

The business of authenticity

To avoid issues with counterfeit foods, especially those containing natural products, ingredient expert Taiyo has implemented a seamlessly monitored supply chain and stringent quality control procedures.

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Whether adulterated, contaminated or inaccurately labelled, deliberately or accidentally, many food products are not what they claim to be, putting the entire industry's credibility at stake.

An age-old problem, products have long been manipulated for economic or criminal gain. Counterfeiting and food fraud is particularly prevalent in consumer products such as coffee, tea, chia, herbs and spices, to name a few. However, both nationally and internationally, raw materials including meat products, milk, nut products or sought-after olive oil can be contaminated for increasingly rising profit margins. And, as demand for natural products or fortified foods with added health value is growing, the problem is getting worse.

The consequences of counterfeiting are often underestimated by industry and agencies alike, as the 2004/2008 milk powder scandals in China have shown. Diluted milk powder cost many babies their lives and injured tens of thousands. Sadly, most fraudsters are not averse to risking innocent lives, as a list of the most common counterfeiting methods shows (see list).

But who is to blame? The price-sensitive consumer of organic products? The margin-conscious retailer balancing choice versus waste? Or industry itself, in which buyers and controllers are the key decision makers? Assigning blame, however, is not a solution.



Natural products are not always authentic and pure. (Copyright: Shutterstock/Artem Postoev).

But, without change, a price war could result with many market players failing in their attempts to run honest, quality oriented businesses. As a result, commodity markets will be dominated by inferior or adulterated products and the ability to obtain high-quality raw materials will diminish.

Sadly, no one is immune to the spectre of falsified raw materials. Globalisation serves both trustworthy producers and criminal suppliers. And, despite the fact that cross-border collaborations, such as the EU Food Fraud Network, are growing and fighting food crime, producers are still vulnerable. The professionalism of counterfeiters, who often

work together in well-organized syndicates, should never be underestimated. (1) Dr Stefan Siebrecht, Managing Director of ingredient specialist, Taiyo GmbH, is calling on the industry to be even more vigilant and expand its in-house activities. "Trust is good, control is better," he says: "Clever contracts and independent controls in the country of cultivation are indispensable, but we cannot rely on that. Every company is obligated to validate the authenticity of their raw materials and to check every single delivery at the factory gate."

A GLANCE AT NORTH AMERICA

Statistics show how justified this mistrust is: in 2016, the US retail trade generated a turnover of more than \$7.4 billion with herbal food supplements. (2) Among the top 10 most popular herbs and dietary supplements were cranberries, coneflower, green tea, flaxseed/linseed oil, ginger, valerian and turmeric (Fig. 1). Yet, the American Herbal Products Association (AHPA) claims that 16 of the 20 best-selling herbs in the US were heavily counterfeited or adulterated. (3) Previously, Canadian scientist Steven



Figure 1 - Teas and their ingredients are often affected by counterfeiting. (Copyright: Shutterstock/Chiociolla).

Newmaster stated that no uniform standards exist for the authentication of herbal products. (4) In an authenticity study, conducted by the Centre for Biodiversity Genomics at the Biodiversity Institute of Ontario, 44 plant products from 12 North American companies were analysed. The results showed that most of the samples were of poor quality, often containing significant substitutes, contaminants and fillers, which were either listed incorrectly on the label or not at all. In total, only two out of the twelve companies investigated supplied authentic, unpolluted and unadulterated products, which infers that at least ten vendors are willing to accept exposing their customers to potential health hazards.

With public health in mind, using a multidisciplinary approach to identify herbal mixtures is recommended. They

often contain more than one pharmacologically active ingredient and are frequently used by consumers in combination with conventional medicines, which can lead to adverse interactions. (5)

Unintentional adulteration (improper harvesting or processing of the plant material, for example), can also cause serious public health consequences if incorrect conclusions regarding effect and usability are drawn. (6) Plants purchased for research purposes should therefore always be independently checked for authenticity.

Given the market growth in recent years, it's clear that neither regulators, manufacturers nor consumer protection authorities have the resources to test every product and advertising claim. By contrast, however, it's not something that can be ignored — particularly considering the widespread awareness that the consumption of unknown, contaminated or toxic plant components and food ingredients can cause long-term physical damage.

ADULTERATED PRODUCTS ALSO IN EUROPE

With the legalisation of cannabis products for certain uses in various countries, interest in non-psychoactive CBD oil has grown significantly. In 2017, a study on the authenticity of CBD oils was published in "Pharmaceutisch Weekblad" that compared the actual cannabinoid content with the amount listed on the product label. (7) Out of 21 CBD oils tested that were not bought in shops but from patients, only two were actually legal.

To cite some other examples, even commercially available, organically produced chia seeds can contain impurities (Fig. 2). And, in the case of tea, not only are claims of variety and origin faked, but so are the special health-enhancing ingredients. One example is the amino acid L-theanine, which has a relaxing, stress-reducing effect. Synthetic L-theanine is allowed to be sold outside Europe, but not on the continent. Nevertheless, there is synthetic theanine on the market in Europe, which is declared as "natural." In fact, according to an isotopic analysis conducted by Professor Perini at the Edmund Mach Foundation in Italy, Taiyo is the only supplier of natural L-theanine in Europe. The study will be published in the second half of 2020.

OLD TRICKS AND NEW ANALYSIS METHODS

Many have called for the use of analytical technologies by quality oriented suppliers or local food authorities, but these techniques can be time-consuming and expensive. (8) However, progress in quality control procedures has led to higher detection rates of counterfeit products. Radiocarbon (¹⁴C) analysis has been used to identify petrochemical impurities, for example, and the C3 and C4 carbon fixation pathways in plants offer a way to quantify the relative proportions of ¹²C and ¹³C isotopes in a product, helping to distinguish whether it's natural or synthetic. As well as DNA barcoding, numerous other analytical methods are increasingly reducing the scope for counterfeiters. For example, synchronous fluorescence spectroscopy combined with chemometrics makes it possible to distinguish genuine grape seed oil from blended products, etc. (9,10,11) One of the most modern methods for determining odour and taste profiles is ultra-high performance liquid chromatography-mass spectrometry (UHPLC-MS).

OPEN YOUR EYES WHEN BUYING RAW MATERIALS!

The first step to unadulterated raw materials begins with the selection of the right supplier and a precise knowledge of the market. "If you know that 40,000 tons of a product with a protected designation of origin such as Darjeeling tea are sold worldwide every year, but the Darjeeling region can only produce 10,000 tons, this means that 75% of the tea sold must come from other plants," explains Dr Stefan Siebrecht.

With Matcha tea, the situation is even more complicated. Matcha requires six weeks of sun protection during growth; the shading and selective harvesting are both complex and costly. The reason for



Figure 2 - Foreign ingredients in a sample of organic chia seeds purchased from a German discounter. (Copyright: Taiyo).

this is that only a small part of the Japanese Matcha harvest lastis exported. It's mostly sold to the domestic market for use in traditional tea ceremonies. The quality of inexpensive Matcha powder may not, therefore, be very good. It's often mixed with normal green tea powder or sometimes consists entirely of conventional green tea leaf powder. "Such adulteration cannot be detected with a DNA test because the contaminant is from the same species, *Camelia sinensis*. This makes it all the more important to choose the right trading partner carefully," notes Dr Siebrecht.

THE TAIYO WAY

So, how does a traditional Japanese family business such as Taiyo handle the procurement of raw materials and guarantee authentic products? "One way, for example, is certification. We are aiming to certify the majority of our products to make it easier for customers to label and verify their own products," says Dr Stefan Siebrecht.

For example, Taiyo's dietary fiber Sunfiber® from the Indian guar bean (*Cyamopsis tetragonolobus*) received ISO certification as a 100% natural ingredient in November 2019 (ISO 19657: 2017). This means that the confirmed naturalness of this ingredient can be claimed on the packaging and in advertisements. Similarly, with its chia seeds, nothing is left to chance: in cooperation with the world's largest supplier, based in Chile, Taiyo offers chia with a guaranteed purity level of 99.95% based on sophisticated sorting and cleaning processes. Regarding Matcha, Taiyo works with a renowned Japanese partner to ensure that its product is authentic, of guaranteed quality and derived from a strictly monitored cultivation and production process.

CONCLUSION: TACKLING IT IS IN THE GLOBAL INTEREST

It's no coincidence that family businesses such as Taiyo form the stable backbone of the economy – from small businesses to large corporations and all around the globe. They focus on their core competences and rely on security and integrity as the cornerstones of their business success. Sustainable action creates healthy profit.

Dr Stefan Siebrecht concludes: "The global fight against adulteration or food fraud is in the interest of society as a whole. Not only is the reputation of the food and food supplement industry at stake, it also affects the whole raw material supply chain, including small farmers,

cooperatives and plantation owners in remote regions of the world. Consumers may have become accustomed to low prices, as have producers, who want to and usually have to buy cheaply; but, in the end, we all pay the bill."

"As a chemist, I am enthusiastic about the advanced analytical methods that make it possible to determine the origin, production methods and properties of plants and food, and to more effectively identify counterfeits. In addition, globally applicable standards are needed. ISO standards and controlled quality certificates from independent laboratories can be seen as an important step in this direction. In the future, we will hopefully have an authorised regulatory authority that provides a properly regulated environment – for the participants in the entire process chain right through to the consumer."

THE 7 MOST COMMON COUNTERFEITING METHODS

1. The addition of foreign components, particles and other plants than those listed to increase the overall volume. Examples include sand, pebbles, plant components, other tea varieties in green tea and Matcha, blending olive oil with cheaper oils, cereals and husk material in coffee.
2. The addition of dyes to change the product's characteristics. Blueberry can be mixed with amaranth dye (Red Dye No. 2, an azo dye that can cause cancer), and curcumin blended with a potentially carcinogenic yellow dye.
3. The addition of medicinal substances to alter the product's effect/functionality. The steroid, DHEA, has been found in muscle-building products and a globally banned weight loss substance detected in food supplements.
4. The sale of herbal mixtures or other herbs that falsely claim to confer healing properties, such as Golden Seal with gold thread, Oregon grape, yellow dock, etc.
5. False declarations of synthetic substances as natural products, including synthetic vanillin, caffeine and L-theanine.
6. The enrichment of key components with synthetic homologues, such as guarana and synthetic caffeine or green tea extracts with synthetic L-theanine.
7. The misrepresentation of production, quality or origin to disguise quality losses and maximise profits, such as the formation of carcinogenic BAP/PAH by overheating, the use of prohibited solvents or mineral oil residues (MOSH/POSH/MOAH) or

the use of excessive or prohibited pesticides.

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