

Quality of Butter and Blends of Butter with Oleomargarine

By Lester Hankin and J. Gordon Hanna

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The Connecticut Department of Consumer Protection

The origin of butter-making is unknown, but presumably it was in prehistoric stages of animal husbandry. Since then man has commonly used butter as a spread and as a fat for cooking.

Butter is made from cream, the fatty portion of milk. In the United States only cream from cow's milk is used for commercial butter production but the cream from milk of other animals can also be made into butter. When the cream is churned, the fat droplets coalesce and form progressively larger clusters of fat globules. These globules eventually break away from the liquid portion and form the semi-solid or plastic material we call butter. The butter may then be washed, colored, salted and then packaged in a variety of shapes and sizes, even in individual servings called pats. Regulations state that butter must contain at least 80% fat. Whipped butter has air incorporated into the butter to make it spread more easily.

Although the per capita consumption of butter in the United States has declined over the past 40 years, many consumers continue to prefer butter over margarine for cooking or as a spread because of its distinctive flavor, aroma and cooking attributes.

Although commercially produced butter is made from pasteurized cream, microorganisms such as bacteria or yeasts and molds can be introduced into the product from processing or packaging. The flavor of good butter is very delicate and even small amounts of microbial growth can damage its pleasant flavor and aroma. If butter is kept refrigerated below 40°F, organisms in the butter multiply slowly. On the other hand, should the butter be stored above 50°F, contaminating organisms can multiply quickly and deteriorate the product.

In this study we examined both butter and blends of butter with oleomargarine for microorganisms as well as for nutrients.

Methods

Thirty-five samples of butter or blends of butter with oleomargarine were collected at retail stores by inspectors of the Connecticut Department of Consumer Protection. Twenty-three samples were regular butter (one pound blocks or quarter pound sticks), nine were whipped butter, and three were blends of butter with oleomargarine. The Standard Plate Count and tests for coliform bacteria and enterococci were according to Standard Methods for the Examination of Dairy Products (5), chemical analyses by AOAC methods (3), and sodium by atomic absorption spectrophotometry (2). Lipolytic and proteolytic organisms were detected as previously described (1).

Results and Discussion

The results of microbiological and chemical analyses of the 35 samples of butter and blends of butter with oleomargarine are shown in Table I.

Microbial. A standard test for bacterial contaminants in dairy products is the test for coliform bacteria. All samples contained less than 2 coliform bacteria per gram which usually indicates good manufacturing practices. It has been suggested, however, that coliform bacteria may die easily in stored butter and that a test for enterococci may be more valid in assessing sanitary quality (4). Only samples 23 and 34 contained enterococci, 220 and 22 per gram, respectively. A standard of not more than 10 per gram has been suggested (4, 5).

Table 1. Microbial and Nutrient Analysis of Butter and Blends of Butter with Oleomargarine.

Sample Number	Brand and Type	Standard Plate Count ^a CFU/g ^c	Psychrotrophic Bacteria CFU/g	Proteolytic Bacteria CFU/g	Lipolytic Bacteria CFU/g	Yeasts and Molds CFU/g ^a	Fat, %	Casein, %	Sodium, mg/100g ^c	Cholesterol mg/100g	Calories No./pat ^b	Sample Number
1	A & P butter, lightly salted	8,700	<10	1,600	55	<2	81.4	1.29	488	209	36	1
2	Breakstone's butter, lightly salted	40	<10	20	25	<2	81.0	1.73	641	224	36	2
3	Breakstone's butter, sweet	1,500	<10	30	40	<2	79.8	1.08	5.5	199	35	3
4	Breakstone's whipped butter, lightly salted	60	<10	30	50	<2	81.4	1.90	635	199	27	4
5	Breakstone's whipped butter, sweet	90	<10	10	40	<2	81.1	0.78	4.8	193	27	5
6	Cabot Vermont butter	52,000	190	51,000	1,000	200	82.6	1.42	515	188	37	6
7	Finast butter	200,000	180	1,000	1,000	74	80.8	1.61	607	202	36	7
8	Grand Union Creamery butter, lightly salted	620,000	<10	60,000	>300,000	10	81.6	1.59	750	197	36	8
9	Grocers Pride butter	890	<10	340	26	<2	80.3	1.75	655	201	36	9
10	Grassland superwhipped butter, lightly salted	80	<10	30	70	120	80.9	2.21	408	190	27	10
11	Hood butter, lightly salted	320	36	130	100	6	81.0	1.63	620	203	36	11
12	Hotel Bar Blend margarine—40% butter	14	<10	<10	<10	<2	80.3	1.23	427	81	36	12
13	Hotel Bar butter	45,000	<10	4,000	2,500	10	79.5	1.36	382	151	35	13
14	Land O'Lakes butter, lightly salted	130	<10	45	22	<2	85.9	1.03	604	196	38	14
15	Land O'Lakes butter, sweet	40	60	10	28	<2	80.2	1.58	7.5	192	36	15
16	Land O'Lakes whipped butter, lightly salted	260	<10	110	34	<2	80.6	1.12	550	207	27	16
17	Land O'Lakes whipped butter, sweet	970	760	10	70	<2	80.1	1.28	5.1	217	27	17
18	Land O'Lakes Country Morning Blend margarine, lightly salted—40% butter	140	<10	70	18	<2	79.8	0.81	611	81	35	18
19	Land O'Lakes Country Morning Blend margarine, sweet—40% butter	70	<10	20	36	<2	79.9	1.09	14.3	82	35	19
20	Real Gold butter, lightly salted	40	<10	20	42	<2	80.5	1.22	589	177	36	20
21	Pathmark butter, lightly salted	89,000	68	7,000	13,000	<2	80.6	1.55	391	147	36	21
22	Shop Rite butter, lightly salted	61,000	72,000	<10	28	580	84.1	0.41	511	185	37	22
23	Shop Rite butter, sweet	>3,000,000	>300,000	>3,000,000	>300,000	>3,000	80.0	1.25	5.5	203	35	23
24	Shop Rite whipped butter, lightly salted	64	<10	50	40	<2	80.6	1.22	596	191	27	24
25	Shop Rite whipped butter, sweet	25	<10	10	26	<2	81.6	1.23	13.7	192	27	25
26	Shurfine butter, lightly salted	550,000	160	150,000	98,000	48	82.8	1.72	600	213	37	26
27	Stop and Shop butter, lightly salted	500	750	<10	<10	<2	81.6	1.36	682	176	36	27
28	State Brand butter, lightly salted	4,400	<10	2,100	80	<2	81.2	1.20	627	213	36	28
29	Summer Maid butter	3,400	12,000	2,700	<10	21,000	80.0	0.86	660	197	35	29
30	Sun Glory butter	<10	30	<10	30	<2	78.3	1.15	469	149	35	30
31	Sweet Life butter, lightly salted	4,400	3,400	40	1,300	20	80.8	1.33	445	212	36	31
32	Waldbaum's butter, lightly salted	1,400,000	<10	<10	>300,000	1,700	83.1	1.60	667	247	37	32
33	Waldbaum's butter, sweet	30	<10	20	26	<2	82.6	1.33	14.6	197	37	33
34	Waldbaum's whipped butter, lightly salted	120	<10	25	26	15	79.7	1.31	772	184	27	34
35	Waldbaum's whipped butter, sweet	15	<10	10	<10	<2	81.8	1.23	12.8	186	28	35

a) Standard Plate Count is number of aerobic bacteria reported as number of colony forming units (CFU) per gram. Yeast and mold count is reported as colony forming units per gram.

b) A pat or individual serving of regular butter is 5 grams, for whipped butter it is 3.8 grams.

c) g = grams; mg = milligrams.

The number of bacteria per gram (Standard Plate Count) also provides some information about manufacturing techniques. There are no standards for total numbers of bacteria in butter, but in Connecticut, for example, 100,000 per gram (Standard Plate Count) is allowed in ice cream. Only 5 samples of butter had more than this number (Table 1).

Because butter is stored at a low temperature, a measure of the number of psychrotrophic bacteria is important. Psychrotrophic bacteria are those able to grow, albeit slowly, at low temperatures and cause deterioration of the butter. Although only sample 23 contained a considerable number of psychrotrophs (>3 million), sample 22 was also high (over 50,000) (Table 1).

The two other microbial tests for detecting contaminating organisms were for lipolytic bacteria, those that degrade fat, and proteolytic bacteria, those that attack proteins. Essentially only samples 8, 23, 26, and 32 contained a high number of lipolytic bacteria and only samples 6, 8, 23, and 26 contained a high number of proteolytic bacteria. Only

samples 23, 29, and 32 contained an appreciable number of yeasts and molds.

We do not attach significance to health to the number of microorganisms found in these butter samples. The tests we conducted are useful in detecting organisms that help evaluate manufacturing and packaging techniques and the findings help to assess potential keeping quality of the product.

Nutrients. The average fat content in all samples was 81.1%. The nine whipped butters averaged 80.0% and the three blends 80.9%. Only sample 30, with 78.3% fat was below standard (Table 1). Although less than 80% fat is shown for five other samples in Table 1 (79.5 to 79.9%), the values conform to the 80% minimum when rounded to the nearest whole number. The three blends of butter with oleomargarine, samples 12, 18, and 19, claimed 40% butter and 41.0, 41.7, and 41.3% butterfat was found respectively. None of the butter was adulterated with vegetable oil.

Butter contains small amounts of protein (designated as

% casein in Table 1). The average protein content of the 32 butter samples was 1.35% but the range was wide. The amount of casein left in the butter after churning the cream depends on how much the butter is worked and washed. The three blends averaged 1.04% protein.

Fat provides about 9 calories per gram, about twice that supplied by protein or carbohydrate. We show in Table 1 the calories provided by a pat of butter, an individual serving. A pat of regular butter weighs 5 grams and a pat of whipped butter weighs only 3.8 grams since it contains some air. The number of calories per gram of regular and whipped was the same, but the whipped butter contained less per pat (36.1 per pat of regular butter versus 27.1 per pat of whipped) because each pat weighed less. The blends contained about the same calories as regular butter.

Some people are concerned about cholesterol in butter. The milligrams (mg) cholesterol per 100 grams of butter is shown in Table 1. The average in the 32 butter samples was 195 mg and in the three blends was 81 mg, since the blends

contain only 41% butter. One serving (a pat) of regular butter contains about 10 mg cholesterol. For comparison, one egg contains about 270 mg cholesterol.

Sodium interests those who wish to restrict their salt intake. The sodium in the nine sweet butters and blends averaged 9.3 mg per 100 grams (Table 1). Those labelled as lightly salted or unlabelled as to salt contained 572 mg. There was little difference in average sodium content between those labelled lightly salted (18 samples averaged 586 mg per 100 grams) and those unlabelled as to salt (8 samples averaged 541 mg). A pat of butter contains 20 to 30 mg of sodium which is about the same as in a saltine.

Conclusions

Thirty-two regular and whipped butters and three blends of butter with oleomargarine were tested for microorganisms and nutrients. Although there are no microbial standards for butter, only five samples of the 35 examined were considered to contain an excessive number of contaminating

microorganisms. Two samples contained many psychrotrophic bacteria which can grow at temperatures in a refrigerator. All samples contained less than two coliform bacteria per gram.

All samples, except one, contained at least the 80% fat that is required by regulation. Blends of butter with oleomargarine claiming 40% butter actually contained about 41%. Protein content averaged 1.35% for butter and 1.04% for the blends. The butter averaged 195 mg cholesterol per 100 grams and the blends with 41% butter 81 mg.

The number of calories in a single serving of butter ranged from 27 to 36. The sodium content of the sweet butters and blends averaged 9.3 mg per 100 grams and those labelled as lightly salted or unlabelled as to salt averaged 586 mg.

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