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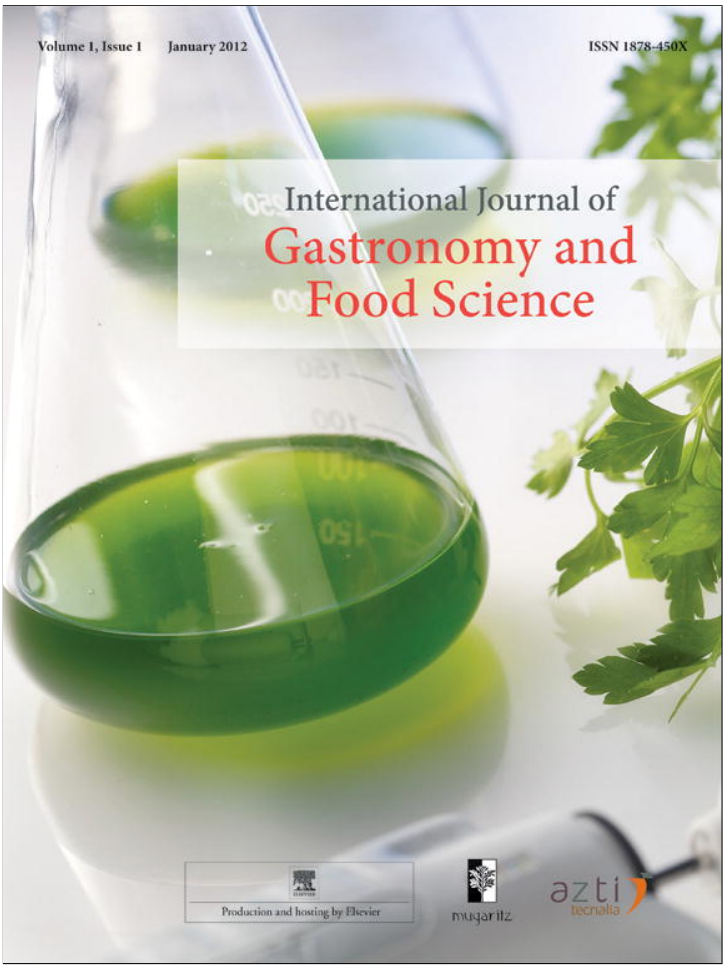

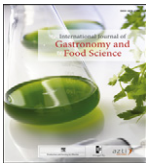

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Cooking and nutritional science: Gastronomy goes further

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Abstract

Science-based cooking is closely associated with the design of stimulating and novel dishes that make guests feel an explosion of sensations. Chefs are expected to use high quality foods and thorough preparation techniques. But food science is not only texture and technology, it is also nutrition and health. From a nutritional point of view, science-based cooking may contribute to providing certain nutrients and other food components, which could confer healthy aspects to the dishes and menus. Chefs may then also consider nutritional aspects when designing dishes and menus. The purpose of the present study was to evaluate the nutritional profile of the innovative dishes and menus offered in Mugaritz Restaurant in Spain. European food legislation and recommendations have been applied in order to evaluate two menus and to globally understand the impact they have on diet and health.

Keywords: Gastronomy; Nutritional profile; Health properties

Introduction

The evolution and history of gastronomy has been clearly influenced by the social and economic background in each period of time. In 1825, gastronomy was defined as 'the reasoned knowledge of all that relates to man feeding himself'. Its aim was to 'attend to the preservation of man by means of the best possible food' (Vega and Ubbink, 2008). In the past, the aim of a diet was to provide nutritional requirements in order to avoid nutrient deficiencies. This aim has evolved into the desire to keep or improve health status through the diet. Likewise, the evolution of gastronomy into haute cuisine has led to the utilization of new ingredients and technologies that could interact with nutrients and alter the contribution of the dishes to the overall diet. The main goal of haute cuisine cooks is to innovate and design delicious dishes with new textures and flavors, which promote new sensations in customers. The logical next step of this goal for haute cuisine could be to understand the impact of these new processes and ingredient mixtures on the nutritional composition of the dishes and menus, and furthermore, the impact of the menus on the overall diet of the individual. Cooks could implement this knowledge in the design of new dishes in order to equilibrate the menus in terms of nutritional and health properties. As gastronomy and haute cuisine are intensely related to social interactions, it is extremely interesting to analyze their implications on one of the major current concerns of society: health. In this sense, European Food Safety Authority (EFSA) is concerned about new product launches with nutritional and health claims that need to be substantiated. New legislation is consequently being put together in order to control and define the claims made by the manufacturers of these products. Bearing these indications from EFSA in mind, the results presented here

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are discussed in terms of nutritional and health properties of two different menus from Mugaritz Restaurant.

Materials and methods

Menu design

The working team of the experimental kitchen from Mugaritz Restaurant was responsible for defining and designing the dishes. The selection of the final recipes and menus was made attending to guest demands and sensory preferences. Recipes are described in Supplementary material. Final presentation of a dish is shown in the figures, for example, *A pasta of amaranth, baby langoustine tails*, is shown in Fig. 1.

Nutritional composition analysis of dishes and menus

A total of 21 dishes conforming to two different menus (Sustraiak and Naturan) were analyzed. All dishes were prepared in duplicate and weighed. Each dish was then completely homogenized and a representative sample was used for nutritional composition analysis. Macro and micronutrients as well as certain bioactive compounds were determined. Samples were analyzed according to the Association of Official Analytical Chemists methods (AOAC, 2002): moisture (AOAC 950.46), ash (AOAC 923.03) and protein content (AOAC 954.01). The measurement of reducing sugars was expressed as invert sugar or dextrose equivalent by the Luff–Schoorl method (Lees, 1968).

Total lipids were evaluated by extraction with chloroform/methanol/water following the Bligh & Dyer method with minor modifications (Bligh and Dyer, 1959). The quantitative cholesterol content of the samples was determined according to the Annex V of the European Official Analysis Methods (European Commission, 1991a). Quantification of the silanised sterol fraction was carried out by capillary gas chromatography, on a Hewlett Packard 6890 chromatograph with flame ionization detector (FID) using a SE-54 capillary column (30 m × 0.25 mm i.d. and 0.25 μm thickness, Supelco). Lipid extractions from each sample were esterified as described in Annex X of the European Official Analysis Methods (European Commission, 1991b). Fatty acid methyl esters (FAMEs) were analyzed using a gas chromatograph Hewlett Packard 5860 equipped with a flame ionization detector 6890 (FID) and a DB-23 fused silica capillary column (60 m × 0.25 mm i.d. and 0.25 μm thickness; Agilent Technologies, USA). Fatty acids were identified by comparison of retention times to standards and relative quantities were expressed as weight percent of total fatty acids.

Fig. 1. Presentation of the dish of *A pasta of amaranth, baby langoustine tails. Tender garden leaves*. Photograph from Jose Luis López de Zubiria.

Total dietary fiber (TDF) was analyzed following the official enzymatic–gravimetric method (AOAC 991.43), total sodium (Na) and potassium (K) by a flame photometric method (AOAC 969.23), calcium (Ca) by atomic absorption spectrophotometry (AOAC 975.03) in a fast sequential atomic absorption spectrophotometer (model AA240 FS, Varian Inc., The Netherlands), following the official methods (AOAC, 2002). The analytical curve was plotted for each element. All the nutritional composition analyses were done in duplicate and the results shown in the tables are the means.

Nutrition and health assessment tools

For the nutrition and health assessment of Mugaritz food designs, the current legislation on nutrition and health claims of foodstuffs was utilized. As a consequence, the nutrients of compulsory declaration for nutritional claims were analyzed. Total energy was also calculated as indicated by law: energy (kcal) = 4 × (g protein + g carbohydrate) + 9 × (g lipid) + 2 × (g of TDF) (European Commission, 2011).

In order to assess the real contribution of each dish and menu to the diet, results were expressed considering the servings given to the customers in the restaurant. This information allowed the comparison between nutritional values of all the dishes (per serving) and evaluation of their contribution to the menu.

In order to convey the relative significance of the contribution of each dish and menu to a daily diet, the results were also expressed as a percentage of a Daily Reference Value (DRV) or Reference Intake (RI). DRVs or RIs for energy and selected nutrients were those proposed by the Panel on Dietetic Products, Nutrition and Allergies of the European Food Safety Authority (EFSA) for a woman (EFSA, 2009a, 2010a).

In order to highlight their nutritional properties or potential effects on health, it was also necessary to evaluate the overall nutritional status of the dish and menu designs. To that end, dishes were categorized on the basis of their composition according to a legal proposal of the European Commission (2009). For each food category, thresholds of sodium, saturated fat and sugars have been suggested. Dishes complying with these nutritional criteria would be justified in making nutrition and health claims according to food regulations (European Commission, 2006, 2010, 2011). Thus only those dishes, which did not exceed EFSA thresholds, were evaluated for nutritional and health claims.

Additionally, the presence of some nutrients (sodium and cholesterol) and also certain bioactive components (long chain omega-3, linolenic acid and potassium) involved in the etiology (formation or prevention) of

cardiovascular diseases were evaluated. Finally, based on scientific opinions of EFSA regarding the health aspects of food components, menus were assessed for their potential health benefit for the general population.

Results and discussion

Nutritional profile of dishes and menus

Nutritional composition per serving

The basic nutritional composition of the dishes, expressed by portion, was assessed focusing on nutrients of compulsory declaration according to the Regulation 1169/2011 (European Commission, 2011). Tables 1 and 2 summarize the results for 21 dishes divided into two different menus (Sustraiak and Naturan).

In general, the nutritional quality of the dishes (in terms of energy, fat, sugar and sodium) was remarkable and appropriate for a healthy diet, with some exceptions. As shown in Tables 1 and 2, those dishes that provided the highest energy, total fat and saturated fat were *Caramelized sweet French toast, Iberian suckling pig*, *Euskal Herria cheeses* (from the Sustraiak menu) and *Foie-Gras with mustard* and *Braised Iberian pork tails and pan fried langoustines* (from the Naturan menu). As fat provides more calories per gram than other nutrients, these dishes, which are high in fat, contribute more importantly to total calories. Although the Sustraiak menu had more dishes with a low-calorie content than the Naturan, three high-calorie dishes from Sustraiak brought total calorie content and saturated fat content for both menus to the same level.

The highest protein content was seen in Honeyed fish stew and Iberian suckling pig from the Sustraiak and A piece of veal, Braised Iberian pork tails and pan fried langoustines and Loin of sole from the Naturan. All of these were composed mainly of meat or fish, thus naturally rich in this nutrient.

Sugar content in the Sustraiak menu was higher than in the Naturan, basically caused by the high sugar content of Caramelized sweet French toast (32.50 g), a dessert rich in sugar, cream and butter. Moreover, Selection of Euskal Herria cheeses was the dish with the second highest sugar content (10.24 g), and it was in the Sustraiak menu as well. This notably increased the difference in total sugar content between the two menus.

The Naturan menu was richer in sodium than the Sustraiak, mainly because of two dishes: Heart of baby leeks and A piece of veal (795.43 and 841.28 mg, respectively). Thus, even though the rest of dishes were similar in terms of sodium content, the Naturan menu had two more dishes, which, when summed, accounted for the total sodium content difference between the menus.

Regarding the total dietary fiber, it was remarkable that there were high differences among dishes but the fiber content of the menus was quite similar. As an example, three dishes (Iberian suckling pig, Selection of Euskal Herria cheeses and Caramelized sweet French toast) from the Sustraiak menu, contributed almost for the 90% of the TDF.

Considering the contribution of the menus to the total diet, it is important to highlight that menus were not fully equilibrated because of their lack of carbohydrates. In this study the breakfast was not evaluated, so this meal would compensate their lack on the diet because it is usually the major supplier of carbohydrates. On the other hand, fat, protein and sodium content were above the recommendations. The appropriate layout of some critical dishes could easily help to nutritionally equilibrate the menus.

Contribution of the menus to Dietary Reference Values and Reference Intakes

Tables 3 and 4 reflect the contribution of each menu to the DRVs, defined in the Materials and methods section. This information was very useful to understand the real impact of each dish and menu on the global diet.

Table 1
Intake of the critical nutrients per serving of each dish from the Sustraiak menu.

Dish[a]	Calories (kcal)	Protein (g)	Carbohydrates (g)	Total sugars (g)	Fat (g)	SFA[b] (g)	TDF[c] (g)	Sodium (mg)
Ravioli filling of crab and fresh chestnuts	28.51	4.36	1.94	0.39	0.22	Tr	0.68	444.09
Mini mozzarellas: buttery Idiazabal cheese gnocci in salted Iberian pork bouillon	25.45	0.87	3.23	1.12	0.86	0.24	0.68	111.63
A pasta of amaranth, baby langoustine tails	94.78	12.22	4.09	0.12	2.35	0.66	4.18	271.55
Honeyed fish stew	88.90	18.94	0.32	0.85	1.23	0.35	0.41	638.47
Iberian suckling pig	284.19	19.39	8.84	0.24	18.94	5.45	0.41	432.79
Selection of Euskal Herria cheeses	214.28	12.28	10.61	10.24	12.06	7.34	7.09	426.97
Carrots, hazelnut cream and gomasio	37.57	0.60	6.28	6.46	0.85	0.20	1.23	42.54
Caramelized sweet French toast	258.63	7.12	26.75	32.50	13.33	7.90	1.62	171.47
Edible stones (boiled potatoes in gray clay)	56.82	1.04	3.49	1.30	4.15	0.84	0.69	37.67
White fried shrimp	37.66	2.73	0.15	0.02	2.63	0.29	1.21	144.30
Organic wheat bread	173.97	5.19	36.42	5.36	0.26	0.05	2.58	426.20
Menu	**1300.75**	**84.74**	**102.11**	**58.59**	**56.87**	**23.32**	**20.76**	**3147.70**

[a]Complete information of dishes is detailed in the Supplementary material.
[b]Saturated fatty acids.
[c]Total dietary fiber.

Table 2
Intake of the critical nutrients per serving of each dish from the Naturan menu.

Dish[a]	Calories (kcal)	Protein (g)	Carbohydrates (g)	Total sugars (g)	Fat (g)	SFA[b] (g)	TDF[c] (g)	Sodium (mg)
Vegetable carpaccio	147.45	4.86	8.97	5.62	9.86	2.55	1.66	107.91
Silky kokotxa of bacalao	41.80	5.64	0.36	0.24	1.83	0.38	0.69	301.72
Heart of baby leeks	53.96	5.08	2.02	1.68	2.37	0.55	2.10	795.43
Foie-Gras with mustard	236.42	6.79	4.47	1.17	20.26	7.22	4.53	291.22
Loin of sole	167.77	17.33	3.99	0.73	8.98	4.18	0.83	457.80
Sautéed red mullet fillets	122.36	13.97	2.49	1.25	5.65	1.85	2.84	611.34
A piece of veal	121.34	20.16	5.65	1.55	1.72	0.74	1.35	841.28
Braised Iberian pork tails and pan fried langoustines	231.80	22.61	4.17	2.44	13.63	4.46	1.02	426.93
Warm squash	85.83	14.75	2.59	3.99	1.58	1.04	1.10	77.98
Interpretation of vanity: moist chocolate cake, cold almond cream, bubbles, smoke and cocoa	93.37	2.08	5.69	3.91	6.57	4.58	1.56	17.81
Edible stones (boiled potatoes in gray clay)	56.82	1.04	3.49	1.30	4.15	0.84	0.69	37.67
White fried shrimp	37.66	2.73	0.15	0.02	2.63	0.29	1.21	144.30
Organic wheat bread	173.97	5.19	36.42	5.36	0.26	0.05	2.58	426.20
Menu	**1381.30**	**111.72**	**71.13**	**23.38**	**67.80**	**25.79**	**19.83**	**4127.95**

[a]Complete information of dishes is detailed in the Supplementary material.
[b]Saturated fatty acids.
[c]Total dietary fiber.

Table 3
Percentage of the Dietary Reference Values (DRVs) and References Intakes (RIs) covered in Sustraiak menu.

Dish[a]	Calories	Fat	SFA[b]	Carbohydrates	Sugars	Sodium	TDF[c]
Ravioli filling of crab and fresh chestnuts	1.43	0.31	Tr	0.84	0.44	18.82	2.70
Mini mozzarellas: buttery Idiazabal cheese gnocci in salted Iberian pork bouillon	1.27	1.22	1.18	1.40	1.25	4.73	2.71
A pasta of amaranth., baby langoustine tails	4.74	3.36	3.31	1.78	0.14	11.51	16.71
Honeyed fish stew	4.44	1.75	1.74	0.14	0.94	27.05	1.62
Iberian suckling pig	14.21	27.06	27.26	3.84	0.26	18.34	1.64
Selection of Euskal Herria cheeses	10.71	17.23	36.70	4.61	11.37	18.09	28.35
Carrots. hazelnut cream and gomasio	1.88	1.21	1.02	2.73	7.18	1.80	4.91
Caramelized sweet French toast	12.93	19.04	39.49	11.63	36.11	7.27	6.47
Edible stones (boiled potatoes in gray clay)	2.84	5.93	4.21	1.52	1.44	1.60	2.76
White fried shrimp	1.88	3.76	1.44	0.07	0.02	6.11	4.85
Organic wheat bread	8.70	0.37	0.27	15.84	5.96	18.06	10.33
Menu	**65.04**	**81.24**	**116.61**	**44.40**	**65.10**	**133.38**	**83.05**

[a]Complete information of dishes is detailed in the Supplementary material.
[b]Total dietary fiber.
[c]Saturated fatty acids.

The Naturan menu had a stronger impact on total calories, total fat and total saturated fat recommendations than the Sustraiak menu, as was expected. Neither menu exceeded total daily recommended calories, but the Naturan menu reached the 80th percentile. It is necessary here to highlight that both fat and saturated fat in the Naturan menu exceeded recommendations (113.56% and 143.60%, respectively). It is noticeable that for the dish Interpretation of vanity, its contribution to recommended fat intake is not as high as its contribution to saturated fat intake. The use of butter and other lipids rich in saturated fat like cocoa could explain this fact. Saturated fat was also excessive in the Sustraiak menu, and in this case, one dish contributed more than the others: Caramelized sweet French toast. It is clearly something to be aware of, because the intake of saturated fat is one of the most important risk factors for cardiovascular diseases and obesity.

Sugars did not reach the DRV but were clearly higher in the Sustraiak menu because of the dish Caramelized sweet French toast. Salt has one of the most restrictive recommendations for cooking. It is a key ingredient because of its implication in cardiovascular and renal diseases but also because of its sensorial properties. It is easy to reach the 6 g Reference Intake (RI) of salt published by EFSA. Nevertheless, we tried to identify dishes with excessive sodium content in order to assess the addition of salt. There were three major contributors to total sodium content of menus: A piece of veal, Sautéed red mullet fillets and Honeyed fish stew, all of them more than 20% above the RI. Two of these were located in the Naturan menu, which exceeded the Reference Intake for sodium

Table 4
Percentage of the Dietary Reference Values (DRVs) and References Intakes (RIs) covered in Naturan menu.

Dish[a]	Calories	Fat	SFA[b]	Carbohydrates	Sugars	Sodium	TDF[c]
Vegetable carpaccio	7.37	14.09	12.74	3.90	6.24	4.57	6.66
Silky kokotxa of bacalao	2.09	2.61	1.91	0.15	0.27	12.78	2.76
Heart of baby leeks	2.70	3.39	2.76	0.88	1.87	33.70	8.40
Foie-Gras with mustard	11.82	28.94	36.08	1.94	1.30	12.34	18.13
Loin of sole	8.39	12.83	20.92	1.74	0.81	19.40	3.33
Sautéed red mullet fillets	6.12	8.07	9.23	1.08	1.38	25.90	11.38
A piece of veal	6.07	2.45	3.68	2.46	1.72	35.65	5.39
Braised Iberian pork tails and pan fried langoustines	11.59	19.47	22.29	1.81	2.71	18.09	4.08
Warm squash	4.29	2.26	5.21	1.13	4.43	3.30	4.42
Interpretation of vanity: moist chocolate cake., cold almond cream., bubbles., smoke and cocoa	4.67	9.39	22.88	2.47	4.35	0.75	6.25
Edible stones (boiled potatoes in gray clay)	2.84	5.93	4.21	1.52	1.44	1.60	2.76
White fried shrimp	1.88	3.76	1.44	0.07	0.02	6.11	4.85
Organic wheat bread	8.70	0.37	0.27	15.84	5.96	18.06	10.33
Menu	**78.53**	**113.56**	**143.60**	**34.98**	**32.49**	**192.27**	**88.73**

[a]Complete information of dishes is detailed in the Supplementary material.
[b]Saturated fatty acids.
[c]Total dietary fiber.

more than the Sustraiak menu (192% and 133%). The total sodium content of both menus seems a critical nutrient to consider. Although it is easy to control the salt content of the dishes, it should be considered that salt is not the unique sodium source.

Total dietary fiber was near 90% in both menus, which is extremely positive. The general population does not consume the daily recommended amount of fiber (25 g), and the use of cellulose and other fibers in the design of restaurant dishes would help to reach this recommendation.

Classification of dishes according to the legal proposal from the European Commission (EC)

In order to assess the nutritional status of the dishes, the legal proposal from the EC was applied. As mentioned in the Materials and methods section, a legal preliminary draft proposal was published in 2009 (European Commission, 2009). This draft defined the highest acceptable sodium, saturated fat and total sugars content for certain categories of food taking into account their contribution to the diet but, it is important to point out that this preliminary proposal is not definitive. Also, it was not easy to decide which of the food categories in the proposal were adequate for such elaborate dishes as those considered in this study and, in some cases the classification may not be the best considering the characteristics of the dishes (Table 5). As an example, Caramelized sweet French toast and Interpretation of vanity were classified in the cereals group although this group has a fat content limit that most desserts could not meet (and there is not a dessert category).

After the classification of the Mugaritz dishes into groups, thresholds in sodium, saturates and sugars were checked. Dishes not satisfying these limits were not considered for further health and nutritional claims. Results are shown in Table 5. Values over the thresholds proposed by the EC are given in bold font.

12 Dishes of 21 satisfied all the limits of its group. Briefly, in 5 dishes, sodium content should be slightly controlled, especially in the fish and fishery products group. Saturated fat content was unacceptable only in 3 dishes, two of them being desserts and the last one foie-gras (naturally rich in saturated fat). In the case of total sugars, they were not appropriate for Caramelized sweet French toast and Carrots, hazelnut cream and gomasio. The limit was not excessively crossed in the case of Caramelized sweet French toast. Carrots, hazelnut cream and gomasio was classified as fruits and vegetables, whose threshold in sugar content is very low for a dish that is served as a dessert. Nevertheless, the high sugar could be mentioned as a warning point.

Nutritional and health claims

Foods with a particularly beneficial nutritional property (regarding nutrient profile and provided energy) and foods that have demonstrated a relationship with any health aspect can carry a claim of the mentioned positive properties. In the context of the EU Regulation, food bearing any such claim should not have an undesirable nutrient composition, in particular regarding those critical nutrients, salt, fat and sugar, for which excessive intakes are not recommended (European Commission, 2009). Thus, after the overall assessment of nutritional status of the dishes, those complying with key nutrient thresholds were checked for nutritional and health claims. Nutritional claim specifications according to Regulation (EC) 1924/2006 and 116/2010 were applied to dishes, which met these criteria. Allowed nutritional claims are shown in Table 6.

All 12 dishes complying with the specific nutrient profile could claim some nutritional properties. Two of them had

Table 5
Classification of the dishes by categories of food. Evaluation based on the critical nutrients.

Dish[a]	Classification	Recommendation for the critical nutrients			Nutrient profiles		
		Total sugars (g/100 g)	Sodium (mg/100 g)	SFA[b] (g/100 g)	Total sugars (g/100 g)	Sodium (mg/100 g)	SFA[b] (g/100 g)
Caramelized sweet French toast	Cereals and cereal products. Breakfast cereals	25	500	5	**25.00**	131.90	**6.08**
Interpretation of vanity: moist chocolate cake.					8.89	40.47	**10.40**
Cold almond cream. Bubbles. smoke and cocoa							
Selection of Euskal Herria cheeses	Dairy based products. Cheeses	15	600	10	7.76	323.46	5.56
A pasta of amaranth., baby langoustine tails	Fish. Fishery products. Crustaceans and molluscs	–	700	10	0.20	445.17	1.09
Honeyed fish stew					0.95	**717.38**	0.39
Silky kokotxa of bacalao					0.61	**754.30**	0.96
Loin of sole					0.62	387.97	3.55
Sautéed red mullet fillets					1.25	611.34	1.85
White fried shrimp					0.10	**962.03**	1.92
Iberian suckling pig	Meat or meat based products	–	700	5	0.20	363.69	4.58
Foie-Gras with mustard					1.41	350.86	**8.70**
A piece of veal					1.55	**841.28**	0.74
Braised Iberian pork tails and pan fried langoustines					2.32	406.60	4.25
Ravioli filling of crab and fresh chestnuts	Ready meals. Soups and sandwiches	10	400	5	0.20	225.43	Tr
Mini mozzarellas: buttery Idiazabal cheese gnocci in salted Iberian pork boullion					2.04	202.97	0.43
Vegetable carpaccio	Fruits. vegetables and their products. Except oils	15	400	5	5.85	112.41	2.66
Carrots. Hazelnut cream and gomasio					**23.92**	157.56	0.76
Heart of baby leeks					1.83	**864.59**	0.60
Warm squash					5.95	116.39	1.56
Edible stones (boiled potatoes in gray clay)					3.94	114.16	2.55
Organic wheat bread	Cereals and cereal products. Breads	15	700	5	8.00	636.12	0.08

[a]Complete information of dishes is detailed in the Supplementary material.
[b]Saturated fatty acids.

up to nine possible nutritional claims (Ravioli filling of crab and fresh chestnuts and A pasta of amaranth and baby langoustine tails). The most frequently allowed claims were those related to protein content. In most of the dishes, sugar and fiber content were low or high enough, respectively, to bear claims. Dishes that contributed to the overall high sugar content of menus were discarded previously, so the vast majority of dishes here could bear the Low sugars claim. The less frequent claims were Low energy, Saturated fat-free and Source of calcium, with only one dish allowed for each of these claims. Potassium levels were analyzed but were not high enough to bear the high potassium claim in any of the dishes.

Although the majority of the dishes showed strong nutritional properties, enough for making validated claims, the total composition of the menus must also be considered. In order to make any claim, the entire menu should be nutritionally equilibrated, as previously mentioned.

Regarding health claims, based on recently published scientific opinions by EFSA and data available from menus, we tried to determine if any of the dishes could bear health claims.

All dishes containing at least enough protein to bear the nutritional claim "source of protein" could also bear the health claim "protein contributes to the maintenance of bone" and "protein contributes to the growth or maintenance of muscle mass" (EFSA, 2010b). As shown in Table 6, this occurred for almost all dishes considered (10 of a total of 12).

Similarly, all dishes containing at least enough calcium to bear the nutritional claim "source of calcium" could also bear the following health claims: "calcium is needed for the maintenance of normal bones and teeth", "calcium contributes to normal muscle function and neurotransmission", "calcium contributes to normal blood clotting", "calcium contributes to normal energy metabolism" and "calcium contributes to the normal function of digestive enzymes" (EFSA, 2010c). This was the case for Selection of Euskal Herria cheeses.

In order to bear the claim alpha-linoleic acid (LA) or alpha-linolenic acid (ALA) helps to maintain normal blood cholesterol concentrations; dishes should have at least 1.5

Table 6
Nutritional claims for filtered dishes.

Dish[a]	Low energy	Low fat	Fat-free	Low saturated fat[b]	Saturated fat-free[b]	Low sugars	Sugars-free	With no added sugars	Low sodium/salt	High fiber	Source of fiber	High protein	Source of protein	Source of calcium	Source of omega-3 (EPA + DHA)	High monounsaturated fat	High unsaturated fat
Ravioli filling of crab and fresh chestnuts	•	•	•			•	•	•			•	•	•				
Mini mozzarellas: buttery Idiazabal cheese gnocci in salted Iberian pork bouillon		•		•		•		•			•		•				•
A pasta of amaranth., baby langoustine tails				•		•	•	•		•	•	•	•		•		
Iberian suckling pig												•	•			•	
Selection of Euskal Herria cheeses						•	•	•		•	•	•	•	•			
Vegetable carpaccio								•	•				•			•	•
Loin of sole						•						•	•		•	•	
Sautéed red mullet fillets						•		•			•	•	•		•		
Braised Iberian pork tails and pan fried langoustines						•		•				•	•			•	
Warm squash		•							•			•	•				
Edible stones (boiled potatoes in gray clay)						•			•							•	•
Organic wheat bread		•	•	•	•			•			•						

[a] Complete information of dishes is detailed in the Supplementary material.
[b] Trans-fatty acids were not determined.

and 0.3 g of each fatty acid, respectively (EFSA, 2009b,c). White fried shrimp was rich enough in alpha-linoleic acid to bear a claim (data not shown), but it was not considered for nutritional and health claims because of its high sodium content. Two other dishes could bear a claim based on their fatty acid profiles: Iberian suckling pig, because of its alpha-linoleic acid content (2.31 g per serving) and Loin of sole for its alpha-linolenic acid content (0.4 g per serving).

It is also interesting to evaluate the total fatty acid intake for the menus as a whole because health claims could be justified when intake levels are achieved overall. Logically, taking this into account, both menus could bear the previously mentioned claims. Moreover, the Naturan menu could bear the claim related to eicosapentaenoic acid (EPA) and EPA + docosahexaenoic acid (DHA) levels (440.90 and 638.45 mg, respectively). In this case, the health claims are as follows: "its DHA levels contribute to the maintenance of normal brain function and to the maintenance of normal vision" (EFSA, 2010d) and "its EPA + DHA levels contribute to the normal function of the heart" (EFSA, 2010e). Nevertheless, it is important to point out that claims for the menus as a whole require taking into account dishes that were discarded because they did not meet the EC draft requirements for threshold values of key nutrients.

There is not any health or nutritional claim regarding low levels of cholesterol. Nevertheless it is interesting to analyze because this nutrient is essential for life but, at the same time, its serum levels are an important biomarker for cardiovascular diseases. There was not an excessive cholesterol content in any of the menus (138.66 mg for Sustraiak and 141.58 mg for Naturan), even considering the recommendation for persons whose LDL levels are above the goal (< 200 mg of cholesterol intake per day) (NECP, 2002).

Some isolated dishes could bear the nutritional claim low sodium/salt (Vegetable carpaccio, Warm squash and Edible stones). These dishes could then bear the health claim "High sodium intake increases blood pressure; consumption of foods low or very low in sodium helps to maintain normal blood pressure" (EFSA, 2011). As has been previously described, total sodium content of both menus should be taken into account.

Conclusion

In general, when focusing on the maximum recommended amount of critical nutrients such as saturated fat, sugar and sodium, more than half of the dishes from both menus were nutritionally well-balanced. Those dishes that exceeded the suggested criteria for the critical nutrients were studied to identify the responsible ingredients as an opportunity for the improvement of their nutritional quality and for the improvement of dishes and menus in general. In addition, it was found that nutritional claims could be made for all the dishes, which did not exceed the suggested criteria. Furthermore, some dishes had significant amounts of certain bioactive compounds, which may help in the prevention of

cardiovascular diseases. Others could bear some health claims regarding their protein and calcium content.

Summing up, fine dining and cooking, in general, have become an important part of leisure time. Haute cuisine has gotten closer to society and vice versa and consequently, both of them should be aware of the others' motivations and concerns. This approach or symbiosis has changed the way of cooking in most restaurants, forcing an adaptation to the desires and necessities suggested by the most heterogeneous gourmet community in history.

The sensitivity that Mugaritz has developed in matters of health and nutrition is as important as any given feedback received directly from their customers. Without giving up the creative and artisan component that characterizes restaurants, Mugaritz has gradually changed certain ingredients with a very important gastronomic value (fat, protein), for others equally valuable, but more healthy (herbs, cereals, tubers and vegetables).

This work, in terms of the interest of high level cooks in better understanding the impact of new procedures on a food's nutritional properties, is an important contribution to a new concept of gastronomy, focused not only on sensations but also on nutrition and health. These concepts could be equally applied in all restaurants and catering services to encourage changes in the distribution of dishes on the menus and understanding of the impact of some critical ingredients as added salt, sugar and fat (easily controllable) on the diet. The application of this knowledge at this level demands a better and wider transmission of dietetic and nutritional issues from school to professional education and training. Diet is the most important source of prevention of diseases such as obesity, diabetes and cardiovascular diseases, with high prevalence not only in the developed countries but around the world. Educational programs should take this into account as an important issue for maintenance of the next generation's nutritional and health status.

Conflict of interest

The authors declare that there are no conflicts of interest.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ijgfs.2011.11.004.

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(DHA) and maintenance of normal (fasting) blood concentrations of triglycerides (ID 533, 691, 3150), protection of blood lipids from oxidative damage (ID 630), contribution to the maintenance or achievement of a normal body weight (ID 629), brain, eye and nerve development (ID 627, 689, 704, 742, 3148, 3151), maintenance of normal brain function (ID 565, 626, 631, 689, 690, 704, 742, 3148, 3151), maintenance of normal vision (ID 627, 632, 743, 3149) and maintenance of normal spermatozoa motility (ID 628) pursuant to Article 13(1) of Regulation (EC) No 1924/2006. EFSA Journal 8, 1734.

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