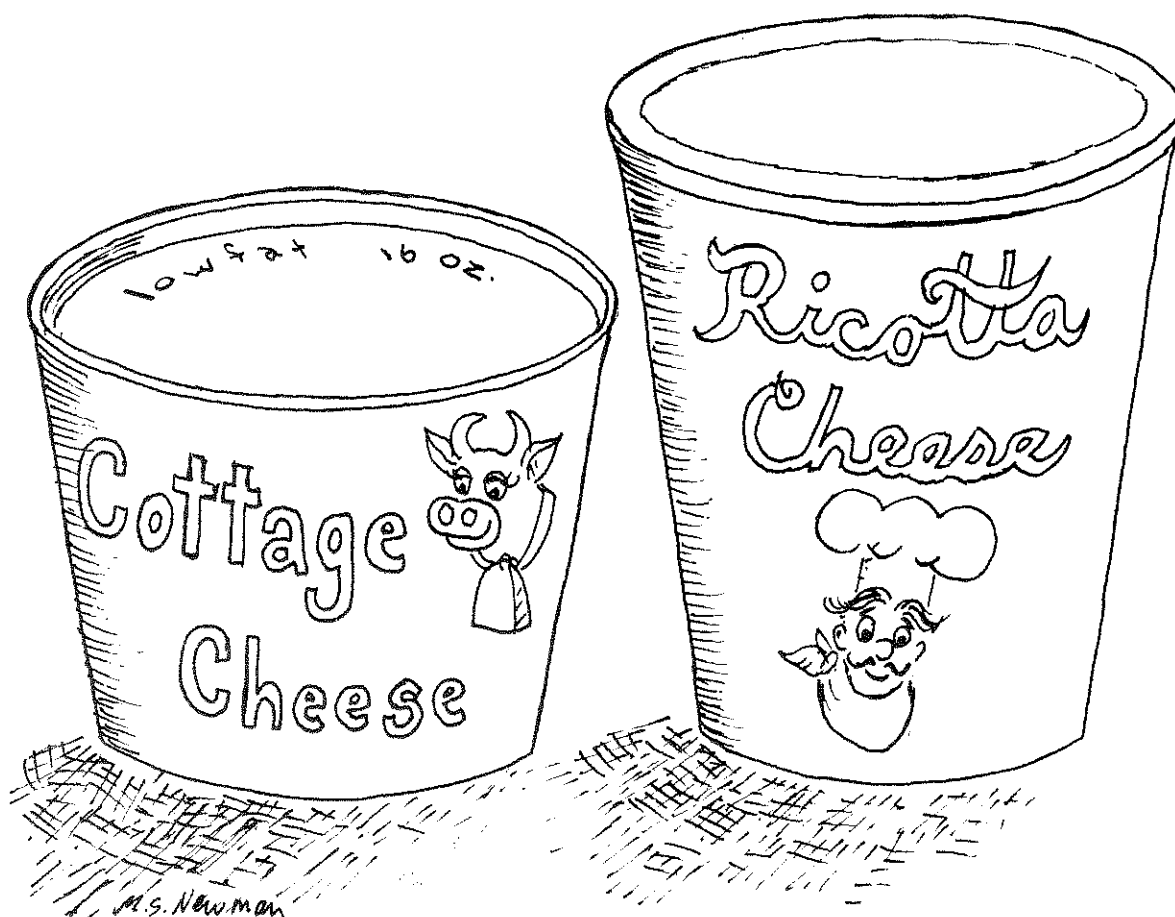


# Quality of COTTAGE CHEESE AND RICOTTA CHEESE

*A Cooperative Study by the Connecticut Department of Agriculture  
and The Connecticut Agricultural Experiment Station*

**By Lester Hankin, Donald Shields, and J. Gordon Hanna**



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## QUALITY OF COTTAGE CHEESE AND RICOTTA CHEESE

By Lester Hankin, Donald Shields, and J. Gordon Hanna

The average annual consumption of cottage cheese in the United States is about 5 pounds per person (3), indicating it is popular among a large segment of the population. It is eaten without further preparation as well as used as an ingredient in other foods.

Cottage cheese is a soft uncured cheese usually made from skim milk. Lactic acid bacteria and associated *Leuconostoc* species are added to the milk to produce acid which precipitates the casein, the major protein in milk, and forms the curd. The lactic acid bacteria and *Leuconostocs* also produce compounds that give the cheese its characteristic flavor. Sometimes the enzyme rennet is combined with the bacteria to form the curd.

After the milk curdles or sets it is cut into cubes and heated (to about 130-135 F). The duration of heating depends on such factors as acidity and milk solids content and determines the characteristics of the curd. After heating, which destroys the lactic acid bacteria and any rennet, the whey (the liquid portion of milk after the curd forms) is drained and the curd is washed with cool water, then ice water, and the water drained.

Finally, the "dressing", salt, cream, stabilizer or other additives, is mixed with the curd. Fruit or vegetables may also be

added at this time. The amount and type of dressing selected depends on the type of product desired (lowfat, regular). The finished cottage cheese is then packed into containers and refrigerated.

The above is only a general description of cottage cheese manufacture; manufacturers have variations for their particular products.

The various designations of curd sizes including large, small, California, pot, etc., generally indicate only the size of the curd particles. This is determined during manufacture by the spacing of the wire blades used to cut the original curd. For large curd cottage cheese the curd is cut into half-inch cubes or larger; California and pot style are usually large curd. For small curd, one-fourth-inch size cubes are cut. Sometimes the cheese is made into whipped cottage cheese.

Some labels declare the salt content; others state that no salt was added. Usually the label states only that salt was added but not the amount; up to 1% may be used in regular creamed cottage cheese.

According to Federal regulations (2) regular creamed cottage cheese must not exceed 80% moisture and must contain a minimum of 4% fat. To be labeled a dry curd cheese it must contain less than 0.5% fat. Lowfat cottage cheese must contain between

Table 1. Code period, age, keeping quality, microbial contaminants, acidity, and declared additives in cottage cheese

Sample number	Brand, % fat, curd type or style	Code period (days)	Age at purchase (days)	Keeping quality (days)	Yeasts (no./g)	Molds (no./g)
1	A & P, 4%, large	25	9	25	<10	<10
2	A & P, 4%, large	25	23	25	<10	<10
3	A & P, 4%, small	25	27	27 <sup>1</sup>	<10	<10
4	A & P, 4%, small	25	14	25	<10	<10
5	A.C. Petersen Farms, 4%	20	14	19	680	50
6	A.C. Petersen Farms, 4%	20	11	20	430	<10
7	Axelrod's, 4%, chunk, all natural	25	12	25	190	<10
8	Axelrod's, 4%, chunk, all natural	25	14	25	<10	<10
9	Axelrod's, 4%, small, all natural	25	21	25	<10	<10
10	Axelrod's, 4%, small, all natural	25	24	25	<10	<10
11	Axelrod's, 4%, pot, all natural	25	18	25	20	<10
12	Axelrod's, 4%, pot, all natural	25	18	25	100	<10
13	Axelrod's, 4%, whipped, all natural	25	23	25	110	<10
14	Axelrod's, 4%, whipped, all natural	25	18	25	<10	<10
15	Axelrod's, Easy Dieter, 1%, lowfat	25	22	25	<10	<10
16	Axelrod's, Easy Dieter, 1%, lowfat	25	9	25	240	10
17	Axelrod's, less than 1/2%, dry curd, no salt added	25	17	25	<10	<10
18	Axelrod's, less than 1/2%, dry curd, no salt added	25	27	27 <sup>1</sup>	80	<10
19	Axelrod's, 4%, pineapple	25	17	25	<10	<10
20	Axelrod's, 4%, pineapple	25	11	25	<10	<10
21	Axelrod's, 4%, fruit salad	25	11	25	<10	<10
22	Axelrod's, 4%, fruit salad	25	18	25	<10	<10
23	Axelrod's, 4%, garden salad	25	20	25	<10	<10
24	Axelrod's, 4%, garden salad	25	21	25	<10	<10
25	Befit, 1%, lowfat	21	9	21	10	<10
26	Befit, 1%, lowfat	21	10	21	180	<10
27	Borden, 4%, large	28	20	28	146	<10
28	Borden, 4%, large	28	26	28	150	<10
29	Borden, 4%, small	28	25	28	49,000,000	<10
30	Borden, 4%, small	28	28	28	3,800	<10
31	Borden, Liteline, 1%, lowfat	28	19	28	320	<10
32	Borden, Liteline, 1%, lowfat	28	29	29 <sup>1</sup>	48,000	<10
33	Breakstone's, 4%, California, all natural	50	45	50	<10	<10
34	Breakstone's, 4%, California, all natural	50	17	41	<10	<10
35	Breakstone's, 4%, small, all natural, smooth and creamy	50	16	32	<10	<10
36	Breakstone's, 4%, small, all natural, smooth and creamy	50	20	44	40	<10
37	Breakstone's, 4%, small, tangy, all natural	40	35	40	130	<10
38	Breakstone's, 4%, small, tangy, all natural	40	31	40	4,600	<10
39	Breakstone's, 2%, lowfat, all natural	50	26	47	13,000	<10
40	Breakstone's, 2%, lowfat, all natural	50	25	50	<10	<10
41	Breakstone's, less than 1/2%, dry curd, no salt added	40	21	40	<10	<10
42	Breakstone's, less than 1/2%, dry curd, no salt added	40	19	40	<10	<10
43	Breakstone's, 4%, pineapple	50	19	33	<10	<10
44	Breakstone's, 4%, pineapple	50	20	50	<10	<10
45	Cumberland Farms, 4%, small	21	22	22 <sup>1</sup>	<10	780
46	Cumberland Farms, 4%, small	21	15	21	<10	<10
47	Dairylea, 4%, small	21	10	21	<10	<10
48	Dairylea, 4%, small	21	10	18	34,000	<10
49	Daitch, 4%, California	21	19	2	-	-
50	Daitch, 4%, California	21	6	19	110	<10
51	Daitch, Brisk 'n Bouncy, 1%, lowfat	21	12	18	2,200	60
52	Daitch, Brisk 'n Bouncy, 1%, lowfat	21	10	21	260	<10
53	Deary Bros., 4%	21	19	19	10	<10
54	Deary Bros., 4%	21	12	21	10	<10
55	Finast, 4%, large	21	17	21	<10	<10
56	Finast, 4%, large	21	8	21	<10	<10
57	Finast, 4%, small	21	7	21	<10	<10
58	Finast, 4%, small	21	8	21	40	<10
59	Friendship, 4%, California	18	29	3	-	-
60	Friendship, 4%, California	18	9	18	170	<10
61	Friendship, 2%, pot, lowfat	18	12	18	<10	<10
62	Friendship, 2%, pot, lowfat	18	16	18	10	<10
63	Friendship, 1%, lowfat	18	17	18	40	<10
64	Friendship, 1%, lowfat	18	7	18	<10	<10
65	Friendship, Calorie Meter, 1%, lowfat, no salt added	18	6	18	<10	<10
66	Friendship, Calorie Meter, 1%, lowfat, no salt added	18	18	18	<10	<10
67	Friendship, 4%, pineapple	18	20	20 <sup>1</sup>	110	<10
68	Friendship, 4%, pineapple	18	12	18	3,000	<10
69	Friendship, 4%, garden salad	18	12	18	28,000	20
70	Friendship, 4%, garden salad	18	8	18	50	<10
71	Garellick Farms, 4%, small	21	19	21	1,600	<10
72	Garellick Farms, 4%, small	21	24	21	30	<10
73	Grand Union, 4%	25	21	25	140	<10
74	Grand Union, 4%	25	23	25	60	<10
75	Guida's Dairy, 4%, large, natural	25	21	25	<10	<10
76	Guida's Dairy, 4%, large, natural	25	16	25	<10	<10

Coliform bacteria (no./g)	Gram Negative Bacteria			Label Declarations				Acidity (%)	Sample number
	Proteolytic (no./g)	Lipolytic (no./g)	Stabilizers	Sugar	Citric acid	Enzymes	Misc. additives		
<10	<10	<10	+	-	-	-		1.05	1
<10	<10	<10	+	-	-	-		1.03	2
<10	<10	<10	+	-	-	-		1.13	3
<10	<10	<10	+	-	-	-		1.12	4
70	300	6,700	+	-	-	-	cal. sulf. <sup>8</sup>	1.02	5
30	4,300,000	67,000	+	-	-	-	cal. sulf.	1.02	6
<10	<10	10	+	-	-	-		1.08	7
<10	<10	<10	+	-	-	-		1.04	8
<10	<10	<10	+	-	-	-		1.00	9
<10	<10	<10	+	-	-	-		1.05	10
10	10	<10	+	-	-	-		1.06	11
<10	<10	50	+	-	-	-		1.20	12
<10	<10	<10	+	-	-	-		1.11	13
<10	<10	<10	+	-	-	-		1.04	14
<10	<10	<10	+	-	-	-		1.04	15
<10	<10	<10	+	-	-	-		1.06	16
<10	<10	<10	-	-	-	-		1.66	17
<10	<10	<10	-	-	-	-		1.54	18
<10	<10	<10	+	+	-	-		0.88	19
<10	<10	<10	+	+	-	-		0.92	20
<10	<10	<10	+	+	+	-	starch	0.95	21
<10	<10	<10	+	+	+	-	starch	0.89	22
<10	<10	<10	+	+	-	-	vinegar	1.16	23
<10	<10	<10	+	+	-	-	vinegar	1.19	24
<10	<10	<10	+	-	-	-		1.07	25
<10	10	7,900	+	-	-	-		1.18	26
180	<10	<10	+	-	+	+	cal. sulf., glyc. <sup>8</sup>	1.29	27
<10	<10	<10	+	-	+	+	cal. sulf., glyc.	1.23	28
<10	<10	<10	+	-	+	+	cal. sulf., glyc.	1.01	29
<10	<10	<10	+	-	+	+	cal. sulf., glyc.	1.23	30
<10	<10	<10	+	-	+	+	cal. sulf., glyc.	1.00	31
<10	<10	<10	+	-	+	+	cal. sulf., glyc.	1.01	32
<10	<10	<10	-	-	-	+		0.91	33
<10	<10	<10	-	-	-	+		0.97	34
<10	<10	<10	-	-	-	-		0.92	35
<10	<10	<10	-	-	-	-		1.04	36
<10	<10	<10	-	-	-	+		1.52	37
<10	<10	<10	-	-	-	+		1.29	38
<10	<10	<10	-	-	-	+		1.00	39
<10	<10	<10	-	-	-	+		1.01	40
<10	<10	<10	-	-	-	+		1.02	41
<10	<10	<10	-	-	-	+		1.62	42
20	<10	<10	-	+	+	-		0.86	43
<10	<10	<10	-	+	+	-		0.88	44
<10	<10	<10	+	-	-	-	lecithin	1.23	45
<10	<10	<10	+	-	-	-	lecithin	1.05	46
<10	<10	<10	+	-	-	-	lecithin	1.14	47
<10	<10	<10	+	-	-	-	lecithin	1.30	48
-	-	-	+	-	-	-	lecithin	1.35	49
<10	10	<10	+	-	-	-	lecithin	1.18	50
<10	100	10	+	-	-	-		1.34	51
<10	10	<10	+	-	-	-		1.11	52
<10	<10	1,700	+	+	-	-		1.06	53
<10	10	30	+	+	-	-		1.03	54
<10	<10	<10	+	-	-	-	lecithin	1.26	55
9,200	20,000	70,000	+	-	-	-	lecithin	1.24	56
<10	<10	<10	+	-	-	-	lecithin	1.07	57
270	50	700	+	-	-	-	lecithin	1.10	58
-	-	-	-	-	-	-		1.26	59
<10	10	<10	-	-	-	-		1.02	60
<10	50	<10	-	-	-	-		1.23	61
<10	<10	<10	-	-	-	-		1.09	62
<10	10	<10	-	-	-	-		0.93	63
<10	<10	10	-	-	-	-		1.08	64
<10	30	4,700	-	-	-	-		1.01	65
<10	900	3,000	-	-	-	-		1.03	66
<10	<10	<10	-	+	-	-		0.91	67
<10	2,500	4,800	-	+	-	-		0.83	68
<10	36,000	17,000	-	-	-	-		1.08	69
1,700	29,000	130,000	-	-	-	-		1.01	70
10	<10	<10	+	-	-	-	lecithin	1.31	71
<10	10	<10	+	-	-	-	lecithin	1.19	72
<10	10	<10	+	-	-	-		1.00	73
<10	<10	40	+	-	-	-		0.96	74
<10	<10	<10	+	-	-	-		1.02	75
<10	<10	<10	+	-	-	-		1.04	76

Table 1 continued

Sample number	Brand, % fat, curd type or style	Code period (days)	Age at purchase (days)	Keeping quality (days)	Yeasts (no./g)	Molds (no./g)
77	Hood, 4%, large, all natural	18	13	18	1,200	<10
78	Hood, 4%, large, all natural	18	13	18	<10	<10
79	Hood, 4%, small, country style	18	9	18	60	<10
80	Hood, 4%, small, country style	18	12	18	<10	<10
81	Hood, Nuform, 1%, small, lowfat, 99% fat free	25	5	25	<10	<10
82	Hood, Nuform, 1%, small, lowfat, 99% fat free	25	6	25	<10	<10
83	Hood, 4%, pineapple	25	18	25	<10	<10
84	Hood, 4%, pineapple	25	18	25	<10	<10
85	Hood, 4%, garden salad, all natural	18	8	18	<10	<10
86	Hood, 4%, garden salad, all natural	18	8	18	<10	<10
87	Hood, 4%, chive, all natural	18	8	18	2,900	<10
88	Hood, 4%, chive, all natural	18	13	18	40	<10
89	Marcus Dairy, 4%	20	5	15	60	10
90	Marcus Dairy, 4%	20	6	20	<10	20
91	Moser Farms, 4%, small, naturally flavored	21	8	21	<10	<10
92	Moser Farms, 4%, small, naturally flavored	21	15	21	1,000	<10
93	Old Mill, 4%, small, no salt added	25	10	25	<10	<10
94	Pathmark, 4%, large, California, all natural	25 <sup>4</sup>	18	25	60	<10
95	Pathmark, 4%, large, California, all natural	21 <sup>4</sup>	20	21	<10	<10
96	Pathmark, 4%, small, all natural	21 <sup>4</sup>	9	21	<10	<10
97	Pathmark, 4%, small, all natural	25 <sup>4</sup>	12	25	<10	<10
98	Pathmark, 1%, lowfat	25	11	25	20	<10
99	Pathmark, 1%, lowfat	25	15	25	1,000	<10
100	Rosedale (Cabot), 4%, all natural	13	13	13	3,300	<10
101	Rosedale (Cabot), 4%	13	11	13	800	32,000
102	Rosedale (Cabot), 4%, all natural, no salt added	13	6	13	520	20
103	Sealtest, 4%, large, naturally flavored	60	12	31	<10	<10
104	Sealtest, 4%, large, naturally flavored	60	18	42	<10	<10
105	Sealtest, 4%, small, naturally flavored	60	18	40	3,100	<10
106	Sealtest, 4%, small, naturally flavored	60	20	41	<10	<10
107	Sealtest, Light 'n Lively, 1%, lowfat, 99% fat free	60	12	29	<10	<10
108	Sealtest, Light 'n Lively, 1%, lowfat, 99% fat free	60	14	35	<10	<10
109	Sealtest, Light 'n Lively, 1%, lowfat, peach and pineapple	50	18	18 <sup>5</sup>	<10	<10
110	Sealtest, Light 'n Lively, 1%, lowfat, peach and pineapple	50	10	50	110	<10
111	Sealtest, Light 'n Lively, 1%, lowfat, garden salad	50	21	50	<10	<10
112	Sealtest, Light 'n Lively, 1%, lowfat, garden salad	50	26	50	790	<10
113	Shop Rite, 4%, California	21	5	21	<10	<10
114	Shop Rite, 4%, California	21	13	21	<10	<10
115	Shop Rite, 4%, chunky	21	8	21	<10	<10
116	Shop Rite, 4%, chunky	21	14	21	<10	<10
117	Shop Rite, 4%, tiny	21 <sup>4</sup>	8	21	<10	<10
118	Shop Rite, 4%, tiny	25 <sup>4</sup>	12	25	<10	<10
119	Shop Rite, SomeThinLite, 1%, lowfat	21	8	21	<10	<10
120	Shop Rite, SomeThinLite, 1%, lowfat	21	14	21	<10	<10
121	Shop Rite, 4%, pineapple	25	17	25	<10	<10
122	Shop Rite, 4%, pineapple	25	19	25	<10	<10
123	Stew Leonard's, 4%, all natural	21	7	17	<10	<10
124	Stew Leonard's, 4%, all natural	21	8	21	<10	<10
125	Stop & Shop, 4%, large, all natural	21	14	21	<10	<10
126	Stop & Shop, 4%, large, all natural	21	24	24 <sup>1</sup>	230	<10
127	Stop & Shop, 4%, small, all natural	21	14	21	<10	<10
128	Stop & Shop, 4%, small, all natural	21	14	21	<10	<10
129	Stop & Shop, 1%, small, all natural, 99% fat free	21	15	21	<10	<10
130	Stop & Shop, 1%, small, all natural, 99% fat free	21	14	21	<10	<10
131	Shurefine, 4%	21	15	21	30	10
132	Shurefine, 4%	21	22	22 <sup>1</sup>	<10	<10
133	University of Connecticut	6	—	10	<10	<10
134	Waldbaum's, 4%, California	21	11	21	1,500	120
135	Waldbaum's, 4%, California	21	12	21	120	20
136	Waldbaum's, 4%, pineapple	21	12	18	10	<10
137	Waldbaum's, 4%, pineapple	21	12	21	120,000	<10
138	Wawa, 4%, small, naturally flavored	60	12	39	<10	<10
139	Wawa, 4%, small, naturally flavored	60	20	38	<10	<10
140	Zausner's, 4%, herb and garlic	60	39	7	—	—
141	Zausner's, 4%, herb and garlic	60	39	7	—	—

## Footnotes to Table 1:

1. Past code date when purchased but quality satisfactory.
2. Mold found on surface of cheese when purchased. Therefore samples were not tested for microbes.
3. Yeast found growing on surface of cheese when purchased. Therefore samples were not tested for microbes.
4. Different code period for each sample because they were made at different plants.

Coliform bacteria (no./g)	Gram Negative Bacteria		Label Declarations					Acidity (%)	Sample number
	Proteolytic (no./g)	Lipolytic (no./g)	Stabilizers	Sugar	Citric acid	Enzymes	Misc. additives		
<10	10	30	-	-	-	+		1.11	77
<10	<10	11,000,000	-	-	-	+		1.01	78
700	<10	340	-	-	-	-		0.99	79
<10	<10	120	-	-	-	-		0.98	80
<10	<10	<10	+	-	-	-	glyc.	1.17	81
<10	<10	10	+	-	-	-	glyc.	1.08	82
<10	<10	<10	-	+	-	-		0.92	83
<10	<10	<10	-	+	-	-		0.95	84
<10	<10	<10	-	-	-	-		1.10	85
<10	<10	2,600,000	-	-	-	-		1.08	86
<10	8	3,200,000	-	-	-	-		1.09	87
20	70,000	820,000	-	-	-	-		1.09	88
<10	20	56	+	-	-	-	cal. sulf.	1.09	89
210	20	190	+	-	-	-	cal. sulf.	1.04	90
170	<10	170	+	-	-	-	lecithin	1.24	91
150	3,000,000	3,000,000	+	-	-	-	lecithin	1.31	92
81,000	<10	<10	+	-	-	-		1.04	93
<10	<10	<10	-	-	-	-		1.06	94
<10	<10	<10	-	-	-	-		1.05	95
<10	<10	<10	-	-	-	-		0.98	96
<10	<10	<10	-	-	-	-		1.11	97
<10	<10	<10	+	-	-	-		1.07	98
<10	<10	<10	+	-	-	-		1.16	99
66,000	60	150,000	-	-	-	-		1.17	100
180,000	450,000	<10	-	-	-	-		1.15	101
170,000	360,000	510,000	-	-	-	-		0.91	102
<10	<10	<10	+	-	-	+		1.03	103
<10	<10	<10	+	-	-	+		0.98	104
<10	<10	<10	+	-	-	-		0.98	105
<10	10	<10	+	-	-	-		1.00	106
<10	<10	<10	+	-	-	-	artif. flav. <sup>8</sup>	0.99	107
<10	<10	<10	+	-	-	-	artif. flav.	0.97	108
<10	10	<10	+	+	-	-	artif. flav., starch	1.23	109
<10	<10	<10	+	+	-	-	artif. flav., starch	0.88	110
<10	<10	<10	+	-	-	-	{vinegar, artif. flav.}	1.03	111
<10	<10	<10	+	-	-	-	{cotton seed oil}	1.00	112
<10	<10	<10	-	-	-	-		0.98	113
<10	<10	<10	-	-	-	-		1.02	114
30	<10	<10	-	-	-	-		1.00	115
2,600	130	500	-	-	-	-		1.02	116
10	<10	<10	-	-	-	-		0.98	117
<10	<10	<10	-	-	-	-		1.03	118
10	10	110,000	+	-	-	-		1.03	119
4,500	800	2,100	+	-	-	-		1.13	120
<10	<10	<10	+	+	-	-		0.84	121
<10	<10	<10	+	+	-	-		0.91	122
<10	<10	<10	-	-	-	+		1.12	123
10	120	40	-	-	-	+		1.20	124
<10	<10	<10	-	-	-	-		0.99	125
<10	<10	<10	-	-	-	-		0.96	126
<10	<10	<10	-	-	-	-		0.94	127
<10	20	<10	-	-	-	-		0.98	128
<10	<10	<10	-	-	-	-		1.14	129
<10	10	<10	-	-	-	-		1.10	130
<10	<10	<10	+	-	-	-	lecithin	1.22	131
<10	<10	<10	+	-	-	-	lecithin	1.17	132
<10	<10	<10	+	-	-	-		1.03	133
<10	<10	<10	-	-	-	+		0.96	134
>300,000	<10	<10	-	-	-	+		0.99	135
<10	<10	10	-	-	-	+		0.78	136
<10	100	1,100	-	-	-	+		0.90	137
<10	<10	<10	+	-	-	+		0.96	138
<10	<10	<10	+	-	-	+		1.01	139
-	-	-	+	-	-	+		1.23	140
-	-	-	+	-	-	+		0.94	141

5. Extremely poor consistency when purchased; very loose and not of acceptable quality.

6. Code period unknown but cheese remained acceptable for 10 days after purchase.

7. Mold found on surface of sample 140 and bacterial growth on sample 141 when purchased. Thus, samples not of acceptable quality and not tested for microbes.

8. Cal. sulf. means calcium sulfate, glyc. means glycerides, artif. flav. means artificial flavor.

0.5% and 2% fat and have a moisture content below 82.5%.

Labeling must indicate if a preservative was used and if enzymes were added during the manufacturing process. If the cheese is flavored (fruit, vegetables) the cheese portion must conform to the Federal regulations. However, the nutrient declarations are based on the finished product (2).

Ricotta cheese is similar to cottage cheese in many respects. It was formerly made only from whey, but now it is usually made from whole or part skim milk. Ricotta cheese usually is softer and has a finer curd size than cottage cheese.

As sold, ricotta cheese usually contains 4 to 10% fat. In the manufacture of ricotta cheese, lactic acid bacteria sometimes are used to form acid to precipitate the milk proteins and to improve flavor. Enzymes and even food grade acids are used alone or in combination with the bacteria. Ricotta has more solids than cottage cheese, averaging about 25%. It is most often used in cooking and baking.

#### METHODS

All samples were purchased at food stores in Connecticut from April through June 1980. We tested 141 cottage cheese samples including 107 regular creamed (4% fat), 30 lowfat (1 to 2% fat) and 4 dry curd (less than 0.5% fat). Of the regular creamed type 24 were flavored (fruit, vegetables, herbs) and of the lowfat type four were flavored.

The cottage cheeses included seven curd sizes: large, small, tiny, California, chunk, pot, and whipped. Not all curd sizes were found for each brand and 16 of the samples did not state a curd size on the label. Of the 19 ricotta cheeses 12 declared they were made from whole milk and 7 from part skim milk.

Two samples of most brands or varieties of cottage cheese (except for three brands) were purchased. Each sample was manufactured on a different day. For two brands only one sample was obtainable and for another we obtained three samples, one of which declared that no salt was added.

We tested one sample of each brand of ricotta cheese. Duplicate samples of each cottage and ricotta cheese were purchased each time; one was used for microbial and chemical analysis, and one for taste and keeping quality analysis.

Analyses for coliform bacteria were made using Violet Red Bile agar and for yeasts and molds using acidified potato dextrose agar according to Standard Methods (8). We have described assays for numbers of proteolytic and lipolytic gram negative bacteria (4).

Analyses for percent acidity, fat and protein were made according to Official Methods (6). Calculations used for estimating carbohydrate and calories have been described (5). Sodium was determined by atomic absorption spectrophotometry (1) and sorbate by high-pressure liquid-chromatography (7).

Nutritional claims for cottage and ricotta cheese are usually based on a 4-ounce serving (113 grams). For comparison, data for the nutrients fat, protein, and carbohydrate and for caloric content are based on 113 grams.

For assessing keeping quality, samples were refrigerated at 40 F (4.4 C) and examined and tasted periodically until the code date was reached (date stamped on carton as last day of sale). Since flavor, size of curd and consistency are matters of personal choice, we rejected samples as unsatisfactory only when an obvious flavor defect or surface microbial growth was evident. Cheese samples containing microbial growth on the surface when purchased were considered unsatisfactory.

Code periods, the number of days from manufacture to last day of sale stamped on the carton (code date) were supplied by all the manufacturers.

#### RESULTS AND DISCUSSION

##### Plant Permit Numbers:

The label must state where the product was manufactured. This is done in one of two ways: either by listing a plant permit number (designated by the State Department of Agriculture) or, if the plant is making and distributing the product directly under



its own brand, then by listing its name and address. When the plant permit number is used, the number preceding the dash (Tables 2 and 4) (for example, 36-1234) indicates the state, and the number after the dash designates the specific manufacturing plant. In the present study 09- indicates Connecticut, 36- New York, 34- New Jersey, 42- Pennsylvania and 50- Vermont.

The majority of the cottage cheese samples (56.7%) were made at six different plants in New York. Only two plants in Connecticut make cottage cheese and represent 3.5% of the samples. Forty-one samples had no plant permit designation; all but one were made by four manufacturers: Sealtest, Hood, Borden, and Friendship. Note that in some cases (Table 2) two samples of the same brand were made at different plants.

Each brand of ricotta cheese (except one: footnote 3, Table 4) was made at a different plant (Table 4).

#### Code Periods and Shelf Life:

Twenty-six of the 140 cottage cheese samples, or about 19%, (sample 133 had no code date) failed to have acceptable quality to the end of the designated code period (Table 1). We stored the samples at 40 F (4.4 C) after purchase. A higher refrigeration temperature certainly would have further decreased the shelf life.

The average age at purchase of all samples was 15.9 days from date of manufacture; the range was from 5 to 39 days (Table 1). Seven samples were beyond the code date (outdated) stamped on the carton, (samples 3, 18, 32, 45, 58, 67, 126, 131, Table 1), but all of these except sample 58 were of acceptable quality. Four samples contained visible microbial growth on the surface of the cheese when purchased and thus were not of acceptable quality. Only one (sample 58) had reached the end of its designated code date. Code periods (days from manufacture to date stamped on carton) ranged from 13 to 60 days.

The code periods for ricotta cheese ranged from 21 to 60 days (Table 3). The average age at purchase was 19.5 days with a range from 1 to 46 days. Eight of the ricotta cheeses did not remain of acceptable quality to the code date stamped on the

carton (Table 3).

#### Microbial Analysis:

Yeasts: Most samples (55%) of cottage cheese contained fewer than 10 yeasts per gram (Table 1). Ten is the lowest number of any microbe that can be detected by our methods of analysis. Some samples contained an excessive number of yeasts (greater than 50 per gram). There was no evidence that samples containing sorbate (a yeast and mold inhibitor) contained fewer yeasts than those samples not containing this preservative. All of the ricotta cheeses contained less than 10 yeasts per gram.

Molds: Mold contamination was generally minimal in the cottage cheeses (less than 10 per gram) (Table 1). However, many samples were eventually rejected as not lasting to the end of the code period because of microbial growth on the surface of the cheese. Ricotta cheeses were also low in mold contamination except for two samples that contained mold on the surface of the cheese when purchased (Table 3).

Coliform bacteria: The presence of coliform bacteria may indicate poor sanitation practices during manufacturing and processing. A large portion of the cottage cheese samples (79%) contained fewer than 10 coliform bacteria per gram indicating sanitary manufacturing techniques were used (Table 1).

Only two samples of ricotta cheese contained an excessive number of coliform bacteria (Table 3, samples 15 and 16).

Gram negative bacteria: Psychrotrophs are organisms which can grow at refrigeration temperatures. Many of the psychrotrophs in dairy products are gram negative bacteria, usually pseudomonads. They are very active biochemically and able to degrade the lipids (fat) and casein (milk protein) to produce flavors and odors that make the product unpalatable. Most psychrotrophs are killed by pasteurization and if found in dairy products are probably reintroduced during packaging.

Since protein (casein) and fat (cream) are major constituents of cottage and ricotta cheeses, we tested for two types of gram negative bacteria: those that degrade fat (lipolytic bacteria) and those that degrade protein (proteolytic bacteria).

Table 2. Nutrients in 113 grams (4 ounces) and percentage of moisture and sorbate in cottage cheese

Sample number	Brand, % fat, curd type or style	Plant permit number	Moisture (%)	Fat	
				Claim (g)	% of claim found
1	A & P, 4%, large	36-0329	79.0	5	92.0
2	A & P, 4%, large	36-0329	79.7	5	98.0
3	A & P, 4%, small	36-2345	79.4	5	104.0
4	A & P, 4%, small	36-2345	79.9	5	94.0
5	A.C. Petersen Farms, 4%	09-221	80.1	4	125.0
6	A.C. Petersen Farms, 4%	09-221	79.1	4	147.5
7	Axelrod's, 4%, chunk, all natural	36-0329	78.9	5	118.0
8	Axelrod's, 4%, chunk, all natural	36-2345	79.6	5	104.0
9	Axelrod's, 4%, small, all natural	36-2345	79.9	5	102.0
10	Axelrod's, 4%, small, all natural	36-2345	79.2	5	100.0
11	Axelrod's, 4%, pot, all natural	36-2345	79.7	5	100.0
12	Axelrod's, 4%, pot, all natural	36-2345	80.5	5	90.0
13	Axelrod's, 4%, whipped, all natural	36-2345	78.9	5	102.0
14	Axelrod's, 4%, whipped, all natural	36-2345	80.2	5	96.0
15	Axelrod's, Easy Dieter, 1%, lowfat	36-0329	81.5	1	150.0
16	Axelrod's, Easy Dieter, 1%, lowfat	36-2345	82.1	1	180.0
17	Axelrod's, less than 1/2%, dry curd, no salt added	36-2345	78.9	1	40.0
18	Axelrod's, less than 1/2%, dry curd, no salt added	36-2345	81.2	1	30.0
19	Axelrod's, 4%, pineapple	36-2345	73.4	4	67.5
20	Axelrod's, 4%, pineapple	36-2345	75.7	4	62.5
21	Axelrod's, 4%, fruit salad	36-2345	75.2	4	55.0
22	Axelrod's, 4%, fruit salad	36-2345	77.3	4	62.5
23	Axelrod's, 4%, garden salad	36-2345	80.4	4	110.0
24	Axelrod's, 4%, garden salad	36-2345	81.0	4	115.0
25	Befit, 1%, lowfat	36-1564	82.3	1	170.0
26	Befit, 1%, lowfat	36-1564	81.3	1	170.0
27	Borden, 4%, large	not listed	80.9	5	88.0
28	Borden, 4%, large	not listed	79.8	5	88.0
29	Borden, 4%, small	not listed	79.4	5	90.0
30	Borden, 4%, small	not listed	81.7	5	90.0
31	Borden, Lite-line, 1%, lowfat	not listed	82.4	1	170.0
32	Borden, Lite-line, 1%, lowfat	not listed	82.6	1	160.0
33	Breakstone's, 4%, California, all natural	36-2158	79.2	5	100.0
34	Breakstone's, 4%, California, all natural	36-2158	82.0	5	84.0
35	Breakstone's, 4%, small, all natural, smooth and creamy	36-2158	80.2	5	96.0
36	Breakstone's, 4%, small, all natural, smooth and creamy	36-2158	80.1	5	98.0
37	Breakstone's, 4%, small, tangy, all natural	36-2158	80.5	5	96.0
38	Breakstone's, 4%, small, tangy, all natural	36-2158	81.2	5	94.0
39	Breakstone's, 2%, lowfat, all natural	36-2158	82.9	2	130.0
40	Breakstone's, 2%, lowfat, all natural	36-2158	82.1	2	120.0
41	Breakstone's, less than 1/2%, dry curd, no salt added	36-2158	79.7	0	
42	Breakstone's, less than 1/2%, dry curd, no salt added	36-2158	80.6	0	
43	Breakstone's, 4%, pineapple	36-2158	74.4	5	68.0
44	Breakstone's, 4%, pineapple	36-2158	75.5	5	48.0
45	Cumberland Farms, 4%, small	36-1564	80.2	5	86.0
46	Cumberland Farms, 4%, small	36-1564	82.0	5	74.0
47	Dairylea, 4%, small	36-1564	79.1	5	108.0
48	Dairylea, 4%, small	36-1564	78.4	5	100.0
49	Daitch, 4%, California	36-1564	81.4	5	102.0
50	Daitch, 4%, California	36-1564	78.9	5	94.0
51	Daitch, Brisk 'n Bouncy, 1%, lowfat	36-1564	81.1	1	110.0
52	Daitch, Brisk 'n Bouncy, 1%, lowfat	36-1564	81.6	1	180.0
53	Deary Bros., 4%	50-61	76.7	5	158.0
54	Deary Bros., 4%	50-61	78.1	5	142.0
55	Finast, 4%, large	36-1564	79.8	5	102.0
56	Finast, 4%, large	36-1564	79.2	5	90.0
57	Finast, 4%, small	36-1564	81.7	5	80.0
58	Finast, 4%, small	36-1564	80.3	5	98.0
59	Friendship, 4%, California	not listed	80.8	5	110.0
60	Friendship, 4%, California	not listed	80.5	5	100.0
61	Friendship, 2%, pot, lowfat	not listed	80.8	2	140.0
62	Friendship, 2%, pot, lowfat	not listed	81.4	2	130.0
63	Friendship, 1%, lowfat	not listed	83.6	1	160.0
64	Friendship, 1%, lowfat	not listed	81.7	1	200.0
65	Friendship, Calorie Meter, 1%, lowfat, no salt added	not listed	81.1	1	200.0
66	Friendship, Calorie Meter, 1%, lowfat, no salt added	not listed	82.2	1	190.0
67	Friendship, 4%, pineapple	not listed	76.4	4	80.0
68	Friendship, 4%, pineapple	not listed	77.4	4	72.5
69	Friendship, 4%, garden salad	not listed	81.5	5	84.0
70	Friendship, 4%, garden salad	not listed	81.3	5	96.0
71	Garelick Farms, 4%, small	36-1564	79.0	5	96.0
72	Garelick Farms, 4%, small	36-1564	81.1	5	86.0
73	Grand Union, 4%	36-2345	80.3	5	98.0
74	Grand Union, 4%	36-2345	80.0	5	92.0
75	Guida's Dairy, 4%, large, natural	36-2345	80.6	5	90.0
76	Guida's Dairy, 4%, large, natural	36-2345	80.2	5	98.0

Protein		Carbohydrate		Calories		Sodium found (mg)	Sorbate <sup>4</sup>		Sample number
Claim (g)	% of claim found	Claim (g)	% of claim found	Claim (no.)	% of claim found		Claim	Found (%)	
14	86.4	4	135.0	120	91.7	655	-	0	1
14	97.1	4	77.5	120	90.8	710	-	0	2
14	100.7	4	62.5	120	93.3	331	-	0	3
14	102.9	4	55.0	120	90.0	435	-	0	4
14	95.0	4	62.5	120	89.2	467	-	0.08	5
14	82.1	4	115.0	120	96.7	405	-	0.10	6
14	106.4	4	30.0	120	97.5	757	-	0	7
14	97.1	4	72.5	120	92.5	780	-	0	8
14	92.9	4	80.6	120	91.7	472	-	0	9
14	102.9	4	70.0	120	93.3	424	-	0	10
14	105.7	4	47.5	120	91.7	610	-	0	11
14	102.9	4	55.0	120	87.5	373	-	0	12
14	76.4	4	170.0	120	95.0	359	-	0	13
14	95.7	4	67.5	120	89.2	308	-	0	14
14	97.1	4	105.0	90	93.3	576	-	0.11	15
14	94.3	4	92.5	90	93.3	695	-	0.03	16
18	97.8	3	163.3	80	116.3	46 <sup>3</sup>	-	0	17
18	90.0	3	130.0	80	102.5	125 <sup>3</sup>	-	0	18
11	105.5	15	98.0	140	92.1	520	+	0.13	19
11	102.7	15	84.0	140	84.3	311	+	0	20
11	83.6	15	104.0	140	85.0	475	+	0.03	21
11	90.9	15	80.0	140	78.6	401	+	0.06	22
14	82.1	2	235.0	110	93.6	565	+	0.05	23
14	88.6	2	150.0	110	92.7	359	+	0	24
14	86.4	4	122.5	90	92.2	297	-	0	25
14	102.1	4	95.0	90	97.8	314	-	0	26
14	106.4	4	22.5	120	85.0	401	+	0.09	27
14	107.1	4	47.5	120	88.3	520	+	0.04	28
14	98.6	4	90.0	120	90.8	399	+	0	29
14	89.3	4	57.5	120	82.5	399	+	0.07	30
14	98.6	4	62.5	90	88.9	520	-	0.07	31
14	96.4	4	70.0	90	87.8	469	-	0.09	32
14	104.3	4	62.5	120	93.3	554	-	0	33
14	96.4	4	40.0	120	80.8	401	-	0	34
12	120.0	5	36.0	110	96.4	418	-	0	35
12	119.2	5	38.0	110	97.3	354	-	0	36
14	82.1	4	102.5	120	87.5	617	-	0	37
14	94.3	4	45.0	120	84.2	365	-	0	38
12	113.3	4	45.0	90	93.3	644	-	0	39
12	107.5	4	85.0	90	95.6	412	-	0	40
15	108.0	8	65.0	80	112.5	53 <sup>3</sup>	-	0	41
15	96.0	8	75.0	80	108.8	66 <sup>3</sup>	-	0	42
10	105.0	13	108.5	140	91.4	531	-	0.03	43
10	115.0	13	98.5	140	78.6	418	-	0.02	44
14	93.6	4	85.0	120	86.7	576	-	0	45
14	73.6	4	125.0	120	78.3	893	-	0	46
14	70.7	4	165.0	120	94.2	540	-	0.10	47
14	104.3	4	77.5	120	95.8	521	-	0	48
14	99.3	4	77.5	120	78.9	568	-	0	49
14	80.7	4	137.5	120	79.5	486	-	0	50
14	104.3	4	105.0	90	94.4	339	-	0	51
14	98.6	4	95.0	90	95.6	350	-	0	52
14	90.7	4	92.5	120	112.5	599	+	0.17	53
14	97.1	4	52.5	120	104.2	568	+	0.20	54
14	97.1	4	62.5	120	90.8	551	-	0	55
14	108.6	4	57.5	120	91.7	414	-	0	56
14	93.6	4	57.5	120	80.8	693	-	0	57
14	95.7	4	62.5	120	88.3	554	-	0	58
14	88.6	4	70.0	120	90.8	303	-	0	59
14	94.3	4	62.5	120	89.2	659	-	0	60
14	94.3	4	90.0	100	92.0	484	-	0	61
14	97.1	4	102.5	100	94.0	427	-	0	62
14	102.1	4	32.5	90	84.4	614	-	0	63
14	102.9	4	67.5	90	95.6	450	-	0	64
14	98.6	4	100.0	90	98.9	94	-	0	65
14	106.4	4	65.0	90	96.7	305	-	0	66
11	102.7	15	74.0	140	84.3	407	-	0.03	67
11	117.3	15	58.0	140	80.0	438	-	0	68
14	86.4	4	85.0	120	82.5	401	-	0	69
14	82.1	4	85.0	120	85.0	286	-	0	70
14	88.6	4	125.0	120	92.5	480	-	0	71
14	90.0	4	77.5	120	84.2	299	-	0	72
14	109.3	4	17.5	120	89.2	367	-	0	73
14	96.4	4	75.0	120	89.2	551	-	0	74
14	101.4	4	42.5	120	86.7	531	-	0	75
14	94.3	4	72.5	120	90.0	599	-	0	76

Table 2 continued

Sample number	Brand, % fat, curd type or style	Plant permit number	Moisture (%)	Fat	
				Claim (g)	% of claim found
77	Hood, 4%, large, all natural	not listed	79.1	5	102.0
78	Hood, 4%, large, all natural	not listed	80.4	5	92.0
79	Hood, 4%, small, country style	not listed	80.6	5	110.0
80	Hood, 4%, small, country style	not listed	79.9	5	98.0
81	Hood, Nuform, 1%, small, lowfat, 99% fat free	not listed	82.4	1	120.0
82	Hood, Nuform, 1%, small, lowfat, 99% fat free	not listed	82.7	1	110.0
83	Hood, 4%, pineapple	not listed	73.6	4	55.0
84	Hood, 4%, pineapple	not listed	74.8	4	50.0
85	Hood, 4%, garden salad, all natural	not listed	79.6	5	90.0
86	Hood, 4%, garden salad, all natural	not listed	80.1	5	96.0
87	Hood, 4%, chive, all natural	not listed	80.3	5	94.0
88	Hood, 4%, chive, all natural	not listed	80.8	5	86.0
89	Marcus Dairy, 4%	09-221	80.3	4	127.5
90	Marcus Dairy, 4%	09-221	79.4	4	142.5
91	Moser Farms, 4%, small, naturally flavored	36-1564	79.8	5	94.0
92	Moser Farms, 4%, small, naturally flavored	36-1564	78.7	5	96.0
93	Old Mill, 4%, small, no salt added	36-0329	78.8	5	104.0
94	Pathmark, 4%, large, California, all natural	36-0329	79.6	5	80.0
95	Pathmark, 4%, large, California, all natural	36-3417	80.3	5	64.0
96	Pathmark, 4%, small, all natural	36-3417	79.8	5	104.0
97	Pathmark, 4%, small, all natural	36-0329	79.7	5	80.0
98	Pathmark, 1%, lowfat	36-0329	82.4	1	150.0
99	Pathmark, 1%, lowfat	36-0329	81.6	1	140.0
100	Rosedale (Cabot), 4%, all natural	50-19	77.8	5	102.0
101	Rosedale (Cabot), 4%	50-19	78.9	5	106.0
102	Rosedale (Cabot), 4%, all natural, no salt added	50-19	79.2	5	118.0
103	Sealtest, 4%, large, naturally flavored	not listed	80.8	5	86.0
104	Sealtest, 4%, large, naturally flavored	not listed	80.9	5	84.0
105	Sealtest, 4%, small, naturally flavored	not listed	81.0	5	94.0
106	Sealtest, 4%, small, naturally flavored	not listed	81.2	5	92.0
107	Sealtest, Light 'n Lively, 1%, lowfat, 99% fat free	not listed	84.0	1	100.0
108	Sealtest, Light 'n Lively, 1%, lowfat, 99% fat free	not listed	83.4	1	100.0
109	Sealtest, Light 'n Lively, 1%, lowfat, peach and pineapple	not listed	79.9	1	77.0
110	Sealtest, Light 'n Lively, 1%, lowfat, peach and pineapple	not listed	79.6	1	63.0
111	Sealtest, Light 'n Lively, 1%, lowfat, garden salad, 99% fat free	not listed	83.4	1	150.0
112	Sealtest, Light 'n Lively, 1%, lowfat, garden salad, 99% fat free	not listed	82.5	1	160.0
113	Shop Rite, 4%, California	36-3417	79.6	5	110.0
114	Shop Rite, 4%, California	36-3417	79.3	5	100.0
115	Shop Rite, 4%, chunky	42-037	81.2	5	100.0
116	Shop Rite, 4%, chunky	42-037	81.1	5	86.0
117	Shop Rite, 4%, tiny	42-037	80.2	5	108.0
118	Shop Rite, 4%, tiny	36-2345	80.4	5	96.0
119	Shop Rite, SomeThinLite, 1%, lowfat	42-037	81.2	1	180.0
120	Shop Rite, SomeThinLite, 1%, lowfat	42-037	80.9	1	150.0
121	Shop Rite, 4%, pineapple	36-2345	75.2	4	60.0
122	Shop Rite, 4%, pineapple	36-2345	76.4	4	57.5
123	Stew Leonard's, 4%, all natural	36-1564	80.6	5	96.0
124	Stew Leonard's, 4%, all natural	36-1564	79.3	5	102.0
125	Stop & Shop, 4%, large, all natural	36-3417	79.3	5	120.0
126	Stop & Shop, 4%, large, all natural	36-3417	79.4	5	104.0
127	Stop & Shop, 4%, small, all natural	36-3417	78.8	5	128.0
128	Stop & Shop, 4%, small, all natural	36-3417	77.9	5	118.0
129	Stop & Shop, 1%, small, all natural, 99% fat free	36-3417	81.8	1	200.0
130	Stop & Shop, 1%, small, all natural, 99% fat free	36-3417	81.6	1	320.0
131	Shurfine, 4%	36-1564	79.9	5	90.0
132	Shurfine, 4%	36-1564	79.3	5	102.0
133	University of Connecticut <sup>2</sup>	not listed	77.6	-	-
134	Waldbaum's, 4%, California	42-100	80.4	5	122.0
135	Waldbaum's, 4%, California	42-100	78.4	5	112.0
136	Waldbaum's, 4%, pineapple	42-100	68.4	4	85.0
137	Waldbaum's, 4%, pineapple	42-100	68.1	4	85.0
138	Wawa, 4%, small, naturally flavored	36-1731	80.8	5	96.0
139	Wawa, 4%, small, naturally flavored	36-1731	80.6	5	94.0
140	Zausner's, 4%, herb and garlic	42-100	77.3	5	128.0
141	Zausner's, 4%, herb and garlic	42-100	79.3	5	108.0

## Footnotes to Table 2.

- Labels on these samples stated 0 grams fat per 113 grams. We found 0.5 gram fat per 113 grams for sample 41 and 0.6 gram for sample 42.
- There were no nutrient claims on the label. We found 9.4 grams fat, 12.0 grams protein, 2.3 grams carbohydrate, and 140 calories per 113 grams.

Protein		Carbohydrate		Calories		Sodium found (mg)	Sorbate <sup>4</sup>		Sample number
Claim (g)	% of claim found	Claim (g)	% of claim found	Claim (no.)	% of claim found		Claim	Found (%)	
14	113.6	3	46.7	120	94.2	435	-	0	77
14	102.9	3	60.0	120	87.5	390	-	0	78
14	99.3	3	40.0	120	90.8	492	-	0	79
14	97.1	3	93.3	120	90.0	435	-	0	80
14	96.4	4	95.0	90	88.9	546	+	0.01	81
14	94.3	4	97.5	90	86.7	388	+	0.09	82
11	81.8	13	133.1	130	95.4	768	-	0.04	83
11	91.8	13	114.3	130	90.8	633	-	0.03	84
14	102.9	4	70.0	110	98.2	452	-	0	85
14	102.1	4	47.5	110	96.4	610	-	0	86
14	94.3	4	75.0	120	88.3	520	-	0	87
14	94.3	4	72.5	120	85.0	644	-	0	88
14	87.9	4	87.5	120	90.0	390	-	0.11	89
14	106.4	4	25.0	120	95.0	456	-	0.13	90
14	110.0	4	30.0	120	90.0	410	-	0	91
14	100.7	4	87.5	120	93.3	610	-	0	92
14	95.0	4	97.5	120	95.8	384	-	0	93
14	100.7	4	80.0	120	87.5	475	-	0	94
14	105.7	4	80.0	120	83.3	266	-	0	95
14	97.1	4	67.5	120	91.7	446	-	0	96
14	97.1	4	97.5	120	87.5	486	-	0	97
14	100.7	4	65.0	90	87.8	582	-	0	98
14	102.9	4	92.5	90	93.3	362	-	0.08	99
14	119.3	4	37.5	120	98.3	610	-	0	100
14	114.3	4	20.0	120	95.0	376	-	0	101
14	89.3	4	107.5	120	99.2	42	-	0	102
12	92.5	4	115.0	110	91.8	497	-	0	103
12	101.7	4	87.5	110	99.0	501	-	0	104
12	109.2	4	52.5	110	92.7	438	-	0	105
12	105.0	4	60.0	110	90.9	427	-	0	106
12	105.8	4	70.0	80	88.5	484	-	0	107
12	103.3	4	100.0	80	92.5	444	-	0	108
12	74.2	11	105.5	100	89.0	441	-	0.02	109
12	89.2	11	92.7	100	89.0	446	-	0.02	110
13	88.5	5	90.0	90	86.7	373	-	0	111
13	90.8	5	94.0	90	87.8	524	-	0	112
14	95.0	4	70.0	120	94.2	362	-	0	113
14	98.6	4	82.5	120	93.3	345	-	0	114
14	86.4	4	67.5	120	85.8	429	-	0	115
14	98.6	4	47.5	120	83.3	405	-	0.04	116
14	102.1	4	85.0	90	96.7	418	-	0.03	117
14	98.6	4	120.0	90	96.7	371	-	0.04	118
14	78.6	4	110.0	120	90.8	433	-	0	119
14	90.0	4	82.5	120	88.3	401	-	0	120
11	78.2	15	106.0	140	85.0	588	+	0.12	121
11	79.1	15	97.3	140	81.4	299	+	0.12	122
14	82.1	4	102.5	120	86.7	452	-	0	123
14	82.1	4	127.5	120	93.3	548	-	0	124
14	97.1	4	60.0	120	96.7	418	-	0	125
14	84.3	4	115.0	120	93.3	365	-	0	126
14	92.9	4	65.0	120	100.0	489	-	0	127
14	75.0	4	172.5	120	101.0	503	-	0	128
14	98.6	4	85.0	90	95.5	438	-	0	129
14	92.9	4	80.0	90	103.3	418	-	0	130
14	102.9	4	57.5	120	88.3	484	-	0	131
14	104.3	4	47.5	120	92.5	497	-	0	132
-	-	-	-	-	-	446	-	0	133
14	78.6	2	190.0	120	94.2	342	-	0	134
14	99.3	2	170.0	120	98.3	435	-	0	135
11	81.8	13	170.0	130	118.5	441	-	0	136
11	88.2	13	168.5	130	120.0	622	-	0	137
14	82.1	4	95.0	120	85.8	421	-	0	138
14	92.9	4	67.5	120	86.7	384	-	0	139
14	92.9	4	107.5	120	104.2	622	-	0	140
14	91.4	4	87.5	120	93.3	574	-	0	141

3. The labels on samples 17 and 18 claimed 29 milligrams sodium per 113 grams and samples 41 and 42 claimed 55 milligrams per 113 grams.

4. A zero level of sorbate means the amount found was less than 0.001%.

Table 3. Code period, age, keeping quality, and microbial contaminants in ricotta cheese

Sample number	Brand and type	Code period (days)	Age at purchase (days)
1	A & P, part skim, all natural	45	35
2	Axelrod's, part skim	60	46
3	Axelrod's, whole milk	60	24
4	Bella Cotta, whole milk, all natural	40	38
5	Brunetto, part skim	45	11
6	Brunetto, whole milk, all natural, no additives, preservatives, chemicals	45	24
7	Calabro, part skim	30	0
8	Calabro, whole milk	30	14
9	Cutrufello's, whole milk, all natural	30	8
10	Daitch, part skim, country packaged, all natural, no additives	45	9
11	Daitch, whole milk, country packaged, 100% natural, no additives	45	16
12	Guglietta, whole milk, natural	50	38
13	Polly-0, part skim, natural, no preservatives	45	33
14	Polly-0, whole milk, natural, no artificial ingredients, preservatives, flavoring	45	26
15	Roma, whole milk, all natural, no additives or preservatives	30	1
16	Sam Maulucci & Sons, whole milk, natural	21	5
17	Sorrento, part skim	56	5
18	Sorrento, whole milk	56	20
19	Stop & Shop, whole milk, all natural	45	17

Footnotes to Table 3:

<sup>1</sup> Mold growth on surface when purchased. Thus, microbial analyses not made.

Table 4. Nutrients per 113 grams (4 ounces) and percentage of acidity and sorbate in ricotta cheese

Sample number	Brand and type	Plant permit number	Moisture (%)
1	A & P, part skim, all natural	34-1138	75.5
2	Axelrod's, part skim	B-0355 <sup>2</sup>	73.0
3	Axelrod's, whole milk	not listed	73.4
4	Bella Cotta, whole milk, all natural	3893 <sup>2</sup>	70.8
5	Brunetto, part skim	not listed	73.6
6	Brunetto, whole milk, all natural, no additives, preservatives, chemicals	not listed	73.8
7	Calabro, part skim	not listed	70.1
8	Calabro, whole milk	not listed	74.2
9	Cutrufello's, whole milk, all natural	not listed	70.7
10	Daitch, part skim, country packaged, all natural, no additives	36-3453	73.7
11	Daitch, whole milk, country packaged, 100% natural, no additives	36-3453	71.8
12	Guglietta, whole milk, natural	not listed	70.5
13	Polly-0, part skim, natural, no preservatives	36-8071	73.2
14	Polly-0, whole milk, natural, no artificial ingredients, preservatives, flavoring	36-8071	70.4
15	Roma, whole milk, all natural, no additives or preservatives	not listed <sup>3</sup>	73.0
16	Sam Maulucci & Sons, whole milk, natural	not listed	71.4
17	Sorrento, part skim	not listed	70.6
18	Sorrento, whole milk	not listed	68.0
19	Stop & Shop, whole milk, all natural	34-751	73.6

Footnotes to Table 4:

<sup>1</sup> None of the samples declared sorbate on the label; a zero level of sorbate indicates amount found was less than 0.001%.

Keeping quality (days)	Yeasts (no./g)	Molds (no./g)	Coliform bacteria (no./g)	Gram Negative Bacteria		Acidity (%)	Sample number
				Proteolytic (no./g)	Lipolytic (no./g)		
45	<10	<10	<10	10	<10	0.51	1
14	<10	<10	<10	<10	<10	0.48	2
36	<10	<10	<10	<10	<10	0.41	3
40	<10	<10	<10	1,400	1,500	0.63	4
45	<10	<10	<10	10	<10	0.51	5
45	<10	<10	<10	<10	<10	0.52	6
16	<10	<10	<10	<10	<10	0.70	7
30	<10	<10	10	120	210	0.50	8
16	<10	<10	<10	700	6,500	0.59	9
45	<10	<10	<10	<10	<10	0.52	10
45	<10	<10	<10	10	<10	0.52	11
50	<10	<10	<10	<10	<10	0.47	12
1	—	—	—	—	—	0.53	13
45	<10	<10	<10	<10	<10	0.51	14
3 <sup>2</sup>	<10	<10	30	700	900	0.58	15
21	<10	<10	130	500	300	0.51	16
1	—	—	—	—	—	0.57	17
56	<10	<10	<10	120,000	<10	0.58	18
33	<10	<10	<10	<10	<10	0.40	19

<sup>2</sup> Sample rejected for having an off-taste but probably not of microbial origin.

Fat		Protein		Carbohydrate		Calories		Sodium		Sorbate <sup>1</sup>	Sample number
Claim (g)	Found (g)	Claim (g)	Found (g)	Claim (g)	Found (g)	Claim (no.)	Found (no.)	Claim (mg)	Found (mg)	found (%)	
8	10.9	13	10.3	4	4.9	130	156	-	198	0	1
-	12.2	-	13.6	-	3.1	-	174	-	353	0.08	2
-	11.9	-	11.7	-	4.9	-	171	-	88	0.09	3
-	14.3	-	12.0	-	4.8	-	193	-	173	0	4
12	10.8	10	10.2	4	7.1	170	164	186	207	0	5
13	12.0	16	10.7	5	5.4	190	170	190	133	0	6
10	13.5	11	14.1	4	4.3	170	192	-	503	0	7
13	13.1	14	11.2	4	3.2	180	173	-	346	0	8
-	12.0	-	13.8	-	5.1	-	181	-	192	0	9
12	10.9	10	12.8	4	4.3	170	164	186	286	0	10
13	15.6	16	12.1	6	2.6	190	196	190	184	0	11
-	16.5	-	11.5	-	3.7	-	206	-	254	0	12
12	12.0	14	10.8	4	6.0	180	173	-	306	0	13
14	15.6	14	14.7	4	1.7	200	207	-	277	0	14
-	13.5	-	13.2	-	2.2	-	180	-	207	0	15
-	14.3	-	12.1	-	4.5	-	192	-	201	0	16
-	13.4	-	11.4	-	6.9	-	191	-	373	0	17
-	17.5	-	11.8	-	5.3	-	223	-	254	0	18
14	13.3	11	11.0	4	3.8	190	176	190	150	0	19

<sup>2</sup> This number is not a registered permit number.

<sup>3</sup> No plant permit number listed but cheese made by Calabro Cheese Corp.

Only about 13% of the cottage cheese samples contained large numbers (greater than 1,000 per gram) of proteolytic or lipolytic bacteria (Table 1). This low number of samples containing gram negative bacteria again attests to satisfactory handling and packaging of the cottage cheese.

Six samples of ricotta cheese contained large numbers of gram negative lipolytic and proteolytic bacteria (Table 3).

#### Additives

Almost half (43%) of the cottage cheese did not declare use of a stabilizer (Table 1). The stabilizers commonly used are gums and carrageenens. Occasionally calcium sulfate, mono- and di- glycerides and lecithin are used. Stabilizers are added so that the cream will adhere better to the curd particles and prevent the presence of "free" cream.

All except two cottage cheeses that declared sugar had been added contained either fruit or vegetables (Table 1). The only exceptions are samples 53 and 54. Some manufacturers added citric acid, probably to help improve the flavor. Six samples claimed an addition of artificial flavor.

Three samples of ricotta cheese stated that vinegar or acetic acid was used as a starter (Table 3, samples 1, 7, and 8), and two samples stated use of a stabilizer (Table 3, samples 2 and 3).

#### Acidity:

The acidity of the cottage cheeses ranged from 0.83 to 1.66% (Table 1). The higher the acidity, the tarter the product. There is nothing detrimental about a high or low acidity but only a personal preference of how tart one prefers his cottage cheese. Thus, samples 37 and 38 stated on the label that they were "tangy" and the acidity of these samples was higher than the usual level of about 1%.

The average acidity of the ricotta cheese was 0.53% (Table 3), considerably lower than the 1.14% average for cottage cheese. This only confirms that ricotta cheese is blander, or less tart, than cottage cheese.

#### Curd size:

We examined cottage cheeses with labels stating that the curd size was large, small, and even tiny. California and chunk style are usually a large curd. Curd size is a matter of personal choice and generally does not affect the taste of the cheese, only the consistency. However, we have observed that many times two containers of the same brand, labeled either large or small, both contained essentially the same size curd. Lowfat cottage cheeses generally had a finer curd size than regular (4%) cottage cheese.

#### Sodium Content:

Some people limit their salt intake, and thus we show in Tables 2 and 4 the sodium content of the cottage and ricotta cheeses. Only two brands of cottage cheese made a statement on sodium content on the label. Interestingly, one brand (Table 2, samples 65 and 66) claimed no salt was added. One of these samples (number 65) was low in sodium, the other (number 66) contained as much sodium as most of the other samples. The label on sample 93 also stated no salt was added, yet this sample contained almost 400 milligrams of sodium per 113 grams; the label on sample 102 also claimed no salt was added and only 42 milligrams of sodium were found per 113 grams. The average content of sodium for all cottage cheese samples, except those stating no salt was added, was 472 milligrams per 113 grams (Table 2).

The sodium content of the ricotta cheeses averaged 246 milligrams per 113 grams, about half the average amount found in cottage cheese (Table 4).

#### Moisture Content:

The moisture content of creamed cottage cheese averaged about 80% and for flavored and lowfat cheese about 82%. In all, 20 samples of cottage cheese exceeded the Federal standard of 80% moisture for creamed cottage cheese and 82.5% for lowfat cottage cheese (Table 2).

#### Preservatives:

Only 16 of the cottage cheese samples declared on the label that sorbate was added (Table 2). This preservative, however, was found in 33 of the samples. In two cases sorbate was declared but not found.



None of the ricotta cheeses declared use of sorbate on the label (Table 4) but two samples contained this preservative.

#### Nutrients:

We determined how closely the cottage cheeses adhered to their label claims for fat, protein, carbohydrate, and calories (Table 2). For all samples the average fat content was 107% of claim (range 30 to 180%, Table 5). The lowfat samples averaged 150% of the amount claimed. Samples claiming a minimum of 4% fat averaged about 100% of claim. The flavored cheeses, those with fruit and vegetables, averaged only about 85% of the claimed amount. Some of these flavored samples claimed a minimum of 4% fat while others stated they were lowfat (1 to 2% fat) (Table 2).

The average protein content for all types of cottage cheese was over 90% of the amount claimed (Table 5). The average carbohydrate content varied among types of cottage cheese from a high of 104% for flavored cheeses to a low of 77% for regular creamed cottage cheese. The determinations for carbohydrate include all the lactose (milk sugar) which is not converted to lactic acid during the fermentation of the milk to form the curd and is entrapped in the curd particles, as well as any carbohydrate that is added in fruit-containing cheese. The average percent of claim for carbohydrate for all samples was 84.9% (Table 5).

Table 5. Average percent of label claim for nutrients in 140 samples of cottage cheese

Type of cheese	Nutrient			
	Fat	Protein	Carbohydrate	Calories
All samples	107.4	96.2	84.9	92.0
4% Fat minimum	100.7	96.3	77.3	91.3
Lowfat	150.0	99.6	88.6	95.5
Flavored	84.5	92.3	104.4	90.6

Caloric content for all types of cottage cheese averaged over 90% of the amount claimed (Table 5).

Since about half of the ricotta cheeses

did not contain any nutrient claims on the label, data for individual samples shown in Table 4 for fat, protein, carbohydrate are given as grams found per 113 grams (4 ounces). Calories are given as number per 113 grams.

The average amount of nutrients found for whole milk and part skim milk ricotta cheese is shown in Table 6. There is no large difference in fat content between the whole and part skim products. In fact, some of the part-skim milk products contained as much or more fat than the whole milk ricotta cheeses (Table 4). An interesting oddity shown in Table 4, is that samples 2 and 3 from the same manufacturer, one whole milk and the other part-skim milk, had about the same amount of fat. The same is true for samples 7 and 8. Protein, carbohydrate, and caloric content of all ricotta samples was about the same (Tables 4 and 6).

Table 6. Average nutrients in grams and number of calories found per 113 grams (4 ounces) in 19 samples of ricotta cheese

Type of cheese	Nutrient			
	Fat	Protein	Carbohydrate	Calories
Whole milk	14.1	12.2	3.9	189
Part-skim milk	12.0	11.9	5.2	173

## CONCLUSIONS

Most (81%) of the cottage cheese samples were of acceptable quality to the date stamped on the carton as the last day of sale when stored at 40 F (4.4 C) after purchase. Most samples were of good microbial quality and contained few contaminating yeasts, molds, or bacteria.

Nutrients were close to the amounts claimed. Lowfat cottage cheese on the average contained more fat (150%) than the amount indicated on the label but within amounts specified by Federal regulations (1 to 2%). Sodium content averaged about 472 milligrams per 113 grams (4 ounces).

About 11% of the samples declared use of sorbate on the label. However, 23% of the cottage cheeses were found to contain this preservative.

Most of the ricotta cheeses also were found to be of satisfactory microbial quality but only 58% remained of acceptable quality to the date stamped on the carton. Sodium content averaged 246 milligrams per 113 grams. There was not a large difference on the average between whole milk and part skim milk ricotta.

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