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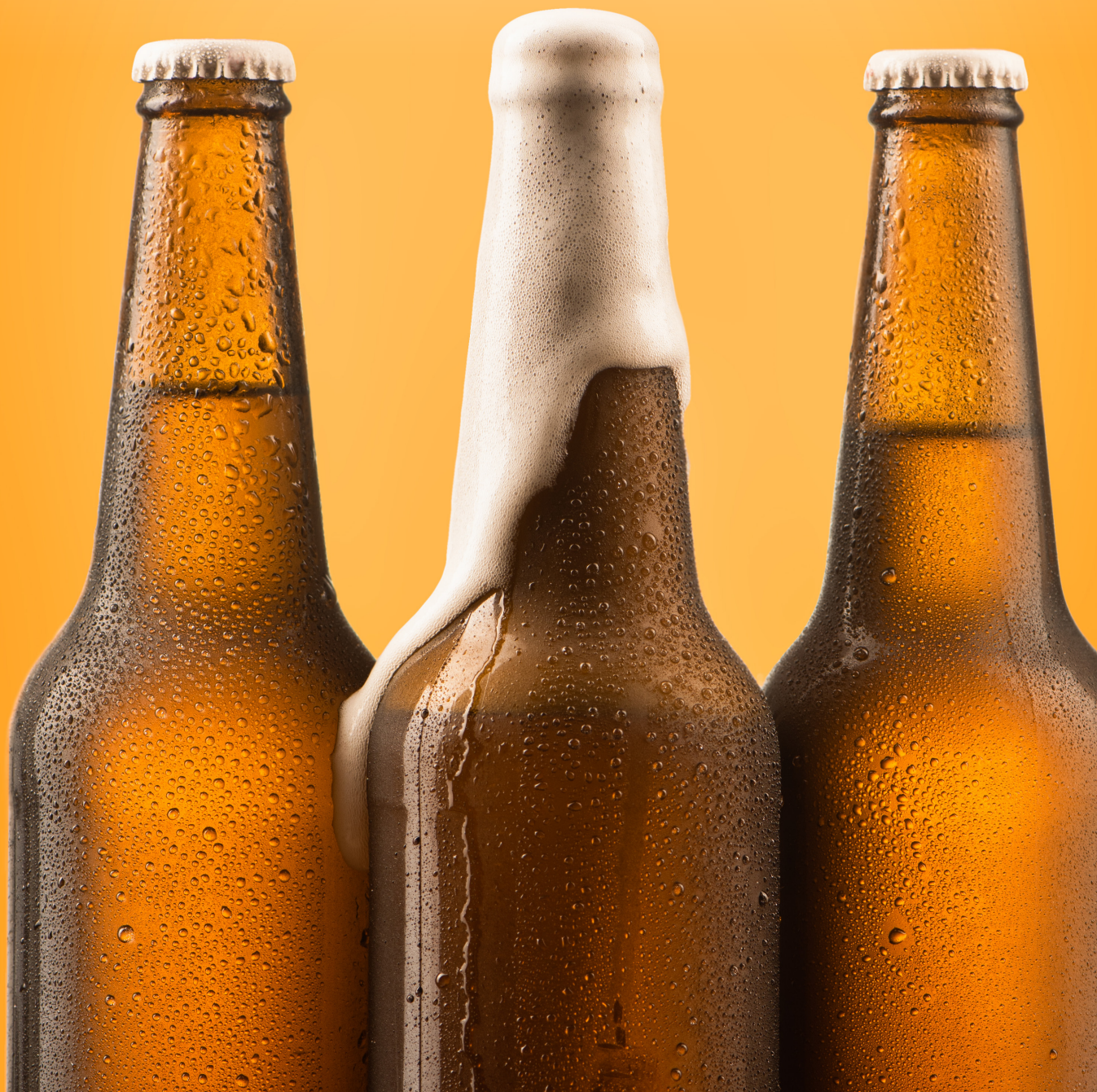
Næringsstofindhold i øl

Nutrient Content in Beer



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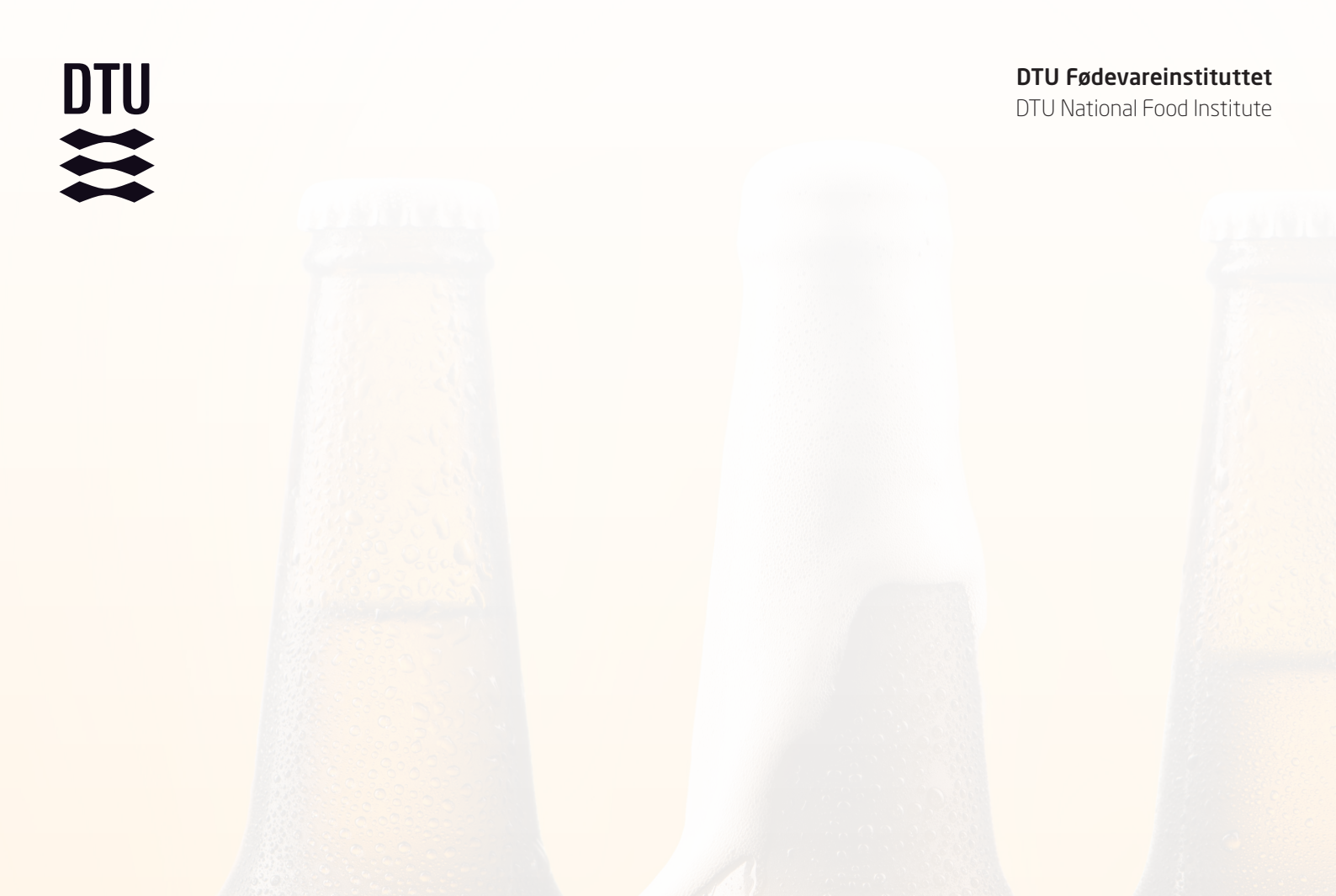

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Nutrient Content in Beer

June 2025

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Preface

On behalf of the Danish Veterinary and Food Administration, the DTU Food Institute conducted a study on the nutrient content of beer in Denmark, during the autumn of 2020. The analytical data from this project will be included in the Danish Food Composition Database and published in Frida, version 5.4 (www.frida.fooddata.dk).

The project was planned and carried out by Anders Poulsen, Jette Jakobsen, and Marija Langwagen. The sampling plan as well as the collection of samples, was done by Marija Langwagen, while the sample analyses were performed by Eurofins Steins Laboratorium in Vejen, Denmark. The report was produced through a collaboration between Anders Poulsen, Jette Jakobsen, and Marija Langwagen.

Kongens Lyngby, April 2025

Marija Langwagen

Project manager

Table of Contents

Summary

This project aimed to obtain knowledge about the nutrient content of the most common beer types on the Danish market.

Based on a market survey, the beer samples were selected to represent the best-selling and most widely available varieties. A total of 13 beer types were included: Blonde and Dark Ale, Christmas Beer, Dark Malt Beer, Wheat Beer (Weissbier & Witbier), Pilsner (Regular, Non-Alcoholic, Classic, Light, and Strong), Stout, and Strong Lager.

In October and November 2020, 42 samples were collected from supermarkets in the Greater Copenhagen area. Subsamples within each beer type were combined into composite samples based on market share.

The 13 beer types were analyzed as composite samples with duplicate determinations for macronutrient content, including alcohol and amino acids, as well as micronutrients such as minerals and vitamins. All analyses were conducted by accredited testing in accordance with ISO 17025 at Eurofins Stein Laboratorium A/S.

The analytical data from this project will be included in the Danish Food Composition Database and published in Frida, version 5.4 (www.frida.fooddata.dk).

Resumé (Danish)

Projektets formål var at opnå viden om indhold af næringsstoffer i de mest almindelige øltyper på det danske marked.

Baseret på en markedsundersøgelse blev prøverne udvalgt, så de repræsenterede de bedst sælgende og mest udbredte varianter. I alt blev 13 øltyper inkluderet: Lys og mørk ale, juleøl, mørk hvidtøl, hvede øl (Weissbier & Witbier), pilsner (almindelig, alkoholfri, Classic, let og Guldøl), Stout og stærk lager.

I oktober og november 2020 blev der indsamlet 42 prøver fra supermarkeder i Storkøbenhavn. Inden for hver øltype blev delprøver kombineret til sammensatte prøver baseret på markedsandel.

De 13 øltyper blev analyseret som pool-prøver med dobbeltbestemmelse af makronæringsstoffer, herunder alkohol og aminosyrer, samt mikronæringsstoffer såsom mineraler og vitaminer. Alle analyser blev udført som akkrediterede analyser i overensstemmelse med ISO 17025 hos Eurofins Stein Laboratorium A/S.

De analytiske data fra dette projekt vil blive inkluderet i den danske fødevaredatabase og offentliggjort i Frida, version 5.4 (www.frida.fooddata.dk).

1. Introduction

The current version of the Danish Food Composition Database (Frida v. 5.3) includes six beer types; however, the data is outdated in terms of market availability, composition, and classification. Four of these beer types, namely Dark Malt Beer, Pilsner, Pilsner Strong (Guldøl), and Pilsner Light, are also analyzed in this study. The existing nutrient data for these beers originates from various Danish and foreign sources.

For the first time, this study aimed to examine the nutrient composition of the main beer types on the Danish market, selected based on a market survey.

This report documents the sample material, analytical methods, and results for the nutrient content of thirteen beer types collected from supermarkets in the Greater Copenhagen area during autumn 2020, considered representative of the Danish market.

The beer samples were analyzed for macro- and micronutrient content in composite samples, with duplicate determinations and accredited testing in accordance with ISO 17025.

The analytical data from this project will be included in the Danish Food Composition Database and published in Frida, version 5.4 (www.frida.fooddata.dk).

2. Sample Materials

2.1 Market Analysis and Sampling Plan

To ensure a representative selection of the best-selling and most widely available beers on the Danish market, product samples were selected based on market volume data from Euromonitor International (2019) and purchase data from GfK ConsumerScan Denmark (2017).

Beer samples were classified using a combination of Euromonitor's market data on the best-selling beer types in Denmark (2020) and the Danish Brewers' Association's classification of beer sales from Danish breweries (Danish Brewers' Association, 2020).

A total of 13 beer types, representing the primary beer categories on the Danish market, were included in the sampling plan (see Table 1).

Table 1. Beer styles included in the study – in English and Danish.

Beer Style	Øltype
Blonde Ale, 6-7% ABV	Ale, lys (blonde), 6-7 % alk. vol.
Dark Ale, 5-7% ABV	Ale, mørk, 5-7 % alk. vol.
Christmas Beer, 5-6% ABV	Juleøl, 5-6 % alk. vol.
Dark Malt Beer, 1-2% ABV	Mørk Hvidtøl, 1-2 % alk. vol.
Wheat Beer (Weissbier), 4-6% ABV	Hvedeøl, lys (weissbier), 4-6 % alk. vol.
Wheat Beer (Witbier), 5-6% ABV	Hvedeøl, lys (witbier), 5-6 % alk. vol.
Pilsner, Non-Alcoholic	Pilsner, alkoholfri
Pilsner, Classic (Vienna Lager), 4-5% ABV	Pilsner, classic (Wienerøl), 4-5 % alk. vol.
Pilsner, Light 2-3% ABV	Pilsner, let, 2-3 % alk. vol.
Pilsner, 4-5% ABV	Pilsner, 4-5 % alk. vol.
Pilsner, Strong (Guldøl), 5-6% ABV	Pilsner, Guldøl, 5-6 % alk. vol.
Stout (Porter), 8% ABV	Stout (Porter), 8 % alk. vol.
Strong Lager, 7-8% ABV	Lager, stærk, 7-8 % alk. vol.

The selection of specific products for each composite sample of a beer type was based on brand share data from Euromonitor International (2019) and purchase data from GfK ConsumerScan Denmark (2017), both measured by volume.

Additionally, the selection was supplemented by a survey conducted in supermarkets across the Capital Region of Denmark from September to November 2020, registering available beer products. This survey covered all major grocery retail chains in Zealand, including Salling Group, Coop Denmark, Rema 1000, Dagrofa, and Lidl, either through online listings or in-store visits.

2.2 Collection of Samples

All samples were purchased from supermarkets in the Greater Copenhagen area during October and November 2020. Each composite sample consisted of products from two to four of the most popular manufacturers and brands, selected based on brand share data from Euromonitor International (2019) and purchase data from GfK ConsumerScan Denmark (2017).

Each composite sample had a total volume of at least 2000 ml, ensuring sufficient material for the analyses.

In total, 42 different beers were sampled. Table 2 provides an overview of the subsamples within the composite samples, including product names, country of origin (brand), and the percentage contribution of each subsample.

More detailed information on the 42 samples, including ingredients, sampling dates, and other relevant data, is available in Appendix A1 (Danish) and Appendix A2 (English).

Table 2. Subsamples within the composite samples and their respective percentage contributions.

Composite Sample Name	Product Name	Country	Weight in composite sample (%)
Blonde Ale, 6-7% ABV	JACOBSEN Saaz Blonde	Denmark	67
	GRIMBERGEN 1128 BLONDE	Denmark	26
	Leffe BLONDE	Belgium	8
Dark Ale, 5-7% ABV	JACOBSEN Brown Ale	Denmark	43
	GRIMBERGEN 1128 DOUBLE AMBRÉE	Denmark	27
	BRYGGERIET REFSVINDINGE ALE No. 16	Denmark	24
	Leffe BRUNE	Belgium	5
Wheat Beer (Witbier),	GRIMBERGEN 1128 BLANCHE	Belgium	33
5-6% ABV	Hoegaarden Wit Blanche	Belgium	33
	Kronenbourg 1664 BLANC	Denmark	33
Wheat Beer (Weissbier),	ERDINGER Weissbier	Germany	33
4-6% ABV	Kaiserdom Hefe-Weissbier NATURTRÜB	Germany	33
	PAULANER Weissbier	Germany	33
Dark Malt Beer, 1-2% ABV	Kongens Bryg PRIMA MØRKT HVIDTØL	Denmark	56
	Vestfyen Pasteuriseret Mørkt Hvidtøl	Denmark	44
Christmas Beer, 5-6% ABV	Tuborg JULEBRYG	Denmark	60
	ROYAL XMAS (blå)	Denmark	20
	ROYAL XMAS (hvid)	Denmark	20
Strong Lager, 7-8% ABV	Tuborg LUXURY FINE FESTIVAL BEER	Denmark	45
	Carlsberg LUKSUS ELEPHANT PILSNER	Denmark	38
	BRUTALIS	Denmark	18
Pilsner, Non-Alcoholic	Carlsberg ALKOHOLFRI NORDIC PILSNER	Denmark	45
	ROYAL 0,0% PILSNER	Denmark	26
	TUBORG NUL 0.0%	Denmark	16
	HEINEKEN 0.0 BEER	Netherlands	13
Pilsner, 4-5% ABV	TUBORG GRØN PILSNER ØL	Denmark	56
	Carlsberg KØBENHAVN DANMARK	Denmark	28
	Heineken ORIGINAL	Netherlands	12
	ROYAL PILSNER	Denmark	4
Pilsner, Classic (Vienna Lager),	TUBORG Classic	Denmark	40
4-5% ABV	ROYAL Classic	Denmark	24
	Carlsberg CARLs SPECIAL	Denmark	20
	POKAL CLASSIC	Denmark	16
Pilsner, Strong (Guldøl),	Tuborg GULD TUBORG	Denmark	47
5-6% ABV	Carlsberg DANMARK SORT GULD PILSNER	Denmark	27
	DANSK GULD	Denmark	20
	HARBOE Luxus GULDØL	Denmark	7
Pilsner, Light, 2-3% ABV	DANSK LIGHT	Denmark	80
	HARBOE Pilsner LIGHT	Denmark	20
Stout (Porter), 8% ABV	ROYAL STOUT	Denmark	37
	WIIBROE PORTER IMPERIAL STOUT	Denmark	37
	LIMFJORDSPORTER DOUBLE BROWN STOUT	Denmark	26

2.3 Sample Preparation.

After collecting, the samples were stored at a temperature similar to that in the supermarket, approximately 18°C. The subsamples for each composite sample were packed in a plastic bag at DTU National Food Institute, remaining in their original glass bottles or cans. Each package included information on the weight of the subsamples used for the composite sample.

The samples were then transported to Eurofins Steins Laboratorium A/S in Vejen, Denmark. Within 72 hours, they were degassed and mixed by pouring the liquid between beakers, after which subsamples were taken. Alcohol content was measured immediately after the composite sample was prepared.

The sample material was stored in plastic containers at a maximum temperature of -18°C until analysis, which was conducted within four months.

A full list of all 42 collected samples, including specific product information such as expiry dates and ingredient lists, can be found in Appendix A1 (Danish) and Appendix A2 (English).

3. Analytical Methods

The 13 composite samples were analyzed for their content of macronutrients, including nitrogen, amino acids, fat, ash, dry matter, sugars, and alcohol; vitamins, including thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, biotin, folates, and α-tocopherol; as well as minerals, including sodium, potassium, calcium, magnesium, phosphorus, iron, copper, zinc, iodine, manganese, chromium, selenium, and molybdenum.

A brief description of the analytical methods used can be found in Appendix B. The beers were analyzed as composite samples with duplicate determinations. All analyses were performed as accredited tests in accordance with ISO 17025:2017 at Eurofins Steins Laboratorium A/S (DANAK TEST Reg. No. 222).

4. Results

The analysis results are presented in Appendices C–F: macronutrients, including alcohol percentage, are detailed in Appendix C; vitamins in Appendix D; minerals in Appendix E; and amino acids in Appendix F.

For nitrogen, none of the beer types had a content above the limit of quantification (LOQ) (Appendix C). Regarding amino acids, at least six of the 18 quantified amino acids had a content below the LOQ (Appendix F). The sources of amino acids in brewed beer primarily originate from malt made from barley or from malt consisting of a mixture of barley and wheat. Ten beers were based on barley malt, while three contained a combination of wheat and barley malt (Appendix A).

For beer types based on barley malt, a combination of the amino acid content in barley and the quantified amino acids above the LOQ (Appendix F) was used to estimate the content of amino acids and nitrogen, which were below the LOQ according to the analytical method. For the three beer types based on a mixture of barley and wheat malt, the nutrient content in barley and wheat (50/50) was used.

The estimated amino acid content is presented in Appendix H. Estimates of carbohydrate content, calculated using the difference method based on dry matter, protein, fat, and ash, as well as protein content estimated by the sum of amino acids, are provided in Appendix G.

5. Discussion

Sampling was performed in the Greater Copenhagen area for practical reasons but was considered representative of the Danish market. During the sampling, adjustments were made as necessary to account for availability in supermarkets at the time of collection, which is judged to have no significant impact on the nutrient content of the affected beer types.

In the current version of the Danish Food Database, version 5.3 (Frida.fooddata.dk), six beer types are included. However, in addition to the quality of the data, the information on these six beer types is outdated in terms of the beer types available on the market, their composition, and their classification. Four of these beer types, namely Dark Malt Beer, Pilsner, Pilsner Strong (Guldøl), and Pilsner Light, are also analyzed in this study. The nutrient content for these four beer types comes from various Danish and foreign sources, including studies specifically focusing on a single nutrient. While such data may not be optimal for a food composition database, the analytical method used in this study demonstrated a lower LOQ for, e.g., copper and zinc, than the LOQ applied in earlier studies.

For nitrogen, the content in the six beers ranges from 0.032 g/100 g to 0.059 g/100 g, which is below the LOQ of 0.1 g/100 g used in our study. In this study, the amino acid content was analyzed in all 13 composite samples. The LOQ for each of the individual amino acids varies between 0.006 g/100 g and 0.035 g/100 g (Appendix B), meaning that the content was below LOQ for a minimum of six amino acids and a maximum of 16 amino acids (Appendix F). The amino acids in beer primarily derive from the malt of barley or a mixture of malt from barley and wheat. The percentage of content of each individual amino acid quantified in the beer, compared to the content of the relevant ingredient in malt (i.e., barley or barley/wheat (50/50)), was calculated. The average of this percentage for each beer type was used to estimate the content of the amino acids and nitrogen, which was found to be below LOQ. The nitrogen content estimated in this study ranges from 0.038 g/100 g to 0.086 g/100 g.

The composite sample of non-alcoholic beer consisted of 45% from a brand containing 0.5% v/v alcohol and 55% from three brands declared to have 0% v/v alcohol. The estimated alcohol content would be 0.22% v/v, which aligns with the analytical result of 0.15% v/v (Appendix C, 2005-POOL-05), as 0.49% v/v alcohol ultimately results in 0.15% v/v alcohol.

The only beer types with detectable amounts of sugar are Dark Malt Beer, non-alcoholic beer, and Christmas beer, containing 7.0, 0.7, and 0.3 g sugars/100 g, respectively. Starch was not analyzed, but the content is assumed to be below the limit of quantification of the analytical method (0.5 g/100 g). Estimates of the carbohydrate content are therefore based on the difference method presented in Appendix H.

The vitamin content is generally negligible compared to the recommended intake. Notably, beer does not contain thiamine (vitamin B1). Alcohol intake decreases the absorption of thiamine, increasing the risk of vitamin B1 deficiency, particularly among alcoholics.

The strength of the project lies in the sampling and production of composite samples that are representative of the market in 2020. The weakness is that analyzing composite samples provides no option to test for variation between the subsamples in each specific beer type.

6. Perspectives

The limit of quantification for the analytical method needs to be improved in future projects aiming to analyze beer. If updating data is essential due to changes in the market, it would be beneficial to establish knowledge of the variation in macronutrients between brands.

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Appendix A1 – Prøveinformationer (Danish)

Øl type (Prøve ID)	Varebetegnelse	Virksomhed	Land	Producent	Produktions-land	Stregkode	Alk. vol. % deklareret	Indhold	Bedst før dato	Indhold i poolprøve		Dato for indsamling
										ml	%	
Ale, lys (blond), 6-7% alk. vol. (2005-POOL-09)												
	Jacobsen Saaz Blonde	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	57095585	7,1	Vand, bygmalt, glukosesirup, hvedemalt, kuldioxid, humle, kvanekstrakt	25-01-21	2600	67	08-11-20
	Grimbergen 1128 Blonde	Carlsberg Denmark A/S	Danmark	Carlsberg Supply Company Polska S.A	Polen	3080216034508	6,7	Vand, bygmalt, glukosesirup, hvedemalt, aromatisk karamel, humle	27-12-21	1000	26	08-11-20
	Leffe Blonde	AB InBev	Belgien	Br. Abbaye de Leffe s.a./n.v	Belgien	5410228222958	6,6	Vand, bygmalt, majs, byg, sukker, humle	24-01-22	300	8	27-10-20
Ale, mørk, 5-7% alk. vol. (2005-POOL-08)												
	Jacobsen Brown Ale	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	57095509	6,0	Vand, bygmalt, glukosesirup, kuldioxid, humle	28-08-20	1600	43	27-10-20 08-11-20
	Grimbergen 1128 Double Ambree	Carlsberg Denmark A/S	Belgien	Carlsberg Supply Company Polska S.A	Polen	3080216034645	6,5	Vand, bygmalt, glukosesirup, sukker, aromatisk karamel, humle	21-12-21 02-03-22	1000	27	27-10-20 08-11-20
	Ale no. 16	Bryggeriet Refsvindinge	Danmark	Bryggeriet Vestfyen A/S	Danmark	57054834	5,7	Vand, bygmalt, humle, farvestof (E150c), antioxidant (askorbinsyre)	05-04-22	900	24	27-10-20
	Leffe Brune	AB InBev	Belgien	Br. Abbaye de Leffe s.a./n.v.	Belgien	5707323644816	6,5	Vand, bygmalt, majs, byg, sukker, humle	08-02-22	200	5	27-10-20
Hvedeøl, lys (Witbier), 5-6% alk. vol. (2005-POOL-11)												
	Hoegaarden Wit Blanche	AB InBev	Belgien	InBev Belgien	Belgien	5410228158424	4,9	Vand, bygmalt, hvedemalt, humle, krydderier, sukker, gær	19-09-21	1600	33	27-10-20 10-11-20
	Kronenbourg 1664 Blanc	Carlsberg Denmark A/S	Danmark	Carlsberg Supply Company Polska S.A	Polen	3080216031811	5,0	Vand, bygmalt, hvede, glukosesirup, aromatisk karamel, aroma, humleekstrakt, appelsinskal, koriander	07-08-21	1600	33	27-10-20
	Grimbergen 1128 Blanche	Carlsberg Denmark A/S	Danmark	Kronenbourg Supply Company	Frankrig	57088969	6,0	Vand, bygmalt, glukosesirup, hvedemalt, naturlige aromaer, aromatisk karamel, humle	01-05-21	1600	33	27-10-20 10-11-20
Hvedeøl, lys (Weissbier), 4-6% alk. vol. (2005-POOL-10)												
	Erdinger Weissbier	Erdinger Weissbräu	Tyskland	Privatbrauerei Erdinger Weissbräu	Tyskland	4002103271314	5,3	Vand, hvedemalt, bygmalt, humle, gær	27-08-21	1600	33	08-11-20 10-11-20
	Kaiserdom Hefe-Weissbier NATURTRÜB	Kaiserdom Bambergen Specialitäten Brauerei	Tyskland	Kaiserdom-Privatbrauerei Bamberg	Tyskland	5700383307677	4,7	Vand, hvedemalt, bygmalt, gær, humle, humleekstrakt	03-11-21	1600	33	27-10-20
	PAULANER Weissbier	Paulaner Brauerei Gruppe GmbH & Co. KGaA	Tyskland	Paulaner Brauerei Gruppe GmbH & Co. KGaA	Tyskland	4066600602002	5,5	Vand, Hvedemalt, bygmalt, gær, humle	06-08-21	1600	33	08-11-20 10-11-20
Mørk Hvidtøl, 1-2% alk. vol. (2005-POOL-07)												
	Kongens Bryg PRIMA MØRKT HVIDTØL	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	57008097	1,7	Vand, bygmalt, byg, sukker, lakrids, farvestof (E150c)	13-02-21	1900	56	27-10-20
	Vestfyen Pasteuriseret Mørkt Hvidtøl	Bryggeriet Vestfyen A/S	Danmark	Bryggeriet Vestfyen A/S	Danmark	57109251	1,8	Vand, bygmalt, sukker, humle, kuldioxid (E290), Farvestof (E150c), antioxidant (E300)	01-10-20	1500	44	27-10-20

Øl type (Prøve ID)	Varebetegnelse	Virksomhed	Land	Producent	Produktions-land	Stregkode	Alk. vol. % deklareret	Indhold	Bedst før dato	Indhold i poolprøve		Dato for indsamling
										ml	%	
Juleøl, 5-6% alk. vol. (2005-POOL-13)												
	Tuborg Julebryg	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700301568	5,6	Vand, bygmalt, byg, lakrids, humle	04-11-21	1800	60	08-11-20 10-11-20
	Royal X-Mas Hvid	Royal Unibrew A/S	Danmark	Royal Unibrew A/S	Danmark	5741000116944	5,6	Vand, bygmalt, glukosesirup, majs, humle	22-07-21	600	20	08-11-20
	Royal X-Mas Blå	Royal Unibrew A/S	Danmark	Royal Unibrew A/S	Danmark	5741000116937	5,6	Vand, bygmalt, glukosesirup, majs, farvestof (E150c), humle	07-07-21	600	20	08-11-20
Lager, stærk, 7-8% alk. vol. (2005-POOL-08)												
	LUXURY Tuborg FINE FESTIVAL BEER	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700991912	7,5	Vand, bygmalt, glukosesirup, humle	13-08-21 13-09-21	1800	45	27-10-20 02-11-20
	Carlsberg LUKSUS ELEPHANT PILSNER	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740600371807	7,2	Vand, bygmalt, humle	13-08-21	1500	38	02-11-20
	BRUTALIS	Harboes Bryggeri A/S	Danmark	Harboes Bryggeri A/S	Danmark	5701318740354	7,7	Vand, bygmalt, byg, glukosesirup, humle	24-09-21	700	18	27-10-20 02-11-20
Pilsner, alkoholfri (2005-POOL-06)												
	Carlsberg ALKOHOLFRI NORDIC PILSNER	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700990427	0,5	Vand, bygmalt, sukker, naturlige aromaer, humle	25-05-21	1400	45	02-11-20
	ROYAL 0,0% PILSNER	Royal Unibrew A/S	Danmark	Royal Unibrew A/S	Danmark	5741000125052	0,0	Vand, bygmalt, humle, naturlige aromaer, humleolie	08-09-21	800	26	27-10-20
	TUBORG NUL 0.0%	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700985416	0,0	Vand, bygmalt, kuldioxid, naturlig aroma, humle	25-12-20	500	16	27-10-20
	HEINEKEN 0.0	Heineken N.V.	Holland	Heineken Brouwerijen B.V.	Holland	5741000155912	0,0	Vand, bygmalt, naturlig aroma, humleekstrakt	01-09-21	400	13	27-10-20 02-11-20
Pilsner, 4-5% alk. vol. (2005-POOL-01)												
	GRØN TUBORG PILSNER ØL	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700030567	4,6	Vand, bygmalt, byg, humle	15-10-21	1400	56	27-10-20 02-11-20
	Carlsberg KØBENHAVN DANMARK	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	57089188	4,6	Vand, bygmalt, humle	31-08-21	700	28	27-10-20 02-11-20
	Heineken ORIGINAL	Heineken N.V.	Holland	Heineken Brouwerijen B.V.	Holland	5741000126868	4,6	Vand, bygmalt, humle	20-06-21	300	12	27-10-20
	ROYAL PILSNER	Royal Unibrew A/S	Danmark	Royal Unibrew A/S	Danmark	5741000115435	4,6	Vand, bygmalt, byg, humle	08-09-21	100	4	27-10-20

Øl type (Prøve ID)	Varebetegnelse	Virksomhed	Land	Producent	Produktions-land	Stregkode	Alk. vol. % deklareret	Indhold	Bedst før dato	Indhold i poolprøve		Dato for indsamling
										ml	%	
Juleøl, 5-6% alk. vol. (2005-POOL-13)												
	Tuborg Julebryg	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700301568	5,6	Vand, bygmalt, byg, lakrids, humle	04-11-21	1800	60	08-11-20 10-11-20
	Royal X-Mas Hvid	Royal Unibrew A/S	Danmark	Royal Unibrew A/S	Danmark	5741000116944	5,6	Vand, bygmalt, glukosesirup, majs, humle	22-07-21	600	20	08-11-20
	Royal X-Mas Blå	Royal Unibrew A/S	Danmark	Royal Unibrew A/S	Danmark	5741000116937	5,6	Vand, bygmalt, glukosesirup, majs, farvestof (E150c), humle	07-07-21	600	20	08-11-20
Lager, stærk, 7-8% alk. vol. (2005-POOL-08)												
	LUXURY Tuborg FINE FESTIVAL BEER	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700991912	7,5	Vand, bygmalt, glukosesirup, humle	13-08-21 13-09-21	1800	45	27-10-20 02-11-20
	Carlsberg LUKSUS ELEPHANT PILSNER	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740600371807	7,2	Vand, bygmalt, humle	13-08-21	1500	38	02-11-20
	BRUTALIS	Harboes Bryggeri A/S	Danmark	Harboes Bryggeri A/S	Danmark	5701318740354	7,7	Vand, bygmalt, byg, glukosesirup, humle	24-09-21	700	18	27-10-20 02-11-20
Pilsner, alkoholfri (2005-POOL-06)												
	Carlsberg ALKOHOLFRI NORDIC PILSNER	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700990427	0,5	Vand, bygmalt, sukker, naturlige aromaer, humle	25-05-21	1400	45	02-11-20
	ROYAL 0,0% PILSNER	Royal Unibrew A/S	Danmark	Royal Unibrew A/S	Danmark	5741000125052	0,0	Vand, bygmalt, humle, naturlige aromaer, humleolie	08-09-21	800	26	27-10-20
	TUBORG NUL 0.0%	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700985416	0,0	Vand, bygmalt, kuldioxid, naturlig aroma, humle	25-12-20	500	16	27-10-20
	HEINEKEN 0.0	Heineken N.V.	Holland	Heineken Brouwerijen B.V.	Holland	5741000155912	0,0	Vand, bygmalt, naturlig aroma, humleekstrakt	01-09-21	400	13	27-10-20 02-11-20
Pilsner, 4-5% alk. vol. (2005-POOL-01)												
	GRØN TUBORG PILSNER ØL	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700030567	4,6	Vand, bygmalt, byg, humle	15-10-21	1400	56	27-10-20 02-11-20
	Carlsberg KØBENHAVN DANMARK	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	57089188	4,6	Vand, bygmalt, humle	31-08-21	700	28	27-10-20 02-11-20
	Heineken ORIGINAL	Heineken N.V.	Holland	Heineken Brouwerijen B.V.	Holland	5741000126868	4,6	Vand, bygmalt, humle	20-06-21	300	12	27-10-20
	ROYAL PILSNER	Royal Unibrew A/S	Danmark	Royal Unibrew A/S	Danmark	5741000115435	4,6	Vand, bygmalt, byg, humle	08-09-21	100	4	27-10-20

Øl type (Prøve ID)	Varebetegnelse	Virksomhed	Land	Producent	Produktions-land	Stregkode	Alk. vol. % deklareret	Indhold	Bedst før dato	Indhold i poolprøve		Dato for indsamling
										ml	%	
Pilsner, classic (Wienerøl), 4-5% alk. vol. (2005-POOL-02)												
	TUBORG Classic	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700999833	4,6	Vand, bygmalt, byg, humle	15-10-21	1000	40	27-10-20 02-11-20
	ROYAL Classic	Royal Unibrew A/S	Danmark	Royal Unibrew A/S	Danmark	5741000116487	4,6	Vand, bygmalt, majs, byg, humle	07-08-25	600	24	27-10-20
	Carlsberg CARLSs SPECIAL	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700999840	4,6	Vand, bygmalt, byg, humle	12-08-21	500	20	02-11-20
	POKAL CLASSIC	Coop Danmark A/S	Danmark	Bryggeriet Vestfyen A/S	Danmark	5750000282559	4,6	Vand, bygmalt, byg, glukosesirup, kuldioxid, humle	08-08-21	400	16	27-10-20 02-11-20
Pilsner, Guldøl, 5-6% alk. vol. (2005-POOL-03)												
	Tuborg GULD TUBORG	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700301582	5,6	Vand, bygmalt, byg, humle	26-09-21	1400	47	27-10-20 02-11-20
	Carlsberg DANMARK SORT GULD PILSNER	Carlsberg Denmark A/S	Danmark	Carlsberg Danmark A/S	Danmark	5740700999536	5,8	Vand, bygmalt, humle	02-08-21	800	27	27-10-20
	DANSK GULD	Harboes Bryggeri A/S	Danmark	Harboes Bryggeri A/S	Danmark	5701318740392	5,7	Vand, bygmalt, glukosesirup, kuldioxid, humle	06-10-21	600	20	02-11-20
	HARBOE Luxus GULDØL	Harboes Bryggeri A/S	Danmark	Harboes Bryggeri A/S	Danmark	5701598032019	5,7	Vand, bygmalt, byg, glukosesirup, humle	23-09-21	200	7	27-10-20
Pilsner, let, 2-3% alk. vol. (2005-POOL-05)												
	DANSK LIGHT	Harboe	Danmark	Harboes Bryggeri A/S	Danmark	5701318740453	2,6	Vand, bygmalt, kuldioxid, humle	03-10-21	2800	80	27-10-20 02-11-20
	HARBOE Pilsner LIGHT	Harboe	Danmark	Harboes Bryggeri A/S	Danmark	5701598034044	2,7	Vand, bymalt, humle	15-09-21	700	20	27-10-20 02-11-20
Stout (Porter), 8% alk. vol. (2005-POOL-12)												
	ROYAL STOUT	Royal	Danmark	Royal Unibrew A/S	Danmark	5741000125021	7,7	Vand, bygmalt, glukosesirup, majs, farvestof (E150c), humle	07-08-25	1300	37	27-10-20 08-11-20
	WIIBROE PORTER - WIIBROE IMPERIAL STOUT	Wiibroe	Danmark	Carlsberg Danmark A/S	Danmark	5701935000145	8,2	Vand, bygmalt, byg, humle	22-03-25	1300	37	08-11-20
	LIMFJORDSPORTER - DOUBLE BROWN STOUT	Thisted Bryghus	Danmark	Thisted Bryghus A/S	Danmark	57014388	7,9	Vand, bygmalt, sukker, humle, antioxidant (ascorbinsyre)	23-06-20	900	26	27-10-20

Appendix A2 – Sample Information

Beer Type (Sample ID)	Name	Company	Country	Manufacturer	Production Country	Barcode	Alcohol % ABV (Declared)	Ingredients	BBD	Composite sample content		Date of collection
										ml	%	
Blonde Ale, 6-7% ABV (2005-POOL-09)												
	JACOBSEN Saaz Blonde	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	57095585	7.1	Water, barley malt, glucose syrup, wheat malt, carbon dioxide, hops, angelica extract	25-01-21	2600	67	08-11-20
	GRIMBERGEN 1128 BLONDE	Carlsberg Denmark A/S	Danmark	Carlsberg Supply Company Polska S.A	Poland	3080216034508	6.7	Water, barley malt, glucose syrup, wheat malt, aromatic caramel, hops	27-12-21	1000	26	08-11-20
	Leffe BLONDE	AB InBev	Belgium	Br. Abbaye de Leffe s.a./n.v	Belgium	5410228222958	6.6	Water, barley malt, corn, barley, sugar, hops	24-01-22	300	8	27-10-20
Dark Ale, 5-7% ABV (2005-POOL-08)												
	JACOBSEN Brown Ale	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	57095509	6.0	Water, barley malt, glucose syrup, carbon dioxide, hops	28-08-20	1600	43	27-10-20 08-11-20
	GRIMBERGEN 1128 DOUBLE AMBRÉE	Carlsberg Denmark A/S	Danmark	Carlsberg Supply Company Polska S.A	Poland	3080216034645	6.5	Water, barley malt, glucose syrup, sugar, aromatic caramel, hops	21-12-21 02-03-22	1000	27	27-10-20 08-11-20
	BRYGGERIET REFSVINDINGE ALE No. 16	Bryggeriet Refsvindinge	Denmark	Bryggeriet Vestfyen A/S	Denmark	57054834	5.7	Water, barley malt, hops, coloring (E150c), antioxidant (ascorbic acid)	05-04-22	900	24	27-10-20
	Leffe BRUNE	AB InBev	Belgium	Br. Abbaye de Leffe s.a./n.v.	Belgium	5707323644816	6.5	Water, barley malt, corn, barley, sugar, hops	08-02-22	200	5	27-10-20
Wheat Beer (Witbier), 5-6% ABV (2005-POOL-11)												
	Hoegaarden Wit Blanche	AB InBev	Belgium	InBev Belgium	Belgium	5410228158424	4.9	Water, barley malt, wheat malt, hops, spices, sugar, yeast	19-09-21	1600	33	27-10-20 10-11-20
	Kronenbourg 1664 BLANC	Carlsberg Denmark A/S	Denmark	Carlsberg Supply Company Polska S.A	Poland	3080216031811	5.0	Water, barley malt, wheat, glucose syrup, aromatic caramel, aroma, hop extract, orange peel, coriander	07-08-21	1600	33	27-10-20
	GRIMBERGEN 1128 BLANCHE	Carlsberg Denmark A/S	Belgium	Kronenbourg Supply Company	France	57088969	6.0	Water, barley malt, glucose syrup, wheat malt, natural flavors, aromatic caramel, hops	01-05-21	1600	33	27-10-20 10-11-20
Wheat Beer (Weissbier), 4-6% ABV (2005-POOL-10)												
	ERDINGER Weissbier	Erdinger Weissbráu	Germany	Privatbrauerei Erdinger Weissbräu	Germany	4002103271314	5.3	Water, wheat malt, barley malt, hops, yeast	27-08-21	1600	33	08-11-20 10-11-20
	Kaiserdom Hefe-Weissbier NATURTRÜB	Kaiserdom Bambergen Specialitäten Brauerei	Germany	Kaiserdom-Privatbrauerei Bamberg	Germany	5700383307677	4.7	Water, wheat malt, barley malt, yeast, hops, hop extract	03-11-21	1600	33	27-10-20
	PAULANER Weissbier	Paulaner Brauerei Gruppe GmbH & Co. KGaA	Germany	Paulaner Brauerei Gruppe GmbH & Co. KGaA	Germany	4066600602002	5.5	Water, wheat malt, barley malt, yeast, hops	06-08-21	1600	33	08-11-20 10-11-20
Dark Malt Beer, 1-2% ABV (2005-POOL-07)												
	Kongens Bryg PRIMA MØRKT HVIDTØL	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	57008097	1.7	Water, barley malt, barley, sugar, licorice, coloring (E150c)	13-02-21	1900	56	27-10-20
	Vestfyen Pasteuriseret Mørkt Hvidtøl	Bryggeriet Vestfyen A/S	Denmark	Bryggeriet Vestfyen A/S	Denmark	57109251	1.8	Water, barley malt, sugar, hops, carbon dioxide (E290), coloring (E150c), antioxidant (E300)	01-10-20	1500	44	27-10-20

Beer Type (Sample ID)	Name	Company	Country	Manufacturer	Production Country	Barcode	Alcohol % ABV (Declared)	Ingredients	BBD	Composite sample content		Date of collection
										ml	%	
Christmas Beer, 5-6% ABV (2005-POOL-13)												
	Tuborg JULEBRYG	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	5740700301568	5.6	Water, barley malt, barley, licorice, hops	04-11-21	1800	60	08-11-20 10-11-20
	ROYAL XMAS (hvid)	Royal Unibrew A/S	Denmark	Royal Unibrew A/S	Denmark	5741000116944	5.6	Water, barley malt, glucose syrup, corn, hops	22-07-21	600	20	08-11-20
	ROYAL XMAS (blå)	Royal Unibrew A/S	Denmark	Royal Unibrew A/S	Denmark	5741000116937	5.6	Water, barley malt, glucose syrup, corn, coloring (E150c), hops	07-07-21	600	20	08-11-20
Strong Lager, 7-8% ABV (2005-POOL-08)												
	Tuborg LUXURY FINE FESTIVAL BEER	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	5740700991912	7.5	Water, barley malt, glucose syrup, hops	13-08-21 13-09-21	1800	45	27-10-20 02-11-20
	Carlsberg LUKSUS ELEPHANT PILSNER	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	5740600371807	7.2	Water, barley malt, hops	13-08-21	1500	38	02-11-20
	BRUTALIS	Harboes Bryggeri A/S	Denmark	Harboes Bryggeri A/S	Denmark	5701318740354	7.7	Water, barley malt, barley, glucose syrup, hops	24-09-21	700	18	27-10-20 02-11-20
Pilsner, Non-Alcoholic (2005-POOL-06)												
	Carlsberg ALKOHOLFRI NORDIC PILSNER	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	5740700990427	0.5	Water, barley malt, sugar, natural flavors, hops	25-05-21	1400	45	02-11-20
	ROYAL 0,0% PILSNER	Royal Unibrew A/S	Denmark	Royal Unibrew A/S	Denmark	5741000125052	0.0	Water, barley malt, hops, natural flavors, hop oil	08-09-21	800	26	27-10-20
	TUBORG NUL 0.0%	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	5740700985416	0.0	Water, barley malt, carbon dioxide, natural flavor, hops	25-12-20	500	16	27-10-20
	HEINEKEN 0.0 BEER	Heineken N.V.	Netherlands	Heineken Brouwerijen B.V.	Netherlands	5741000155912	0.0	Water, barley malt, natural flavor, hop extract	01-09-21	400	13	27-10-20 02-11-20
Pilsner, 4-5% ABV (2005-POOL-01)												
	TUBORG GRØN PILSNER ØL	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	5740700030567	4.6	Water, barley malt, barley, hops	15-10-21	1400	56	27-10-20 02-11-20
	Carlsberg KØBENHAVN DANMARK	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	57089188	4.6	Water, barley malt, hops	31-08-21	700	28	27-10-20 02-11-20
	Heineken ORIGINAL	Heineken N.V.	Netherlands	Heineken Brouwerijen B.V.	Netherlands	5741000126868	4.6	Water, barley malt, hops	20-06-21	300	12	27-10-20
	ROYAL PILSNER	Royal Unibrew A/S	Denmark	Royal Unibrew A/S	Denmark	5741000115435	4.6	Water, barley malt, barley, hops	08-09-21	100	4	27-10-20

Beer Type (Sample ID)	Name	Company	Country	Manufacturer	Production Country	Barcode	Alcohol % ABV (Declared)	Ingredients	BBD	Composite sample content		Date of collection
										ml	%	
Pilsner, Classic (Vienna Lager), 4-5% ABV (2005-POOL-02)												
	TUBORG Classic	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	5740700999833	4.6	Water, barley malt, barley, hops	15-10-21	1000	40	27-10-20 02-11-20
	ROYAL Classic	Royal Unibrew A/S	Denmark	Royal Unibrew A/S	Denmark	5741000116487	4.6	Water, barley malt, corn, barley, hops	07-08-25	600	24	27-10-20
	Carlsberg CARLs SPECIAL	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	5740700999840	4.6	Water, barley malt, barley, hops	12-08-21	500	20	02-11-20
	POKAL CLASSIC	Coop Danmark A/S	Denmark	Bryggeriet Vestfyen A/S	Denmark	5750000282559	4.6	Water, barley malt, barley, glucose syrup, carbon dioxide, hops	08-08-21	400	16	27-10-20 02-11-20
Pilsner, Strong (Guldøl), 5-6% ABV (2005-POOL-03)												
	Tuborg GULD TUBORG	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	5740700301582	5.6	Water, barley malt, barley, hops	26-09-21	1400	47	27-10-20 02-11-20
	Carlsberg DANMARK SORT GULD PILSNER	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	5740700999536	5.8	Water, barley malt, hops	02-08-21	800	27	27-10-20
	DANSK GULD	Harboes Bryggeri A/S	Denmark	Harboes Bryggeri A/S	Denmark	5701318740392	5.7	Water, barley malt, glucose syrup, carbon dioxide, hops	06-10-21	600	20	02-11-20
	HARBOE Luxus GULDØL	Harboes Bryggeri A/S	Denmark	Harboes Bryggeri A/S	Denmark	5701598032019	5.7	Water, barley malt, barley, glucose syrup, hops	23-09-21	200	7	27-10-20
Pilsner, Light, 2-3% ABV (2005-POOL-05)												
	DANSK LIGHT	Harboes Bryggeri A/S	Denmark	Harboes Bryggeri A/S	Denmark	5701318740453	2.6	Water, barley malt, carbon dioxide, hops	03-10-21	2800	80	27-10-20 02-11-20
	HARBOE Pilsner LIGHT	Harboes Bryggeri A/S	Denmark	Harboes Bryggeri A/S	Denmark	5701598034044	2.7	Water, barley malt, hops	15-09-21	700	20	27-10-20 02-11-20
Stout (Porter), 8% ABV (2005-POOL-12)												
	ROYAL STOUT	Royal Unibrew A/S	Denmark	Royal Unibrew A/S	Denmark	5741000125021	7.7	Water, barley malt, glucose syrup, corn, coloring (E150c), hops	07-08-25	1300	37	27-10-20 08-11-20
	WIIBROE PORTER IMPERIAL STOUT	Carlsberg Denmark A/S	Denmark	Carlsberg Denmark A/S	Denmark	5701935000145	8.2	Water, barley malt, barley, hops	22-03-25	1300	37	08-11-20
	LIMFJORDSPORTER DOUBLE BROWN STOUT	Thisted Bryghus A/S	Denmark	Thisted Bryghus A/S	Denmark	57014388	7.9	Water, barley malt, sugar, hops, antioxidant (ascorbic acid)	23-06-20	900	26	27-10-20

Appendix B – Analytical Methods

Nitrogen: NMKL 6:2003. The total amount of organic nitrogen is measured according to the Kjeldahl principle. Test code: DHN10, expanded uncertainty: 5%. LOQ: 0.1 g/100 g.

Amino acids: ISO 13903:2005; EU 152/2009.

- Tryptophane: Alkaline hydrolysis, quantification by HPLC. Test code: DJ009, expanded uncertainty: 10%; LOQ: 0.01 g tryptophan/100 g.
- Methionine and cysteine: Oxidized with hydrogen peroxide and formic acid at low temperature, followed by acid hydrolysis using aqueous hydrochloric acid. Amino acids are separated in an amino acid analyzer and detection using post-column derivatization with ninhydrin reagent at 440 and 570 nm. Test code: DJ011, expanded uncertainty: 15%, LOQ: 0.024 g methionine/100 g, LOQ: 0.006 g cysteine/100 g.
- All other amino acids such as isoleucine, leucine, lysine, phenylalanine, tyrosine, threonine, valine, arginine, histidine, alanine, aspartic acid, glutamic acid, glycine, proline, serine: Hydrolyzed in aqueous hydrochloric acid and separated by an amino acid analyzer. Spectrophotometric detection is carried out using post-column derivatization with ninhydrin reagent at 440 nm and 570 nm. Expanded uncertainty: 14%. LOQ: 0.014-0.035 g/100 g.

Fat: ISO 11085:2015. The sample is boiled in hydrochloric acid. The washed and dried residue is extracted with petroleum ether. The solvent is evaporated, and the residue is dried and weighed. Test code: DHF77, expanded uncertainty: 6%. LOQ: 0.3 g/100 g.

Dry matter: NMKL 23:1991. The total dry matter content is determined by evaporating all water from the sample by means of heating at a constant temperature. Test code: DHD1, expanded uncertainty: 5%.

Ash: NMKL 173:2005. The sample is treated at 525-550°C, and the ash is weighed. Test code: DHA13, expanded uncertainty: 4%.

Sugars: The sugars are separated by ion chromatography with NaOH eluant and detected by pulsed amperometry. Notes: Maltodextrin might not be separated from glucose and maltose. Stevia might not be separated from glucose. Maltitol might not be separated from fructose. Test code: AA480, expanded uncertainty: 12%, LOQ: 0.2 g/100 g.

Alcohol: EBC 9.2.6, MEBAK 2.9.6.3. Anton Paar Alcolyzer Beer ME - NIR spectrometer. Alcohol % v/v is calculated using a specific function of the adsorption intensity of the NIR line of alcohol. The result is valid for 20 ^{o}C. Test code: DHC37. Expanded uncertainty: 0.7%. LOQ: 0.05% v/v.

α-tocopherol: EN 12822:2014. Alkaline hydrolysis, NP-HPLC with fluorescence detection (Ex/Em 290 nm/327 nm). External standard. Test code: A7297. Expanded uncertainty: 16%, LOQ: 0.08 mg/100 g.

Thiamine: EN 14122:2014. Acid hydrolysis, separation by RP-HPLC, and quantification by fluorescence detection (Ex/Em: 368 nm/440 nm) after post-column oxidation to thiochrome, including hydroxyl-2-ethythiamine. External standard. Molecular weight: 265.36 g/mol. Test code: A7273. Expanded uncertainty: 16%. LOQ: 0.015 mg/100 g.

Riboflavin: EN 14152:2003. Acid hydrolysis, enzymatic treatment, separation by RP-HPLC, and quantification by fluorescence detection (Ex/Em: 468 nm/520 nm). External standard. Adapted to quantify riboflavin-5-phosphate and riboflavin separately. Test code: DJB33, expanded uncertainty: 16%, LOQ: 0.01 mg/100 g.

Pyridoxine: EN 14164. Acid extraction, followed by treatment with phosphatase. In the presence of Fe2+ as a catalyst, pyridoxamine (PM) reacts with glyoxylic acid and is transformed into pyridoxal (PL), which is then reduced to pyridoxine (PN) by the action of sodium borohydride in an alkaline medium. Pyridoxine is quantified by RP-HPLC with fluorescence detection (Ex/Em: 290 nm/395 nm). External standard. The sum of PM, PL, PN, and phosphorylated PM, PL, PN is quantified, excluding glycosidic-bound pyridoxine. Molecular weight: 169.18 g/mol. Expanded uncertainty: 14%. LOQ: 0.01 mg/100 g.

Niacin: EN 15652:2009. Nicotinic acid and nicotinamide are extracted from samples in a weak hydrochloric acid solution at 100°C, separated by RP-HPLC, and quantified by fluorescence detection (Ex/Em: 322 nm/380 nm) after a post-column reaction with hydrogen peroxide catalyzed by Cu(II) ions under UV radiation (365 nm).

External standard. Niacin is calculated as the sum of nicotinic acid and nicotinamide. Molecular weight: 123.11 g/mol. Test code: DJB05. Expanded uncertainty: 14%, LOQ: 0.1 mg/100 g.

Biotin: LST AB 266.1, 1995. Biotin is extracted from the sample in an autoclave using acid hydrolysis. After dilution with basal medium containing all required growth nutrients except biotin, the growth response *of Lactobacillus plantarum* (ATCC 8014) to extracted biotin is measured turbidimetrically and compared to calibration solutions with known concentrations. Test code: A7284. Expanded uncertainty: 24%, LOQ: 1 µg/100 g.

Pantothenic acid: AOAC 2012.16. LC/MS/MS with isotope dilution. Test code: DJ5BG, expanded uncertainty: 20%. LOQ: 0.007 mg/100 g.

Folate: NMKL 111:1985. Folate is extracted from the sample in an autoclave using a buffer solution, followed by enzymatic digestion with human plasma and pancreas V. After dilution with basal medium containing all required growth nutrients except folic acid, the growth response of *Lactobacillus rhamnosus* (ATCC 7469) to extracted folate is measured turbidimetrically and compared to calibration solutions with known concentrations. Test code: A7286, expanded uncertainty: 30%, LOQ: 5 µg/100 g.

Sodium, potassium, calcium, magnesium, phosphorus, iron, copper, zinc: EN 13805:2014/EN ISO 11885. Pressure digestion. Analysis of liquid samples by inductively coupled plasma optical emission spectroscopy (ICP-OES).

- Sodium: Test code: J1048, expanded uncertainty 23%, LOQ: 0.5 mg/100 g.
- Potassium: Test code: J1044, expanded uncertainty 21%, LOQ: 0.5 mg/100 g.
- Calcium: Test code: J1038, expanded uncertainty 21%, LOQ: 0.5 mg/100 g.
- Phosphorus: Test code: J1050, expanded uncertainty 21%, LOQ: 0.5 mg/100 g.
- Iron: Test code: J1043, expanded uncertainty 60%, LOQ: 0.05 mg/100 g.
- Copper: Test code: J1042, LOQ: 0.01 mg/100 g.
- Zinc: Test code: J1061, LOQ: 0.05 mg/100 g.

Selenium, chromium, manganese: EN 13805:2014/EN ISO 17294:2016. Pressure digestion. Analysis of liquid samples by inductively coupled plasma mass spectroscopy (ICP-MS).

- Selenium: Test code: CA03C, LOQ: 0.5 µg/100 g.
- Chromium: Test code: JJ0CG, LOQ: 5 µg/100 g.
- Manganese: Test code: JJ0C1, Expanded uncertainty 45%, LOQ: 0.01 mg/100 g.

Molybdenum: EN 13805:2014/EN 15763:2010. Pressure digestion. Analysis of liquid samples by inductively coupled plasma mass spectrometry (ICP-MS). Test code: JCHRM, expanded uncertainty: 45%, LOQ: 1 µg/100 g.

Iodine: DS EN ISO 15111:2007. Following a thermal extraction with tetramethylammonium hydroxide, detected and quantified by ICP-MS. Test code: DJA19, LOQ: 5 µg/100 g.

Appendix C – Macronutrients

Sample Type	Sample Number	Nitrogen g/100 g	Fat g/100 g	Ash g/100 g	Dry matter[1] g/100 g	Alcohol w/w %	Alcohol v/v %	Fructose g/100 g	Glucose g/100 g	Lactose g/100 g	Maltose g/100 g	Sucrose g/100 g
Blonde Ale	2005-POOL-09	< 0.1	< 0.3	0.16	3.98	5.18	6.59	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dark Ale	2005-POOL-08	< 0.1	< 0.3	0.20	5.41	4.63	5.94	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Wheat Beer (Witbier)	2005-POOL-11	< 0.1	< 0.3	0.15	3.88	4.20	5.36	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Wheat Beer (Weissbier)	2005-POOL-10	< 0.1	< 0.3	0.16	4.07	3.91	4.99	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dark Malt Beer	2005-POOL-07	< 0.1	< 0.3	0.13	9.63	1.31	1.71	1.9	1.8	< 0.2	2.2	1.2
Pilsner, Non-Alcoholic	2005-POOL-06	< 0.1	< 0.3	0.13	4.04	0.12	0.15	0.2	0.2	< 0.2	0.3	< 0.2
Pilsner	2005-POOL-01	< 0.1	< 0.3	0.15	2.76	3.64	4.63	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Pilsner, Classic (Vienna Lager)	2005-POOL-02	< 0.1	< 0.3	0.15	2.98	3.60	4.58	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Pilsner, Strong (Guldøl)	2005-POOL-03	< 0.1	< 0.3	0.17	3.41	4.45	5.67	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Pilsner, Light	2005-POOL-05	< 0.1	< 0.3	< 0.1	2.42	2.26	2.87	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Strong Lager	2005-POOL-04	< 0.1	< 0.3	0.19	3.96	5.72	7.28	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Stout (Porter)	2005-POOL-12	0.12	< 0.3	0.23	6.33	6.25	8.03	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Christmas Beer	2005-POOL-13	< 0.1	< 0.3	0.15	3.65	4.40	5.60	< 0.2	0.3	< 0.2	< 0.2	< 0.2

1: In the Danish Food Composition Database, dry matter includes alcohol. The value presented here does not include alcohol.

Appendix D – Vitamins

Sample Type	Sample Number	α-tocopherol mg/100 g	Thiamin mg/100 g	Riboflavin mg/100 g	Niacin mg/100 g	Pyridoxin mg/100 g	Pantothenic acid mg/100 g	Biotin µg/100 g	Folate µg/100 g
Blonde Ale	2005-POOL-09	< 0.08	< 0.015	0.031	0.20	0.038	0.012	1.2	11.6
Dark Ale	2005-POOL-08	< 0.08	< 0.015	0.040	0.31	0.046	< 0.007	1.5	10.2
Wheat Beer (Witbier)	2005-POOL-11	< 0.08	< 0.015	0.027	0.16	0.038	0.021	1.2	9.2
Wheat Beer (Weissbier)	2005-POOL-10	< 0.08	< 0.015	0.031	0.13	0.035	0.046	1.2	10.9
Dark Malt Beer	2005-POOL-07	< 0.08	< 0.015	0.022	0.27	0.032	0.015	1.0	6.5
Pilsner, Non-Alcoholic	2005-POOL-06	< 0.08	< 0.015	0.021	0.16	0.032	0.009	1.0	7.0
Pilsner	2005-POOL-01	< 0.08	< 0.015	0.028	0.14	0.039	0.009	1.0	8.2
Pilsner, Classic (Vienna Lager)	2005-POOL-02	< 0.08	< 0.015	0.027	0.16	0.039	< 0.007	< 1	7.4
Pilsner, Strong (Guldøl)	2005-POOL-03	< 0.08	< 0.015	0.038	0.18	0.046	0.011	1.1	8.8
Pilsner, Light	2005-POOL-05	< 0.08	< 0.015	0.030	0.14	0.036	0.016	< 1	6.1
Strong Lager	2005-POOL-04	< 0.08	< 0.015	0.037	0.15	0.049	< 0.007	1.1	9.1
Stout (Porter)	2005-POOL-12	< 0.08	< 0.015	0.038	0.44	0.028	0.011	1.8	12.5
Christmas Beer	2005-POOL-13	< 0.08	< 0.015	0.030	0.16	0.031	< 0.007	1.0	10.6

Appendix E – Minerals

Sample Type	Sample Number	Sodium mg/100 g	Potas-sium mg/100 g	Calcium mg/100 g	Magne-sium mg/100 g	Phos-phorus mg/100 g	Iron mg/100 g	Copper mg/100 g	Zinc mg/100 g	Man-ganese mg/100 g	Iodine µg/100 g	Chro-mium µg/100 g	Sele-nium µg/100 g	Molyb-denum µg/100 g
Blonde Ale	2005-POOL-09	3.1	50	9.3	7.8	26	< 0.05	< 0.01	< 0.05	0.02	< 5	< 5	< 0.5	< 1.0
Dark Ale	2005-POOL-08	4.6	61	11.0	10.5	26	< 0.05	< 0.01	< 0.05	0.02	< 5	< 5	< 0.5	< 1.0
Wheat Beer (Weissbier)	2005-POOL-10	1.4	52	3.8	9.2	25	0.07	< 0.01	< 0.05	0.02	< 5	< 5	< 0.5	< 1.0
Wheat Beer (Witbier)	2005-POOL-11	2.5	48	5.3	8.4	24	0.08	< 0.01	< 0.05	0.02	< 5	< 5	< 0.5	< 1.0
Dark Malt Beer	2005-POOL-07	4.0	36	5.6	5.2	23	< 0.05	< 0.01	< 0.05	< 0.01	< 5	< 5	< 0.5	< 1.0
Pilsner, Non-Alcoholic	2005-POOL-06	3.6	36	8.1	6.0	26	< 0.05	< 0.01	< 0.05	< 0.01	< 5	< 5	< 0.5	< 1.0
Pilsner	2005-POOL-01	2.8	46	5.8	6.4	25	< 0.05	< 0.01	< 0.05	< 0.01	< 5	< 5	< 0.5	< 1.0
Pilsner, Classic (Vienna Lager)	2005-POOL-02	3.6	45	6.6	6.0	25	< 0.05	< 0.01	< 0.05	< 0.01	< 5	< 5	< 0.5	< 1.0
Pilsner, Strong (Guldøl)	2005-POOL-03	3.4	56	7.4	7.3	33	< 0.05	< 0.01	< 0.05	< 0.01	< 5	< 5	< 0.5	< 1.0
Pilsner, Light	2005-POOL-05	2.5	30	5.0	3.6	12	< 0.05	< 0.01	< 0.05	< 0.01	< 5	< 5	< 0.5	< 1.0
Strong Lager	2005-POOL-04	3.5	54	7.4	7.4	32	< 0.05	< 0.01	< 0.05	< 0.01	< 5	< 5	< 0.5	< 1.0
Stout (Porter)	2005-POOL-12	3.6	76	8.8	11.0	37	< 0.05	< 0.01	< 0.05	0.02	< 5	< 5	< 0.5	2.0
Christmas Beer	2005-POOL-13	3.6	47	6.4	6.7	24	< 0.05	< 0.01	< 0.05	< 0.01	< 5	< 5	< 0.5	< 1.0

Appendix F – Amino Acids

All values in the table are given in g/100 g.

Sample Type	Sample Number	Ile	Leu	Lys	Met	Cys	Phe	Tyr	Thr	Trp	Val	Arg	His	Ala	Asp	Glu	Gly	Pro	Ser
Blonde Ale	2005-POOL-09	<0.035	<0.015	<0.014	<0.024	0.012	<0.031	<0.023	0.010	<0.01	<0.016	0.011	<0.02	<0.015	0.021	0.084	<0.019	0.063	<0.016
Dark Ale	2005-POOL-08	<0.035	0.020	0.016	<0.024	0.015	<0.031	<0.023	0.013	<0.01	0.021	0.018	<0.02	0.024	0.030	0.098	0.024	0.074	0.017
Wheat Beer (Witbier)	2005-POOL-11	<0.035	0.017	<0.014	<0.024	0.013	<0.031	<0.023	0.011	<0.01	<0.016	0.016	<0.02	0.019	0.022	0.106	0.021	0.061	<0.016
Wheat Beer (Weissbier)	2005-POOL-10	<0.035	0.023	<0.014	<0.024	0.015	<0.031	<0.023	0.013	<0.01	0.019	0.016	<0.02	0.020	0.024	0.156	0.024	0.078	0.023
Dark Malt Beer	2005-POOL-07	<0.035	0.015	<0.014	<0.024	0.006	<0.031	<0.023	0.009	<0.01	0.016	0.012	<0.02	0.016	0.020	0.064	<0.019	0.050	<0.016
Pilsner, Non-Alcoholic	2005-POOL-06	<0.035	<0.015	<0.014	<0.024	0.006	<0.031	<0.023	0.008	<0.01	<0.016	0.012	<0.02	0.017	0.019	0.058	<0.019	0.048	<0.016
Pilsner	2005-POOL-01	<0.035	<0.015	<0.014	<0.024	0.011	<0.031	<0.023	0.010	<0.01	0.016	0.013	<0.02	0.018	0.021	0.066	<0.019	0.061	<0.016
Pilsner, Classic (Vienna Lager)	2005-POOL-02	<0.035	<0.015	<0.014	<0.024	0.009	<0.031	<0.023	0.009	<0.01	<0.016	<0.01	<0.02	0.015	0.018	0.061	<0.019	0.053	<0.016
Pilsner, Strong (Guldøl)	2005-POOL-03	<0.035	0.018	<0.014	<0.024	0.010	<0.031	<0.023	0.013	<0.01	0.020	0.015	<0.02	0.022	0.027	0.084	0.023	0.069	<0.016
Pilsner, Light	2005-POOL-05	<0.035	<0.015	<0.014	<0.024	<0.006	<0.031	<0.023	<0.006	<0.01	<0.016	<0.01	<0.02	<0.015	<0.017	0.041	<0.019	0.037	<0.016
Strong Lager	2005-POOL-04	<0.035	0.018	0.015	<0.024	0.012	<0.031	<0.023	0.014	<0.01	0.022	0.017	<0.02	0.025	0.029	0.088	0.025	0.077	0.018
Stout (Porter)	2005-POOL-12	<0.035	0.021	0.015	<0.024	0.015	<0.031	<0.023	0.015	<0.01	0.022	0.013	<0.02	0.026	0.032	0.118	0.026	0.095	0.019
Christmas Beer	2005-POOL-13	<0.035	<0.015	<0.014	<0.024	0.012	<0.031	<0.023	0.010	<0.01	<0.016	0.011	<0.02	0.016	0.020	0.069	<0.019	0.064	<0.016

Isoleucine (Ile), Leucine (Leu), Lysine (Lys), Methionine (Met), Cysteine (Cys), Phenylalanine (Phe), Tyrosine (Tyr), Threonine (Thr), Tryptophan (Trp), Valine (Val), Arginine (Arg), Histidine (His), Alanine (Ala), Aspartic acid (Asp), Glutamic acid (Glu), Glycine (Gly), Proline (Pro), Serine (Ser).

Appendix G – Nitrogen and Amino Acids Content – Analyzed and Estimated Values

Appendix G1. Documentation of the Estimated Content for Samples with Nitrogen and Amino Acids Analyzed Below LOQ

Food	Barley[1]	Wheat[2]	Blonde Ale			Dark Ale			Wheat Beer (Witbier)			Wheat Beer (Weissbier)		
			Analyzed	*rel. W/B	Estimate	Analyzed	**rel. B	Estimate	Analyzed	*rel. W/B	Estimate	Analyzed	*rel. W/B	Estimate
Compound	g/100 g	g/100 g	g/100 g	%	g/100 g	g/100 g	%	g/100 g	g/100 g	%	g/100 g	g/100 g	%	g/100 g
Nitrogen	1,584	1,82	<0,1		0,065	<0,1		0,077	<0,1		0,071	<0,1		0,081
Isoleucine	0,412	0,372	<0,035		0,015	<0,035		0,020	<0,035		0,016	<0,035		0,019
Leucine	0,744	0,76	<0,015		0,029	0,02	2,7		0,017	2,3		0,023	3,1	
Lysine	0,348	0,325	<0,014		0,013	0,016	4,6		<0,014		0,014	<0,014		0,016
Methionine	0,158	0,18	<0,024		0,006	<0,024		0,008	<0,024		0,007	<0,024		0,008
Cystine	0,19	0,244	0,012	5,5		0,015	7,9		0,013	6,0		0,015	6,9	
Phenylalanine	0,539	0,522	<0,031		0,020	<0,031		0,026	<0,031		0,022	<0,031		0,025
Tyrosine	0,269	0,296	<0,023		0,011	<0,023		0,013	<0,023		0,012	<0,023		0,013
Threonine	0,333	0,336	0,01	3,0		0,013	3,9		0,011	3,3		0,013	3,9	
Tryptophan	0,116	0,149	<0,01		0,005	<0,01		0,006	<0,01		0,006	<0,01		0,006
Valine	0,57	0,484	<0,016		0,020	0,021	3,7		<0,016		0,022	0,019	3,6	
Arginine	0,444	0,521	0,011	2,3		0,018	4,1		0,016	3,3		0,016	3,3	
Histidine	0,238	0,261	<0,02		0,010	<0,02		0,012	<0,02		0,010	<0,02		0,012
Alanine	0,412	0,404	<0,015		0,016	0,024	5,8		0,019	4,7		0,02	4,9	
Aspartic acid	0,539	0,577	0,021	3,8		0,03	5,6		0,022	3,9		0,024	4,3	
Glutamic acid	2,38	3,33	0,084	2,9		0,098	4,1		0,106	3,7		0,156	5,5	
Glycine	0,364	0,473	<0,019		0,016	0,024	6,6		0,021	5,0		0,024	5,7	
Proline	1,2	1,13	0,063	5,4		0,074	6,2		0,061	5,2		0,078	6,7	
Serine	0,475	0,554	<0,016		0,020	0,017	3,6		0,017			0,023	4,5	
Average of amino acids quantified >LOQ				3,8			4,9			4,2			4,8	

[1] Barley: ID 1767, Frida.fooddata.dk v. 5.3; [2] Wheat: ID 1838, Frida.fooddata.dk v. 5.3; *Relative to content in wheat/barley (50/50); **Relative content to barley

Appendix G1. Documentation of the Estimated Content for Samples with Nitrogen and Amino Acids Analyzed Below LOQ (continued)

Food	Dark Malt Beer			Pilsner, Non-Alcoholic			Pilsner			Pilsner, Classic (Vienna Lager)			Pilsner, Strong (Guldøl)		
	Analyzed	**rel. B	Estimate	Analyzed	**rel. B	Estimate	Analyzed	**rel. B	Estimate	Analyzed	**rel. B	Estimate	Analyzed	**rel. B	Estimate
Compound	g/100 g	%	g/100 g	g/100 g	%	g/100 g	g/100 g	%	g/100 g	g/100 g	%	g/100 g	g/100 g	%	g/100 g
Nitrogen	<0,1		0,050	<0,1		0,051	<0,1		0,061	<0,1		0,056	<0,1		0,070
Isoleucine	<0,035		0,013	<0,035		0,013	<0,035		0,016	<0,035		0,015	<0,035		0,018
Leucine	0,015	2,0		<0,015		0,024	<0,015		0,029	<0,015		0,027	0,018	2,4	
Lysine	<0,014		0,011	<0,014		0,011	<0,014		0,013	<0,014		0,012	<0,014		0,015
Methionine	<0,024		0,005	<0,024		0,005	<0,024		0,006	<0,024		0,006	<0,024		0,007
Cystine	0,006	3,2		0,006	3,2		0,011	5,8		0,009	4,7		0,01	5,3	
Phenylalanine	<0,031		0,017	<0,031		0,017	<0,031		0,021	<0,031		0,019	<0,031		0,024
Tyrosine	<0,023		0,008	<0,023		0,009	<0,023		0,010	<0,023		0,010	<0,023		0,012
Threonine	0,009	2,7		0,008	2,4		0,01	3,0		0,009	2,7		0,013	3,9	
Tryptophan	<0,01		0,004	<0,01		0,004	<0,01		0,004	<0,01		0,004	<0,01		0,005
Valine	0,016			<0,016		0,018	0,016	2,8		<0,016		0,020	0,02	3,5	
Arginine	0,012	2,7		0,012	2,7		0,013	2,9		<0,01		0,016	0,015	3,4	
Histidine	<0,02		0,007	<0,02		0,008	<0,02		0,009	<0,02		0,008	<0,02		0,011
Alanine	0,016	3,9		0,017	4,1		0,018	4,4		0,015	3,6		0,022	5,3	
Aspartic acid	0,02	3,7		0,019	3,5		0,021	3,9		0,018	3,3		0,027	5,0	
Glutamic acid	0,064	2,7		0,058	2,4		0,066	2,8		0,061	2,6		0,084	3,5	
Glycine	<0,019		0,011	<0,019		0,012	<0,019		0,014	<0,019		0,013	0,023	6,3	
Proline	0,05	4,2		0,048	4,0		0,061	5,1		0,053	4,4		0,069	5,8	
Serine	<0,016		0,015	<0,016		0,015	<0,016		0,018	<0,016		0,017	0,016		
Average of amino acids quantified >LOQ		3,1			3,2			3,8			3,6			4,4	

*Relative to content in wheat/barley (50/50); **Relative content to barley. Barley: ID 1767, Frida.fooddata.dk v. 5.3 and Wheat: ID 1838, Frida.fooddata.dk v. 5.3.

Appendix G1. Documentation of the Estimated Content for Samples with Nitrogen and Amino Acids Analyzed Below LOQ (continued)

Food	Pilsner, Light			Strong Lager			Stout (Porter)			Christmas Beer		
	Analyzed	**rel. B	Estimate	Analyzed	**rel. B	Estimate	Analyzed	**rel. B	Estimate	Analyzed	**rel. B	Estimate
Compound	g/100 g	%	g/100 g	g/100 g	%	g/100 g	g/100 g	%	g/100 g	g/100 g	%	g/100 g
Nitrogen	<0,1		0,038	<0,1		0,075	<0,1		0,086	<0,1		0,063
Isoleucine	<0,035		0,010	<0,035		0,020	<0,035		0,022	<0,035		0,016
Leucine	<0,015		0,018	0,018	2,4		0,021	2,8		<0,015		0,029
Lysine	<0,014		0,008	0,015	4,3		0,015	4,3		<0,014		0,014
Methionine	<0,024		0,004	<0,024		0,008	<0,024		0,009	<0,024		0,006
Cystine	<0,006		0,005	0,012	6,3		0,015	7,9		0,012	6,3	
Phenylalanine	<0,031		0,013	<0,031		0,026	<0,031		0,029	<0,031		0,021
Tyrosine	<0,023		0,006	<0,023		0,013	<0,023		0,015	<0,023		0,011
Threonine	<0,006		0,008	0,014	4,2		0,015	4,5		0,01	3,0	
Tryptophan	<0,01		0,003	<0,01		0,006	<0,01		0,006	<0,01		0,005
Valine	<0,016		0,014	0,022	3,9		0,022	3,9		<0,016		0,022
Arginine	<0,01		0,011	0,017	3,8		0,013	2,9		0,011	2,5	
Histidine	<0,02		0,006	<0,02		0,011	<0,02		0,013	<0,02		0,009
Alanine	<0,015		0,010	0,025	6,1		0,026	6,3		0,016	3,9	
Aspartic acid	<0,017		0,013	0,029	5,4		0,032	5,9		0,02	3,7	
Glutamic acid	0,041	1,7		0,088	3,7		0,118	5,0		0,069	2,9	
Glycine	<0,019		0,009	0,025	6,9		0,026	7,1		<0,019		0,014
Proline	0,037	3,1		0,077	6,4		0,095	7,9		0,064	5,3	
Serine	<0,016		0,011	0,018	3,8		0,019	4,0		<0,016		0,019
Average of amino acids quantified >LOQ		2,4			4,8			5,4			3,9	

*Relative to content in wheat/barley (50/50); **Relative content to barley. Barley: ID 1767, Frida.fooddata.dk v. 5.3 and Wheat: ID 1838, Frida.fooddata.dk v. 5.3.

Appendix G2. Complete Table with Analyzed and Estimated Values

Compound (g/100 g)	Nitrogen	Ile	Leu	Lys	Met	Cys	Phe	Tyr	Thr	Trp	Val	Arg	His	Ala	Asp	Glu	Gly	Pro	Ser
Blonde Ale	*0,065*	*0,015*	*0,029*	*0,013*	*0,006*	0,012	*0,020*	*0,011*	0,010	*0,005*	*0,020*	0,011	*0,010*	*0,016*	0,021	0,084	*0,016*	0,063	*0,020*
Dark Ale	*0,077*	*0,020*	0,020	0,016	*0,008*	0,015	*0,026*	*0,013*	0,013	*0,006*	0,021	0,018	*0,012*	0,024	0,030	0,098	0,024	0,074	0,017
Wheat Beer (Witbier)	*0,071*	*0,016*	0,017	*0,014*	*0,007*	0,013	*0,022*	*0,012*	0,011	*0,006*	*0,022*	0,016	*0,010*	0,019	0,022	0,106	0,021	0,061	*0,021*
Wheat Beer (Weissbier)	*0,081*	*0,019*	0,023	*0,016*	*0,008*	0,015	*0,025*	*0,013*	0,013	*0,006*	0,019	0,016	*0,012*	0,020	0,024	0,156	0,024	0,078	*0,023*
Dark Malt Beer	*0,050*	*0,013*	0,015	*0,011*	*0,005*	0,006	*0,017*	*0,008*	0,009	*0,004*	*0,018*	0,012	*0,007*	0,016	0,020	0,064	*0,011*	0,050	*0,015*
Pilsner, Non-Alcoholic	*0,051*	*0,013*	*0,024*	*0,011*	*0,005*	0,006	*0,017*	*0,009*	0,008	*0,004*	*0,018*	0,012	*0,008*	0,017	0,019	0,058	*0,012*	0,048	*0,015*
Pilsner	*0,061*	*0,016*	*0,029*	*0,013*	*0,006*	0,011	*0,021*	*0,010*	0,010	*0,004*	0,016	0,013	*0,009*	0,018	0,021	0,066	*0,014*	0,061	*0,018*
Pilsner, Classic (Vienna Lager)	*0,056*	*0,015*	*0,027*	*0,012*	*0,006*	0,009	*0,019*	*0,010*	0,009	*0,004*	*0,020*	*0,016*	*0,008*	0,015	0,018	0,061	*0,013*	0,053	*0,017*
Pilsner, Strong (Guldøl)	*0,070*	*0,018*	0,018	*0,015*	*0,007*	0,010	*0,024*	*0,012*	0,013	*0,005*	0,020	0,015	*0,011*	0,022	0,027	0,084	0,023	0,069	*0,021*
Pilsner, Light	*0,038*	*0,010*	*0,018*	*0,008*	*0,004*	*0,005*	*0,013*	*0,006*	*0,008*	*0,003*	*0,014*	*0,011*	*0,006*	*0,010*	*0,013*	0,041	*0,009*	0,037	*0,011*
Strong Lager	*0,075*	*0,020*	0,018	0,015	*0,008*	0,012	*0,026*	*0,013*	0,014	*0,006*	0,022	0,017	*0,011*	0,025	0,029	0,088	0,025	0,077	0,018
Stout (Porter)	*0,086*	*0,022*	0,021	0,015	*0,009*	0,015	*0,029*	*0,015*	0,015	*0,006*	0,022	0,013	*0,013*	0,026	0,032	0,118	0,026	0,095	0,019
Christmas Beer	*0,063*	*0,016*	*0,029*	*0,014*	*0,006*	0,012	*0,021*	*0,011*	0,010	*0,005*	*0,022*	0,011	*0,009*	0,016	0,020	0,069	*0,014*	0,064	*0,019*

*The estimation of amino acid analyzed to below LOQ: For each of the amino acid quantified, the percentage compared to barley/wheat (50/50), was used for the three beer types: Blond Ale, Wheat Beer (Witbier and Weissbier). For the remaining 10 beer types, the percentage was compared to barley. For barley, ID 1767 was used, and for wheat ID 1838 (Frida.fooddata.dk, v. 5.2). The average percentage in the beer compared to barley/wheat for the amino acids quantified was used to estimate the content of the amino acid tested to a content below the limit of quantification (LOQ). This percentage ranged from 2.4% to 5.5% for the 13 beer types.

Appendix H – Carbohydrate and Protein Content – Estimated Values

Sample Type	Sample Number	Carbohydrate[1] g/100 g	Protein[2] g/100 g
Blonde Ale	2005-POOL-09	3.5	0.33
Dark Ale	2005-POOL-08	4.8	0.39
Wheat Beer (Witbier)	2005-POOL-11	3.4	0.36
Wheat Beer (Weissbier)	2005-POOL-10	3.5	0.44
Dark Malt Beer	2005-POOL-07	9.2	0.26
Pilsner, Non-Alcoholic	2005-POOL-06	3.7	0.26
Pilsner	2005-POOL-01	2.3	0.31
Pilsner, Classic (Vienna Lager)	2005-POOL-02	2.5	0.28
Pilsner, Strong (Guldøl)	2005-POOL-03	2.9	0.36
Pilsner, Light	2005-POOL-05	2.1	0.19
Strong Lager	2005-POOL-04	3.4	0.38
Stout (Porter)	2005-POOL-12	5.7	0.44
Christmas Beer	2005-POOL-13	3.2	0.32

[1] Estimated using the difference method (Formula 1)

Formula 1: $Carbohydrate = Dry\ matter - (protein + fat + ash)$

The method was selected as only three beer types showed a sugar content above the LOQ, and starch and dietary fibre content were not included in the analysis protocol.

[2] Protein content is estimated as the sum of amino acids quantified and estimated for content below LOQ (Appendix G), considering that one water molecule is released per amino acid (Formula 2).

Formula 2: $\boldsymbol{Protein} = \sum \text{"Anhydrous"}\boldsymbol{aminoacids} = \sum \frac{\boldsymbol{mass\ (amino\ acids)}}{\boldsymbol{M_w(amino\ acids)}} * (\boldsymbol{M_w(amino\ acids)} - \boldsymbol{M_w(H_2O)})$

The molecular weights (g/mol) used:

Isoleucine	Leucine	Lysine	Methionine	Cysteine	Phenylalanine	Tyrosine	Threonine	Tryptophan
131.175	131.175	146.190	149.210	240.290	165.192	181.191	119.120	204.229
Valine	Arginine	Histidine	Alanine	Aspartic acid	Glutamic acid	Glycine	Proline	Serine
117.148	174.204	155.157	89.094	133.110	147.130	75.067	115.132	105.093

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