



ANTI-AGING

HEALTHY NUTRITION & COSMETIC SOLUTIONS

*Reveal beauty with
Sensient innovations*

Unique functional cosmetic ingredients

Color protection, Solubilizers, Texturing agents and Optical effects

Expertise in high purity colors

Pigments & Dyes, Surface treatments and Dispersions


SENSIENT®
COSMETIC TECHNOLOGIES

We bring life to products!

www.sensient-cosmetics.com



PETRA HUBER
Zurich University of Applied Sciences
Life Sciences and Facility Management
Institute of Food and Beverage Innovation ILGI
CH-8820 Wädenswil,
Switzerland

“Beauty Muffins” – a new approach to cosmetics? Opportunities and limitations of enriched foods in Swiss law

KEYWORDS: Beauty from within, functional foods, Beauty Foods, Anti Aging

ABSTRACT: In the field of nutrition, health has become a driving purchasing motive. Beauty and vitality (“Better-aging”) are deeply rooted needs in an aging population. The market for “beauty from within” has been in a growth phase for years. The product types range from dietary supplements to functional foods. Above all, food with the functional additive “beauty” has particular potential. Even though the EFSA (European Food Safety) has in recent times placed severe limitations on the type of “health claims” which can be made, Euromonitor International has confirmed over the last few years the upwards trend with “beauty functionals” in the American, European and especially in the Asian market. Within the context of an internal innovation project (duration 2009 to 2010) at the Institute of Food and Beverage Innovation ILGI (ZHAW Wädenswil) the question emerged as to whether it is possible to create sensorily appealing “Beauty pastry” - taking into account current Swiss law and the technical feasibility. It should be mentioned that Switzerland, as a non-EU country, is committed to the reduction of trade barriers and to adapting Swiss food legislation to European law. This has led in recent years to constant revision of existing regulations, a continuing process which has resulted since the completion of the above-mentioned project in 2010 in changes in Swiss law to the claims being made, to labeling and to what essential substances may be added to food. The current state of affairs is elucidated below.

INTRODUCTION

The respective areas of competence at ILGI, *Institute of Food and Beverage Innovation ILGI (ZHAW Wädenswil)*, cosmetics, nutrition and technology complemented each other perfectly. After distinguishing between definitions and terms such as functional foods and special foods, the food law landscape in Switzerland and Europe must be considered. Against this background, potential active ingredients (such as natural carotenoid mixture and lycopene) are selected on the basis of their chemical-physical and toxicological properties and combined with regional and/or exotic food ingredients, e.g. grape seed flour and oil, tomatoes and super fruits like Goji berries. Product prototypes (a savoury bread and a sweet muffin version) were produced in the *Backwarentechnikum* (school of baked goods) and were subjected to sensory testing by a semi-trained panel and judged as good or with “like”. The savoury bread proved to have a tannin-astringent finish so to improve its sensory profile, the content of the rich polyphenolic grape seed flour must be optimized. The colour of the sweet muffin version with the carotenoid mixture had to be well explained to the panellists to improve the acceptance level of the product.

Fortified foods cannot replace a balanced diet, however they can perform a useful complementary function where a diet is suboptimal in terms of vitamins and/or other nutrients. In this project, it could be demonstrated that in Switzerland a connection between the claim “skin and beauty” and the selected ingredients can be inferred. The added ingredients must

be chosen carefully, as in the conservative limit for isolated β -carotene recommended by the Scientific Committee on Food – SCF, due to a lack of data as to how high doses might affect heavy smokers. Here, the additional daily intake of β -carotene can be controlled via the portion size of a muffin. Skin measurements made by Raman spectroscopy provide a view into the skin, non-invasively enabling correlations between absorption/intake and concentration of carotenoids to be made. Appropriately designed user studies are required to demonstrate a positive effect on the skin.

BEAUTY FROM WITHIN

In the field of nutrition, health is a driving purchasing motive. The development of the “Lifestyle to Health Style” (1) adds welcome revenue to the economy. After years of watching from the sidelines, the EU authorities, finally had to intervene to protect consumers, especially in the food sector, by means of “Health Claim” regulations. In the past year, of about 1,600 health claims made, only 200 were declared admissible on the basis of having any proven effect (evidence) (2). A similar discussion about evidence with respect to claims of effectiveness of cosmetics is currently being carried out, the results of which will flow into EU cosmetics legislation.

In the field of cosmetics, holistic approaches are sought. Functional foods, whether in the form of nutritional supplements or

traditional functional foods, foster "beauty from within". This market has been in a growth phase for years. The global growth rate of revenues for "Beauty Functionals" in 2007/08 is estimated at 7.4% (3). The Kline Group has forecast that sales worldwide from 2007 to 2012 will almost double. According to Euromonitor International, there was a turnover of the equivalent of €110 million on supplements and foods "for beauty" in both France and Germany in 2008.

In one of the home markets of Beauty Foods, the U.S., a survey (2008 Black report) concluded that most women take dietary supplements or consume functional foods, and are therefore open to additional Nutricosmetics (refers to a non-legally binding definition of food products with cosmetic additional benefits). 74% of women surveyed would test Nutricosmetics if they are easy to consume ("convenience" aspect). 65% would want to enjoy this as a chocolate bar or some other form of traditional food. As with the use of cosmetics, 80% of surveyed women would expect visible results after 2 to 4 weeks (4).

According to various companies, more and more consumers are able to infer a causal relationship between a healthy diet and skin. Glowelle® a beauty drink from Nestlé (USA), Noréliff® a French beauty jam and Jeunesse Anti Aging Goodness® fruit juice from Italy have been just some examples of this type of product. Even the owners of the now secular monastery Neuzelle (Germany) produce an "anti-aging beer in their brewery". So it seems that there is a latent demand for products with positive messages relating to beauty and attractiveness. However, not all products were granted a long product life cycle! The benefits of the product must be communicated in a way that does not overstrain credibility. Another challenge is how quickly a product can convince consumers with any initial positive product benefits. The tendency here seems to be that the period attested to is less generous than that indicated in the survey (4). The calculated price premium will be decisive here as to whether it will remain a niche product for a financially well-off and open-minded target group, or be a more affordable mass product.

In addition to beverages, dairy products, margarine, muesli bars and fruit spreads, bread and baked goods are an interesting, as yet under-exploited category in Switzerland in the area of functional food. Wellness breads with enhanced nutritional value, such as the German bread enriched with omega-3 fatty acids are of special interest for certain population groups. In Switzerland, about 130g of bread is consumed daily, with a growth rate of an additional 2.3%. Half of this consumption takes place outside the home. In Germany, however, a country with a very large variety of bread, 230g of bread and biscuits are consumed per day, and the consumption of baked goods with enhanced nutritional value is increasing. (5) According to "Brot-Monitor Schweiz" 2006 (6), bread is still regarded as the main staple food by 29% of the population, and is consumed on a regular basis.

TRADITIONAL BAKED GOODS AS A NEW VEHICLE OF FUNCTIONALITY?

Within the context of an internal innovation project at the Institute of Food and Beverage Innovation ILGI (ZHAW Wädenswil) the question emerged as to whether it is possible to create sensorily appealing "Beauty pastry" - taking into account current Swiss law (for the period 2009/10) and the technical feasibility. The respective areas of competence at ILGI; cosmetics, nutrition and technology complemented each other perfectly.

The product under development is based on grains, and being enriched with phytochemicals and other skin-relevant substances, this will fit the definition of a conventional food according to the current Swiss legislation pertaining to active ingredients concentrations, composition and the claims which can be made.

LEGAL SITUATION IN SWITZERLAND AND THE EU - HEALTH AND NUTRITION CLAIMS

The first matter to consider is the question as to which category the developed product is assigned by law. The categories of traditional food and/or special food (with sub-category dietary supplements) can be placed on the market without registration or license, if their composition, applications and labeling (including claims) are described in Swiss food legislation. The manufacturer is subject to self-regulation. (7) This determines the claims which can be made about the effect of added essential or nutritionally valuable substances.

Legal Regulation	SR reference number	Main topic
Lebensmittelgesetz, LMG	817	
Lebensmittel und Gebrauchsgegenständeverordnung, LGV	817.02 (release 23.11.2005)	Nutritional information in food with respect to vitamins and minerals
Verordnung des EDI über die Kennzeichnung und Anpreisung von Lebensmittel, LKV	817.022.21 (release 01.01.09)	Nutrition and health-related statements and other BAG approval
Empfehlungsliste/Richtlinien der Eidg. Ernährungskommission (EEK) zuhanden des BAG	release January 2006	"Nutrient function claims" for vitamins and minerals
Verordnung des EDI über Getreide, Hülsenfrüchte, Pflanzenproteine und deren Erzeugnisse	817.022.109 (release 12.12.2006)	
Verordnung des EDI über die in Lebensmitteln zulässigen Zusatzstoffe	817.022.31 (release 01.04.2008)	Food additives such as flavourings or colourings (GMP)
Verordnung über Zusatz essenzieller oder physiologisch nützlicher Stoffe in Lebensmittel	817.022.32 (release 23.11.2005/01.11.2010)	Maximum doses and declaration of additives (labelling and permissible claims)
Verordnung des EDI über Speziallebensmittel	817.022.104 (release 12.12.2006)	Concerns phytochemicals (Secondary metabolites)
Einstufung pflanzlicher Stoffe und Zubereitungen als Arzneimittel oder als Lebensmittel, BAG	release 29.12.2006	
Wirtschaftsliste „Health Claim“ Praxishandbuch Functional Food 2007		EFSA list, official approval by the EU Commission in 2012

Table 1. Swiss legal regulations and other reference works considered, (abbreviations: BAG: Bundesamt für Gesundheit, Federal Office for health (Berne, Switzerland), EDI: Eidgenössisches Departement des Innern, Federal Department of Home Affairs (Berne, Switzerland))

The regulations in the food sector (see Table 1) clearly separate medicinal products. They are designed to prevent fraudulent and misleading claims being made and thereby protect the health of consumers, as well as to protect the "traditional" foods such as bread, milk, etc. in their quality and appearance. Vitamins and minerals, and trace elements concentrations can be increased and, within narrow limitations, claims about their effect (Health claims in accordance with Appendix 8 of the Federal Department of Home Affairs (FDHA) ordinance on the labeling and advertising of foodstuffs, (LKV), or according to separate approval) can be made. Some of the promising phytochemicals are discussed in the ordinance on special food. They can be added. Except for highlighting their nutritional value, they should not be credited with having any special effect, as is partially possible in the EU. The approximately 200 health claims permitted in the EU, with few exceptions, will be included in future in the Swiss LKV regulations as soon as possible. Until now, only 30 of these claims have been permitted in Switzerland. Appropriate conditions have been passed by the national government (2, 8).

A selection of the positive claims allowed in Switzerland for vitamins and minerals (focusing on skin-related substances) is shown in Table 2, based on the EDI (FDHA) ordinance on the labelling and advertising of food, Reference No. 817.022.21 dated 23 November 2005 (as of 1

Nutrient	Daily requirement (recommended daily dose for adults in accordance with 817.022.32)	Permissible claim (in accordance with 817.022.21)
Beta-Carotene (Provitamine A)	4.8mg	<i>"Helps maintain tissue, skin and mucous membranes; is an antioxidant and can soak up free radicals."</i>
Vitamin A	800µg	Vitamin A helps to maintain normal skin.
Vitamin B2 Riboflavin	1.6mg	<i>"Helps maintain tissue, skin and mucous membranes."</i>
Niacin	18mg	<i>"Necessary for the normal functioning of the skin."</i> Riboflavin helps to maintain normal skin. Riboflavin helps to protect cells from oxidative stress.
Vitamin C	60mg	<i>"Functions as an antioxidant."</i> Vitamin C contributes to normal collagen formation for the normal function of the skin and helps to protect cells from oxidative stress.
Vitamin E	10mg	<i>"Stabilises unsaturated fatty acids the cell membrane; as an antioxidant can bind with free radicals."</i> Vitamin E helps to protect the cells from oxidative stress.
Selenium	50µg	<i>"Protects the body from oxidation reactions. Has antioxidant properties."</i> Selenium helps to protect the cells from oxidative stress.
Zinc	10mg	Zinc helps maintain normal hair and contributes to the maintenance of normal nails. Zinc also contributes to the maintenance of normal skin and helps to protect the cells from oxidative stress.
Others: Biotin Iodine Copper Manganese		Biotin helps to maintain normal skin. Iodine helps to maintain normal skin. Copper contributes to normal skin pigmentation. Manganese helps to protect skin cells from oxidative stress.

Table 2. List of the claims permissible in Switzerland for vitamins and minerals (focussing on skin-relevant substances) according to the Swiss ordinance reference numbers 817.022.21 and 817.022.32. "Italics" correspond to the particulars of the prevailing law while conducting the experiments in 2009/10. Effective from 1 January 2013, in accordance with 817.022.21 AFR, the newly permitted health claims in the third column apply, (here highlighted in colour) although the list according to (2) is not yet complete.

January 2013) and the ordinance on the addition of essential or physiologically beneficial substances to food 817.022.32 of 23 November 2005 (as of 1 November 2010).

An interesting legal argument concerning the interpretation of product classification in the EU for food products with added cosmetic value, or Nutricosmetics, and related problems of misleading advertising claims has been presented by the lawyer Reinhart A. (9): "Claims of efficacy can only be made when these have a sufficient scientific basis. Notions of beauty can be very subjective and it is very difficult to objectively prove a cosmetic effect. This raises the question as to whether a particular claim is a health-related claim within the meaning of "health claims" according to the relevant ordinance ((EG) 1924/2006) and is thus subject to approval, or whether it is purely a "beauty" claim with no link to health, e.g. tanned skin is a purely optical effect; beauty as part of general well-being". A similar argument is theoretically possible in Switzerland according to another regulation (SR 817.02 Art. 10/c), as long as no health claims are implied.

"BEAUTY MUFFINS" FROM THE BAKERY

An initial selection of skin-relevant substances has been derived from the results of various epidemiological studies, compared with Swiss law and the capacity these compounds to enrich food, with particular attention being paid to the "nutrient function, or more recently, health-related claims" sections of the relevant regulation (LKV SR 817.022.21

and SR 817.022.32, see Table 1) and the claims which could be made at a later date. Underlying the aging of skin, are, among other things, oxidative processes (10). For this reason, the taking of antioxidant flavonoids such as lycopene (16mg daily for 10 weeks), or beta-carotenoids (15 to 30mg daily for 12 weeks) was investigated in efficacy studies. These antioxidants protect the skin from UVB-induced erythema (12) and photo-oxidative damage (13) respectively. Further studies have been compiled in the article by A. Marini (2011) (11). Individuals with higher levels of lycopene in the skin show "significantly smaller amount of furrows and wrinkles than individuals with lower concentrations (14)." Also interesting are studies of the skin via Raman spectroscopy, which reveal how the content of antioxidants such as "β-carotene and lycopene" in the skin are significantly altered by topical application and oral intake (10).

In addition, these substances had to be assessed to determine their chemical and thermal stability, since core temperatures can exceed 100°C during the baking process. Furthermore, various processing methods have been discussed as to how to avoid high temperature exposure, as is the case with subsequent cold filling or a coating process following the actual baking process.



Figure 1. Test series of sweet product concept with Goji berries

The basic recipe must comply with the regulations covering cereals, pulses, vegetable proteins and their products (SR 810.022.109). These determine the composition of such baked goods, with respect to such things as calories and fat content. The "Beauty muffins" being aspired to fall within the category of pastry products (which includes brioche, muffin etc.) Eating one of these muffins should provide about one-third of the average daily requirement of the main actives. An additional cost SFr.-.10 or €-.08 per portion incurred by adding a compound is tenable. In order to enhance the sensory appeal, the effectiveness and the communication concept of "Beauty muffins", selected lead compounds (lycopene and β-carotene) were supplemented with other foods. Here, both a sweet and a salty-savoury product concept were pursued; see Table 3 and 4 below:

Active compound/ primary source	
	<ul style="list-style-type: none"> natural carotenoid mixture (water and oil-soluble extract commercial products containing β-carotene, α-carotene, lutein, zeaxanthin) Goji berries ("super-fruits", Lycium barbarum contains polysaccharides LBP), carotenoids and flavonoids)

Table 3. Sweet product concept with fruit

In 2009/10, when the investigations were being undertaken, the concentration of the daily dose of β-carotene was not permitted to

exceed 14.4mg per 100g of bread (according to SR 817.022.32, see tab. 1). At this dose, the legally permissible additional triple dose is already included in the calculation in order to offset the potential loss of active ingredients by the time of consumption. According to current legislation, a dose of Vitamin A may only exceed the RDA by 100 percent. (817.022.32.) In the meantime, the EU's Scientific Committee on Food (SCF) have made certain recommendations and their opinions on the tolerable upper intake level of β -carotene (15) have been incorporated because in intervention studies in Finland and the USA, pro-oxidative effects of increased β -carotene doses (>20 mg daily resulted in 10 to 15 times higher blood levels!) were observed in heavy smokers. Pending further scientific information, β -carotene as a food supplement should, in accordance with the German Federal Institute for Risk Assessment BfR, "be based on the lower estimate range." (16),(17) For pragmatic reasons, the SCF recommends not exceeding 2 mg β -carotene as an isolated substance in "food additive use" (15). By controlling the portion size of the muffins, the use of a natural carotenoid mixture and synergistic combination with other antioxidants means that that this amount of consumption by "normal" people (a "normal population) can be considered acceptable. In comparison, the SCF of the EU assumes a daily intake of 3-10mg of β -carotene from food.

**Active compound/
primary source**

- Tomato powder (commercial product with 2% lycopene content)*
- Chopped tomatoes, dried
- Grape seed flour (polyphenols OPC)
- Grape seed oil (polyunsaturated fatty acids)

* maximum daily dose permitted for special food is a triple dose of a total of 18g lycopene per 100g baked goods

Table 4. Salty-savoury product concept with vegetables

A compliant claim for the salty-savoury "Beauty muffins" must refer only to so-called "soft claims" such as "Beauty", etc., and details such as "contains tomato (extract)", "contains grape seed flour and cold-pressed grape seed oil". Making a connection to a health and beauty enhancing effect must be left to the consumer themselves. Specifying lycopene in the nutrition labelling is permitted because lycopene is a naturally occurring substance in tomatoes. If there is a desire to highlight lycopene as an active ingredient, for example "contains lycopene", this requires authorisation and the submission of efficacy studies. A compliant claim for the sweet "Beauty muffins" with goji berries and natural carotenoid mixture can, in addition to a "soft claim", make "hard claims" such as Vitamin A helps to maintain normal skin connected to information on the nutrition declaration.

OUTLOOK

Further steps should be the optimization of basic recipes with innovative calorie-reducing sweeteners, sugar substitutes and dietary fibre. Numerous product versions enriched with phytochemicals (polyphenols from cocoa and coffee beans, green tea, anthocyanin-rich berries, etc.) are conceivable. To improve the evidence of effectiveness, and/or as a supplement to the current EFSA list, a possible correlation must be established between the consumption of enriched products and a biological marker, in this case, a positive change in the skin structure. Skin measurements made by Raman spectroscopy provide a view into the skin, non-invasively enabling correlations between absorption/intake and concentration of carotenoids to be made. If it can be assumed that the organism develops antioxidant networks/protective chains, in that antioxidants work synergistically (10), it may make sense when recommending limits, such as with β -carotene as an isolated substance, to add other

antioxidants in a similar constellation, similar to how these appear in nature as mixtures of several substances. The additional daily intake of β -carotene can be controlled via the portion size of a muffin. The SCF infers a general dietary intake in 3-10mg β -carotene daily.

Legal room to manoeuvre is still limited in Switzerland, but it does allow for traditional foods to be redefined with an added "Beauty" value, and this invites not only the food industry to take innovative approaches.

As part of the harmonization between countries, health claims accepted in the EU, as mentioned earlier in this article, will be adopted in Switzerland in the future. Although health statements are not to be equated with claims of enhancing beauty, these signals from Switzerland encourage the enrichment, with innovative products from the EU area, of a market dedicated to strong traditional values! At the very least, we are one step closer to the dream of eating one's way to beauty.

REFERENCES AND NOTES

1. M. Horx, Trends in the healthcare system, press release 13th European Health Forum Gastein, 6. – 9. October 2010, www.ehfg.org/678.html, accessed 21.12.2012
2. Jü. (2012), Nahrung für Ihre Gesundheit, amtlich bestätigte positive Effekte, Neue Zürcher Zeitung, Nr. 281, 01.12.2012
3. Heller L. (2010), The global market for beauty foods, www.nutrain-ingredients.com, Aug. 2010
4. Beyer A. M. (2008), You can lead a woman to nutricosmetics and cosmeceuticals, but will she try them?, GCI magazine Nov. 2008, www.printthis.com
5. Compagno T. (2008), Brotkonsum in der Schweiz, Coop Zeitung Nr. 50, 9.12.2008
6. Anonym (2006), Ergebnispräsentation Brot-Monitor Schweiz 2006, Präsentation DemoScope Juli 2006
7. Schüpbach S (2009), Politik- Fisch oder Vogel, Nahrungsergänzungsmittel, OTX World, No 47, April 2009
8. Städler E. (2011), neue Regeln für die Gesundheitsversprechen, Alimenta, 22/2011
9. Reinhardt A. (1999), Beauty Food- Schönheit von Innen, Kapitel 3.10 Lebensmittel, in Praxishandbuch Functional Food, 08 02 33, Grundwerk Auflage 1999, 39. Aktualisierungs-Lieferung 04/2009, Behr's Verlag
10. Darvin M., Fluhr J., Meinke M., Zastrow L., Lademann J. (2011), Dermal carotenoid level and kinetics after topical and systemic administration of antioxidants: Enrichment strategies in a controlled in vivo study, J Dermatological Science, Vol. 64, Issue 1, 53-58
11. Marini A. (2011), Schönheit von Innen, funktioniert dies wirklich?, Hautarzt 2011 · 62:614–617
12. Stahl W, Heinrich U, Aust O et al. (2006) Lycopene-rich products and dietary photoprotection. Photochem Photobiol. 5:238–242
13. Heinrich U, Gaertner C, Wiebusch M et al. (2003) Supplementation with beta-carotene or a similar amount of mixed carotenoids protects humans from UV-induced erythema. J Nutr 133:98–101
14. Darvin M., Patzelt S., Gehse S., Schanzer S., Benderoth, Sterry W. et al. (2008), Cutaneous concentration of lycopene correlates significantly with the roughness of the skin, Eur. J Pharm. Biopharm., 96: 921-927
15. Opinion of the scientific committee on food on the tolerable upper intake level of beta carotene (2000), 19.10.2000, http://ec.europa.eu/food/fs/sc/scf/out80b_en.pdf
16. Domke A. et al.(2004), Verwendung von Vitaminen in Lebensmitteln, toxikologische und ernährungsphysiologische Aspekte, Berlin, BfR-Publikation Wissenschaft, www.bfr.bund.de/cd/5799
17. Beta-Carotin in Nahrungsergänzungsmitteln. Stellungnahme Nr. 019/2005 des BfR vom 08. März 2005, www.bfr.bund.de/cm/343/beta_carotin_in_nahrungsergaenzungsmitteln.pdf