2012), p. 7; The actual term 'Silk Road' only dates to 1877, the year Baron Ferdinand von Richthofen, a German geographer in China, coined the phrase in his five-volume atlas, Hansen, p. 6.

3. Hansen, p. 5.
4. Exodus 30.23. The term 'sweet cinnamon' is found in most translations of this bible verse; Clifford A. Wright, 'The Medieval Spice Trade and the Diffusion of the Chile', *Gastronomica,* 7 (2007), 35–43, pp. 36–37.
5. Michael Loewe, 'Spices and Silk: Aspects of World Trade in the First Seven Centuries of the Christian Era', *Journal of the Royal Asiatic Society,* 103 (1971), 166–79, pp. 173–76.
6. Larry R. Beuchat, 'Influence of Water Activity on Growth, Metabolic Activities and Survival of Yeasts and Molds', *Journal of Food Protection,* 46(2), 135–141.
7. James F. Bush, 'Adulteration of Food and Other Natural Products in Ancient Rome', *Food and Drug Law Journal*, 57 (2002), 573–602, p. 577.
8. C. Plinius Secundus, *The Natural History of Pliny,* trans. John Bostock and H.T. Riley, 6 vols (London: George Bell & Sons, 1857), vi, p. 112–13, (bk. xii, ch. 14); for comparison, a legionnaire's annual salary was 300 denarii per Adkins, Lesley & Roy A Adkins, *Handbook of Life in Ancient Rome* (New York: Facts on File, 1994), p. 77.
9. Bush, p. 578.
10. C. Plinius Secundus, p. 141 (bk. xii, ch. 43).
11. Pamela Nightingale, 'The London Pepperers' Guild and Some Twelfth-Century English Trading Links with Spain', *Bulletin of the Institute of Historical Research,* lviii (1985), 123–32, pp. 123–24.
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13. T.D. Whittet, 'Pepperers, Spicers and Grocers–Forerunners of the Apothecaries', *Proceedings of the Royal Society of Medicine,* 61 (1968), 801–806, p. 802; Hart, p. 8.
14. James E. Thorold Rogers, *A History of Agriculture and Prices in England* (Oxford: Clarendon Press, 1882), i, pp. 256, 258, 273–74, 278, 627–31.
15. Hart, pp. 8–9.
16. Whittet, p. 803; Peter Barton Hutt and Peter Barton Hutt II, 'A History of Government Regulation of Adulteration and Misbranding of Food', *Food, Drug, Cosmetic Law Journal*, 39 (1984), 2–73, p. 27.
17. John Timbs, *Curiosities of London* (London: Longmans, Green, Reader, and Dyer, 1868), p. 397.
18. Hart, p. 10.
19. Steven Runciman, *The Fall of Constantinople 1453,* Canto edn. (Cambridge: Cambridge University Press, 1990), p. 164.
20. Louis E. Grivetti, 'Herbs, Spices, and Flavorings', *Nutrition Today,* 51 (2016), 194–97, pp. 195–97.
21. Hart, p. 12.
22. Robert Parthesius, *Dutch Ships in Tropical Waters: The Development of the Dutch East India Company (VOC) Shipping Network in Asia 1595–1660* (Amsterdam: University Press, 2010), pp. 34-35.
23. Hart, p. 14.
24. Frederick Accum, *A Treatise on Adulteration of Food and Culinary Poisons, Exhibiting the Fraudulent Sophistications of Bread, Beer, Wine, Spirituous Liquors, Tea, Coffee, Cream, Confectionery, Vinegar, Mustard, Pepper, Cheese, Olive Oil, Pickles, and Other Articles Employed in Domestic Economy, and Methods of Detecting Them* (London: Longman, Hurst, Rees, Orme, and Brown, 1820).
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26. Accum, pp. 284–86.
27. James Cutbush, *Lectures on the Adulteration of Food and Culinary Poisons: The Detection of Poisons in General and of Adulterations in Sundry Chemical Preparations, &c. used in Medicine and the Arts, with a Means of Discovering Them: and Rules for Determining the Purity of Substances* (Newburgh, NY: Ward M. Gazlay, 1823); *Deadly Adulteration and Slow Poisoning or, Disease and Death in the Pot and the Bottle* (London: Sherwood, Gilbert and Piper, 1829); A. Bussy, *Traité des Moyens de Reconnaitre les Falsifications des Drogues Simples et Composées* (Paris: Thomine, 1829); *The Domestic Chemist: Comprising Instructions for the Detection of Adulteration in Numerous Articles Employed in Domestic Economy, Medicine, and the Arts* (London: Bumpus & Griffin, 1831).

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36. Hutt and Hutt, p. 62.
37. 21 USC Chap. 9.
38. 21 CFR 101.22 (a)(2).
39. 21 CFR 101.22 (h)(1). This is further clarified in the FDA Compliance Policy Guide CPG Sec 525.650 Labeling of Seasonings.
40. Mike Saltmarsh, *Essential Guide to Food Additives,* 4th edn (Cambridge: Royal Society of Chemistry, 2013), p. 73.
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50. U.S. Pub. L. 107-188.
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52. *Draft Guidance for Industry Questions and Answers Regarding the Reportable Food Registry as Established by the Food and Drug Administration Amendments Act of 2007 (Edition 2)* (Rockville, MD: Office of Regulatory Affairs, 2010), p. 2. Found within FDA Docket FDA-2009-D-0260.
53. U.S. Pub. L. 111-353.
54. 21 CFR 1.500-1.514. Although published in the Code of Federal Regulations, the Foreign Supplier Verification Program is not a 'regulation' created by a law passed by Congress but a 'rule' established within the Executive Branch to comply with a law, in this case the Food Safety Modernization Act (FSMA), Pub. L. 111-353. It is published in the Code as Subpart L under Part 1 General Enforcement Regulations. The rule was also published in the Federal Register (v. 80, no. 228, 27 November 2015, pp. 74226–352) under FDA Docket FDA-2011-N-0143-0370.
55. *Foreign Supplier Verification Programs for Importers of Food for Humans and Animals: Guidance for Industry* (Rockville, MD: Office of Regulatory Affairs, 2018). Found within FDA Docket FDA-2017-D-5225.

56. 'FSMA Final Rule on Foreign Supplier Verification Programs (FSVP) for Importers of Food for Humans and Animals', U.S. Food and Drug Administration, <https://www.fda.gov/food/food-safety-modernization-act-fsma/fsma-final-rule-foreign-supplier-verification-programs-fsvp-importers-food-humans-and-animals> [accessed 16 April 2020]
57. 40 CFR 180.
58. 'Pesticides', U.S. Food and Drug Administration, <https://www.fda.gov/food/chemicals-metals-pesticides-food/pesticides> [accessed 18 April 2020]
59. 7 CFR 319.56-3.
60. 'EU Pesticides database', European Commission, <https://ec.europa.eu/food/plant/pesticides/eu-pesticides-database/public> [accessed 18 April 2020]
61. 'Codex Alimentarius', Codex Alimentarius Commission, <http://www.fao.org/fao-who-codexalimentarius/> [accessed 18 April 2020]
62. 'European Federation of the Trade in Dried Fruit, Edible Nuts, Processed Fruit & Vegetables, Processed Fishery Products' <https://frucom.eu/>; 'American Spice Trade Association' <https://www.astaspice.org/>; 'European Spice Association' <https://www.esa-spices.org/>; 'India Pepper and Spice Trade Association' <https://ipstaindia.com/> [accessed 18 April 2020]
63. For Example: *Clean, Safe Spices* (Washington, DC: American Spice Trade Association, 2017); *European Spice Association Quality Minima Document* (Brussels: European Spice Association, 2018); *TURMERIC Post-harvest Operations* (Rome: Food and Agriculture Organization of the United Nations, 2004).