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QUALITY OF CRACKERS

By Lester Hankin, Lucia A. McLean, and J. Gordon Hanna

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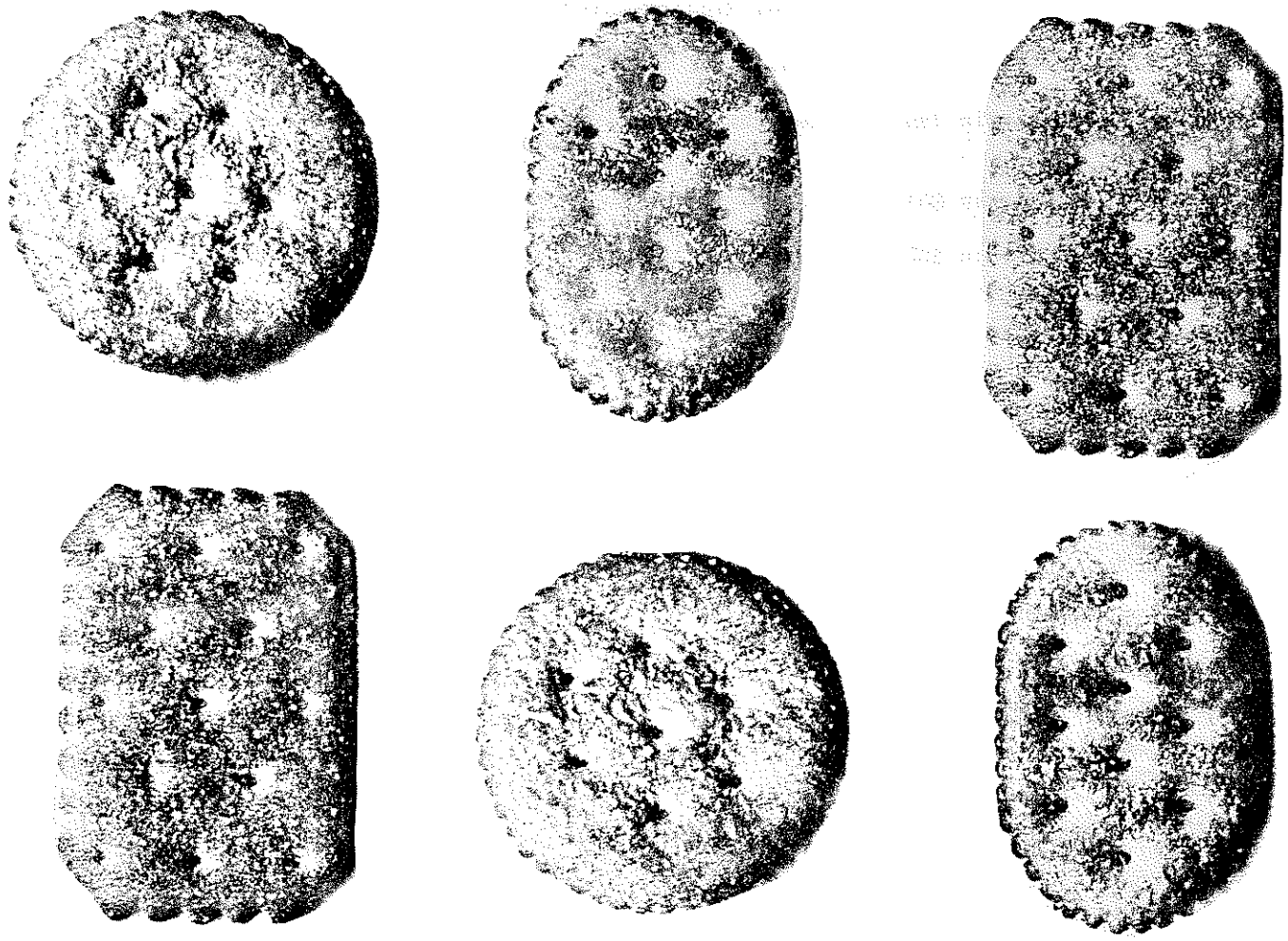

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION NEW HAVEN

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Crackers must be included among the most popular snacks for all ages. They are eaten with or without a topping, with a dip, or with another food such as soup. Some crackers are also used in cooking as, for example, coatings for fish or meat or crusts for pies, as well as for myriad other uses. Crackers come in a variety of shapes, sizes, and flavors to please different tastes.

Consumers usually purchase a cracker for its flavor or basic ingredient (e.g. rye, wheat, rice). Some people are concerned with nutritive quality and seek information on the fat, protein, carbohydrate, and caloric content. Many consumers, for religious or ethical reasons or because they wish to restrict intake of cholesterol from animal fat, are also interested whether animal or vegetable fat is used in the cracker. Some consumers wish to know whether the fat is saturated or unsaturated and how much sodium is in the cracker.

Since it would have been almost impossible to survey all cracker varieties, we selected for analysis four basic types from among the myriad in the stores: snack crackers, saltines with and without salted tops, graham crackers, and animal crackers.

Methods

On a single day 61 samples of crackers representing 22 different brands were collected from retail stores. An inspector from the Connecticut Department of Consumer Protection collected 15 snack types representing 11 brands, 18 saltines (10 with salted top, 8 with unsalted tops) representing 10 brands, 13 graham crackers representing 12 brands, 10 animal crackers, and 5 miscellaneous crackers.

After each sample was ground to a homogeneous mixture, protein, fat, ash, total solids, and carbohydrate content were determined by Official Methods (4). Animal fat was determined by analyzing the fat for cholesterol by gas-liquid chromatography after saponification of the fat and extraction of unsaponifiable residues. For determination of

Table 1. Analysis of animal, graham, saltine, and snack type crackers.

Sample number and brand	Calories per 100 g	Protein (%)	Carbohydrates (%)	Ash (%)	Sodium, mg per 100 g	Animal fat claim	Vegetable fat claim	Animal fat (%)	Vegetable fat (%)	Total fat %	Saturated fat (%)	Unsaturated fat (%)	Cholesterol, mg per 100 g	Sample number
Animal Crackers														
1 A & P	427	6.8	75.9	1.2	385	-	+	0.	11.0	11.0	30	70	0.	1
2 FFV	452	6.6	77.9	1.3	305	+	+	0.	13.0	13.0	29	71	0.	2
3 Gaylord	443	6.5	76.8	1.2	440	-	+	0.	12.5	12.5	29	71	0.	3
4 Grand Union	443	6.2	73.6	1.6	485	+	+	13.1	1.0	14.1	52	48	13.1	4
5 Keebler	452	6.4	70.8	1.4	480	+	+	14.5	1.8	16.3	61	39	14.5	5
6 Nabisco-Barnum's	441	6.4	75.5	1.3	370	+	+	7.6	5.3	12.9	51	49	7.6	6
7 Pathmark	429	6.1	77.2	1.3	335	-	+	0.	10.9	10.9	32	68	0.	7
8 Salerno	449	7.0	73.2	1.3	425	+	+	12.6	2.0	14.6	54	46	12.6	8
9 Shoprite	432	6.8	79.1	1.0	295	-	+	0.	10.1	10.1	31	69	0.	9
10 Stop & Shop	427	6.8	77.2	1.1	325	-	+	0.	10.3	10.3	31	69	0.	10
Average	440	6.6	75.7	1.3	385			12.0[f]	7.8	12.6	40	60	12.0[f]	
Graham Crackers														
11 A & P, Sugar Honey	427	5.6	80.0	1.4	345	-	+	0.	9.6	9.6	28	72	0.	11
12 Edwards Finast, Honey	426	7.3	76.4	1.3	290	-	+	0.	10.4	10.4	31	69	0.	12
13 Food Club, Sugar Honey	432	7.1	77.1	1.3	300	-	+	0.	10.8	10.8	31	69	0.	13
14 Grand Union, Honey	416	6.7	79.1	2.2	935	+	+	2.1	6.2	8.3	49	51	2.1	14
15 Health Valley, Honey	440	8.7	73.8	2.0	515	-	+	0.	12.5	12.5	12	88	0.	15
16 Keebler, Honey	444	7.4	77.3	2.0	480	+	+	6.6	5.4	12.0	52	48	6.6	16
17 Mi-Del, 100% Whole Wheat Honey	409	8.9	74.0	3.5	735	-	+	0.	8.8	8.8	23	77	0.	17
18 Nabisco	433	7.3	78.1	2.2	575	+	+	8.0	2.4	10.4	52	48	8.0	18
19 Nabisco, Honey Maid	432	7.1	78.8	1.9	615	+	+	6.7	3.4	10.1	52	48	6.7	19
20 Pathmark, Sugar Honey	418	6.1	81.3	2.2	705	+	+	5.4	2.4	7.8	50	50	5.4	20
21 Shop Rite, Sugar Honey	424	6.9	77.5	1.4	325	-	+	0.	9.8	9.8	31	69	0.	21
22 Stop & Shop, Sugar Honey	424	7.1	78.4	1.3	355	-	+	0.	9.3	9.3	31	69	0.	22
23 Sunshine, Honey	437	7.3	75.9	2.2	555	-	+	0.	11.9	11.9	30	70	0.	23
Average	439	7.2	77.5	1.9	518			5.8[f]	7.9	10.1	36	64	5.8[f]	
Saltine Type Crackers														
24 A & P, Saltines	427	8.2	70.5	3.5	1345	-	+	0.	12.8	12.8	38	62	0.	24
25 A & P Cracker, unsalted tops	441	8.8	71.9	2.1	830	-	+	0.	13.5	13.5	46	54	0.	25
26 Edwards, Finast, Saltines	426	9.4	71.4	3.4	1110	-	+	0.	11.7	11.7	31	69	0.	26
27 Food Club, Saltines	434	10.7	70.5	3.2	920	-	+	0.	12.4	12.4	31	69	0.	27
28 Grand Union, Saltines	412	8.4	74.2	2.7	900	+	+	5.1	3.3	8.4	49	51	5.1	28
29 Grand Union, Saltines, unsalted tops	418	10.0	74.5	2.1	670	+	+	4.0	5.1	9.1	47	53	4.0	29
30 Keebler, Zesta, Saltines	443	8.9	72.9	2.8	890	+	+	9.2	4.0	13.2	50	50	9.2	30
31 Keebler, Zesta, unsalted tops	442	7.2	75.4	2.0	585	+	+	8.4	4.4	12.8	52	48	8.4	31

32	Nabisco, Premium, Saltines	419	9.9	76.0	3.0	885	+	+	5.8	4.1	9.9	50	50	5.8	32
33	Nabisco, Premium, unsalted tops	405	10.8	66.5	7.0	845	+	+	5.0	5.9	10.9	46	54	5.0	33
34	Pathmark, Saltines	420	9.9	69.9	3.4	1265	-	+	0.	11.5	11.5	31	69	0.	34
35	Pathmark, Saltines, unsalted tops	429	9.4	72.2	2.2	655	-	+	0.	11.7	11.7	32	68	0.	35
36	Shoprite, Saltines	430	8.8	73.9	3.1	1140	-	+	0.	11.3	11.3	31	69	0.	36
37	Shoprite, Saltines, unsalted tops	433	9.6	72.4	2.3	785	-	+	0.	11.9	11.9	30	70	0.	37
38	Stop & Shop, Saltines	425	9.8	72.6	3.4	890	-	+	0.	10.8	10.8	42	58	0.	38
39	Stop & Shop, Saltines, unsalted tops	431	9.8	73.0	2.3	665	-	+	0.	11.4	11.4	38	62	0.	39
40	Sunshine, Krispy, Saltines	418	9.3	72.8	3.7	1115	-	+	0.	10.2	10.2	31	69	0.	40
41	Sunshine, Krispy Crackers, unsalted tops	428	9.9	73.6	2.4	700	-	+	0.	10.7	10.7	43	57	0.	41
	Average	427	9.4	72.5	3.0	900			6.3[f]	9.3	11.3	40	60	6.3[f]	
	Snack Type Crackers														
42	A & P, Snack	483	--[c]	---	1.9	590	-	+	0.	22.4	22.4	83	17	0.	42
43	Food Club, All Purpose	571	7.1	49.0	2.3	745	-	+	0.	39.4	39.4	79	21	0.	43
44	Freshee, Snack	462	7.6	62.8	4.7	1185	+	+	tr.[d]	20.6	20.6	92	8	tr.[d]	44
45	Grand Union, Snack	502	7.2	62.6	2.3	700	+	+	7.8	17.5	25.3	39	61	7.8	45
46	Hickory Farms, Old Fashioned	420	9.3	72.6	2.5	785	-	+	0.	10.5	10.5	31	69	0.	46
47	Keebler, Club	486	7.6	64.9	3.0	900	+	+	6.0	16.3	22.3	57	43	6.0	47
48	Keebler, Town House, oval	521	6.3	58.3	2.7	810	+	+	6.9	23.0	29.9	85	15	6.9	48
49	Keebler, Tuc	504	8.1	60.5	2.1	625	-	+	0.4[e]	25.7	26.1	84	16	17.2[e]	49
50	Nabisco, Escort	515	5.0	56.1	5.1	650	-	+	0.	30.8	30.8	31	69	0.	50
51	Nabisco, Ritz	498	5.9	64.2	2.8	860	+	+	8.6	16.1	24.7	39	61	8.6	51
52	Nabisco, Waverly Wafers	456	8.2	64.2	5.6	680	+	+	9.4	9.5	18.9	41	59	9.4	52
53	Pathmark, Snax	471	7.3	67.7	1.9	510	+	+	4.3	15.2	19.5	39	61	4.3	53
54	Shoprite, Bits	504	6.7	65.3	1.8	600	-	+	0.	24.6	24.6	75	25	0.	54
55	Stop & Shop, Clix	503	6.4	63.9	2.5	620	-	+	0.	25.2	25.2	29	71	0.	55
56	Sunshine, Hi-Ho	479	5.4	60.3	6.1	900	-	+	0.	24.7	24.7	29	71	0.	56
	Average	492	7.0	62.3	3.2	744			6.2[f]	21.4	24.3	56	44	8.6[f]	
	Miscellaneous Types														
57	Burry New England Milk Lunch	446	7.8	76.6	2.0	630	-	+	0.1[e]	12.2	12.3	80	20	3.9[e]	57
58	Carr's, Table Water Craquelins	422	9.6	76.1	2.1	390	-	+	0.	9.0	9.0	34	66	0.	58
59	Nabisco, Uneeda Biscuit	429	9.6	72.1	2.2	710	-	+	0.	11.6	11.6	31	69	0.	59
60	Venus, New England Soda Cracker	423	9.6	72.7	2.2	565	-	+	0.	10.7	10.7	35	65	0.	60
61	Venus, White Thin Bread Wafers	417	9.2	71.8	2.3	625	-	+	0.	10.6	10.6	37	63	0.	61

[a] The percentage of moisture can be obtained by subtracting percentages of protein, carbohydrate, ash, and fat from 100.

[b] 100 grams is the weight of about 33, 2-by-2 inch saltines, 14 graham crackers, 38 animal crackers, or 29 snack crackers.

[c] Protein and carbohydrate were not determined in this sample.

[d] The trace of animal fat in this sample was less than 0.1% and the trace of cholesterol was less than 1 mg per 100 g.

[e] Samples 49 and 57 did not declare animal fat. Sample 57 declared dried whole eggs, and sample 49 declared eggs were used. Since dried whole eggs contain about 1900 mg cholesterol per 100 g(2), sample 57 likely contained about 0.3% dried whole eggs and sample 49 about 0.9%.

[f] The averages for animal fat pertain only to crackers containing animal fat and for cholesterol only to those containing cholesterol.

percent animal fat (lard or beef), a value of 100 milligrams (mg) cholesterol per 100 grams (g) of fat was used since 100 g of lard contains an average of 95 mg cholesterol and 100 g of beef tallow contains 108 mg.

The ratio of saturated to unsaturated fat was determined by gas-liquid chromatography of the methyl esters of the fatty acids (4). Calories per 100 g of sample were calculated as % fat x 8.79 + [% total solids -(% fat + % ash)] x 4. Sodium was determined by Atomic Absorption Spectrophotometry (1).

Results and Discussion

Fat: Animal fat, lard or beef, was claimed in only 23 of 61 samples, and of these, only sample 2 was found to contain no animal fat and sample 44 contained only a trace (Table 1). Two samples (49 and 57), not claiming animal fat, did contain small amounts derived from eggs. None of the other 36 samples that did not claim animal fat had any. All 61 samples claimed use of vegetable fat and all contained some.

Animal fat was greatest in animal crackers, which averaged 12.0% (Table 1). The other types of crackers containing animal fat had, on the average, about half this amount.

The total fat content of snack crackers was about twice that of other types (Table 1). Only in animal crackers did the total fat content differ between those with only vegetable fat and those with both animal and vegetable fat (Table 2); those with animal fat had 3% more. The labeling of fat is open formulation; i.e. the fat used at any time is determined by availability and market price so long as it does not change the flavor of the cracker.

Table 2. Average percentage of animal fat in crackers and percentage of saturated and unsaturated fatty acids.

	With animal and vegetable fat			With only vegetable fat	
Type	% total fat	% animal fat	% of total fat saturated	% total fat	% of total fat saturated
Animal	14.5(4)[a]	11.9	55	11.2(6)	30
Graham	9.7(5)	4.2	51	10.4(8)	27
Saltine	10.7(6)	6.3	49	11.7(12)	35
Snack	23.8(7)	6.2	50	24.8(8)	56

[a]Number in parenthesis is the number of samples in each group.

Cholesterol: Cholesterol was found only in products containing animal fat, and its content is expressed in mg per 100 g (Table 1). The cholesterol contents in Table 1 can be gauged if the reader knows that, for example, whole milk (3.3% fat) contains 14 mg, ice cream (10% fat) contains 45 mg, and cottage cheese (4.5% fat) contains 15 mg per 100 g.

Thus for animal crackers containing cholesterol from animal fat the average of 12 mg was close to milk and cottage cheese. The other types of crackers with animal fat had about half the cholesterol of animal crackers.

Samples 49 and 57, with animal fat from eggs, also contained cholesterol. Based on the amount of cholesterol in dried whole eggs (2) we calculated that sample 49 contained 0.9% dried whole eggs and sample 57, 0.3%.

Saturation of Fat: Except for snack crackers, more of the fat in crackers containing animal fat was saturated than was the fat in those with only vegetable fat (Table 2). The amount of saturated and unsaturated fatty acids in the fat in crackers depends on whether animal or vegetable fat was used as well as on the type of vegetable fat and its degree of hydrogenation. Coconut oil, a fat noted on many labels, is one of the most saturated vegetable fats and contains only about 8% unsaturated fatty acids while peanut oil contains about 82% and lard about 59%. Examples of samples with considerable saturated fat are 44, 48, 49, 54, and 57 (Table 1). Examples of crackers with considerable amounts of unsaturated fat are samples 15 and 17.

Hydrogenation converts a liquid oil into a semi-solid or solid fat and some of the unsaturated fat into a more saturated fat. All labels stated that the vegetable oil was partially hydrogenated and thus, for example, samples 37 and 41, which do not list coconut oil on the label got their highly saturated fat from hydrogenation.

Carbohydrates: The carbohydrate in crackers comes from the sucrose or sugar listed on the label. It also comes from other listed ingredients such as flour, honey, dextrose and molasses, from malt and corn syrup, and from lactose in whey. Average carbohydrate content was 72-to-78% in animal, graham, and saltine crackers, but only 62% in snack crackers (Table 1).

Protein: Saltines with an average protein content of 9.4% had about 2% more protein than the other types (Table 1). Some miscellaneous crackers contained more than 9% protein.

Calories: One gram of protein or carbohydrate contains 4 calories and 1 gram of fat about 9 calories. Thus, snack crackers, because of their higher fat content, contained 50 more calories per 100 g than the other types (Table 1).

Ash: Ash indicates minerals such as monocalcium phosphate, sodium bicarbonate, sodium bisulfite, calcium carbonate, and sodium acid phosphate used in crackers. One or more may

be in a single brand. Some are used for leavening. Saltines and snack crackers averaged about 3% ash. Grahams averaged 1.9% and animal crackers were lowest with 1.3%.

Sodium: Saltines contained more sodium than the other crackers, with animal crackers containing the least (Table 1). Saltines with unsalted tops averaged 717 mg sodium per 100 g compared to 1046 for those with salted tops. Within the same brand of saltines, the difference in sodium content between salted and unsalted tops was 5 to 50%. Examples are a 5% difference between samples 32 and 33 and about a 50% difference between samples 34 and 35. Previously we reported the sodium content of saltines and other foods (3).

Conclusions

Snack crackers averaged about 25% fat, about twice the amount in the other types. The label on 23 of the 61 samples claimed animal fat. Of the 23 claiming animal fat one contained none; another a trace. Two crackers with no claim for animal fat contained some from eggs. All crackers with animal fat from beef, lard, or eggs contained cholesterol.

Crackers with only vegetable fat contained more unsaturated than saturated fat. Those with no animal fat but a high concentration of saturated fat probably contained considerable coconut fat, a highly saturated vegetable fat.

Protein content ranged from 6.6 to 9.4%. Carbohydrate content ranged from 49.0 to 84.0%. Snack crackers tended to have the most calories because of their higher fat content. Sodium content of saltines averaged 900 mg per 100 g, about 68% more than animal crackers, 43% more than grahams, and 18% more than snack types. Although saltines with unsalted tops averaged about 32% less sodium than those with salted tops, the difference within the same brand ranged from 5 to 50%.

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