lard, and the same lard with 10 per cent. peanut oil admixed. Determinations made on pure peanut oil are added for comparison.

	% solid acids	% crystallizing from 90 % alcohol	% remaining in solution	Beginning of crystallization	Iodine number of crystals	Melting point of crystals
Peanut oil	13.73	4.24	9.49	37°	0.7	71.5
Lard	39.30	5.93	33.37	20°	7.4	54.3
Lard plus 10% peanut oil	37.35	1.62	35.73	19°	4.2	55.0
Oleostearin	36.31	15.18	20.98	25°	4.9	61.5

The amount of solid acids in oleostearin and lard crystallizing at 15° from 90 per cent. alcohol is far greater than in peanut oil, although the temperature at which crystallization begins is far lower. The cause of the precipitation, while primarily, of course, the same as that of arachidic acid, *viz.* the supersaturation of the solution, differs in this, that the arachidic acid precipitates because of its very slight solubility in 90 per cent. alcohol, while the other acids come down because of the great quantity of them in the solution, as shown by the amount remaining in solution after crystallization.

As shown by the table, the melting points of the crystals from the pure lard and those from the lard containing 10 per cent. of peanut oil were about the same and hence not conclusive. The crystals were therefore redissolved in 90 per cent. alcohol and allowed to recrystallize. The melting points were again determined and found to be, pure lard 55°, lard with 10 per cent. peanut oil 77°, showing that nearly pure arachidic acid had been obtained in the latter case.

These results show that the addition of fats containing large percentages of solid fatty acids to cottonseed oil or other oils interferes materially with the detection of peanut oil by this method, and in case the presence of peanut oil is suspected in such mixtures, some modification of the method will be necessary to detect it; either to increase the proportion of 90 per cent. alcohol used, which would be objectionable, or to recrystallize the "arachidic acid" until a melting point higher than that of stearic acid is obtained, when the presence of arachidic acid is established.

SOUTH OMAHA, NEB.,
Aug. 9, 1907.

THE OCCURRENCE OF NITRATES IN VEGETABLE FOODS, IN CURED MEATS AND ELSEWHERE.

BY W. D. RICHARDSON.

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For the purpose of this paper the term "vegetable foods" is used so as to include fruits.

The presence and amount of nitrates in vegetable foods has been noted and determined by Frühling and Grouven, by Sutter and Alwens, by E. Schultze and H. Schultze and others[1]. Frühling and Grouven state

[1] Koenig, Nahrungs und Genussmittel, Vol. 2, p. 94-95.

that nitric acid is not present in ripe seeds, but in green plants of the Gramineae and Leguminosae they found as much as 0.10 per cent. Sutter and Alwens working on beets found quantities up to 3.49 per cent. nitric acid in the dry substance. E. Schultze and H. Schultze report in beet juice from 0.13 per cent. to 0.285 per cent. nitric acid ; E. Schultze and A. Ultrich in beets 0.41 to 0.407 per cent. The same authors report, that of the nitrogen in beets, 32.51 per cent., or nearly one-third the total, exists in the form of nitric acid. Sugar beets contain according to Zoller, 0.324 to 0 926 per cent. nitric acid.[1] E. Egger states that grapes contain no nitrates[2]. Hence the deduction has been made that the presence of nitrates in wine indicates watering of this product. On the other hand Spica[3] finds nitrates occurring naturally in certain musts, and hence concludes that their presence does not necessarily indicate adulteration. Schönbein reports nitric acid present in beer and wine up to 4 to 10 mg. per liter.

The results of the investigations carried out in this laboratory and detailed below, indicate a more general distribution and the presence of larger quantities of nitric nitrogen in vegetable foods than has been commonly supposed. Inasmuch as nearly all of the nitrogen demanded by plants for their growth is taken from the soil in the form of nitrates —a smaller quantity being absorbed possibly as ammonium salts—it is logical to infer that, especially in the earlier stages of growth, significant amounts of nitrates should be found in the plant organism. It would seem reasonable too, to conclude that as the plant develops and approaches maturity, elaborating the nitrate nitrogen into the form of protein bodies, smaller quantities should be found. In other words, as would be expected of a substance which enters at once into metabolic process and is at once changed thereby, the quantities of nitrates found should vary greatly, and the smallest quantities should occur in the mature plants. This seems generally to be the case. The surprising fact is, however, that in certain crops, particularly beets, considerable quantities occur in the fully matured plants. Even in ripe seeds and mature fruits the presence of nitrates has been established qualitatively and quantitatively in practically all samples analyzed. This is the more astonishing in the case of fruits inasmuch as during the ripening process the nitrates must be in contact with many reducing substances.

The presence of nitrites has also been established in a number of vegetable foods, and it seems that here as elsewhere in nature where nitrates occur, nitrites may reasonably be expected. In celery, lettuce, turnips, radishes and beets, quantitative determinations of nitrites were

[1] Koenig, Nahrungs und Genussmittel, 4th Ed., Vol. 2, p. 94-95.
[2] Chem. Centr., 1885, 71-72.
[3] Gazz. chim. ital., 1907, 37, ii. 17-22.

made by a colorimetric method employing Griess' solution of alpha naphthylamine and sulphanilic acid in acetic acid, with the following results :

		Nitrites in Vegetable Foods.		Dry Basis	
Sample.	Moisture.	Nitrite Nitrogen.	Equivalent to Potassium Nitrite.	Nitrite Nitrogen.	Equivalent to Potassium Nitrate.
Celery,	94.3%	0.001 %	0.0044 %	0.0173%	0.0772 %
Lettuce,	76.4	0.0023	0.0109	0.0097	0.0461
Turnips,	86.4	0.00013	0.00058	0.00095	0.0004
Radish,	93.6	0.0023	0.0109	0.035	0.170
Beets,	92.1	0.0018	0.0088	0.0227	0.114

The question whether the nitrites contained in vegetables are absorbed as such from the soil or whether they are produced from nitrates by reduction processes occurring in the plant was not entered into. The general occurrence of nitrites in soils and surface waters would indicate he possibility of their entering the plant from these sources. The writer has observed that beef cut in small cubes and stewed with fresh vegetables such as string beans, tomatoes, potatoes and onions, assumes the color of nitrosohemochromogen, thus indicating the presence of nitrites in the same way as when fresh beef is boiled with saltpeter-cured bacon or a dilute solution of nitrite itself.

In the following investigations the vegetables and fruits used were purchased in the open market during the month of September, some being obtained from wholesale and some from retail dealers. Because vegetables in the Chicago market in some instances come from a considerable distance, it was not possible in every case to obtain them in as fresh condition as desirable and this might lead to low results. The analyses were made as promptly as possible after the arrival of the sample at the laboratory, inasmuch as it is probable that the nitrates present would gradually be reduced as the sample grew stale and withered.

The Schloesing-Wagner method was used for all determinations, 100 grams being the quantity of substance used. Water was the extracting medium except in those cases where the presence of large quantities of starch precluded its use and then a mixture of equal quantities of alcohol and water was used. When working on 100 grams of material one cc. of nitric oxide is the equivalent of about 0.004 grams saltpeter or 0.004 per cent. and the method will detect as little as one or two-tenths of this quantity or 0.0004 per cent. to 0.0008 per cent. Nearly all doubtfully small quantities were checked qualitatively by a test with diphenylamine and sulphuric acid working on an extract of the original substance, or with potassium iodide and starch solution working on the nitric oxide liberated in the determination, by sucking the nitric oxide through the test solution contained in a test tube fitted with long inletand short outlet-tubes and closed by a doubly perforated rubber stopper. This method was found to be very sensitive.

For the analytical work shown in the following tables the writer is indebted to Messrs. Scherubel, Morgan, Hansen, Lehnert, Berry, Winkley, Heath and Hale and Miss Wishart of this laboratory.

TABLE A.

NITRATES IN VEGETABLE FOODS ARRANGED IN THE ORDER OF MAXIMUM QUANTITIES FOUND.

Food	Sample No.	Moisture %	Nitrate Nitrogen %	Equivalent to Saltpeter %	Dry Basis: Nitrate Nitrogen %	Dry Basis: Saltpeter %
Beet	1	75.1	0.182	1.327	0.731	5.33
	2	90.4	0.067	0.469	0.767	5.45
	3	76.4	0.059	0.431	0.230	1.66
	4	74.3	0.034	0.249	0.137	0.99
	5	77.3	0.027	0.200	0.119	0.97
	6	65.3	0.021	0.170	0.061	0.49
	7	92.1	0.021	0.170	0.263	1.91
Egg Plant	1	92.2	0.100	0.801	1.287	10.27
	2	93.5	0.015	0.102	0.228	1.57
	3	92.9	0.011	0.080	0.155	1.13
	4	94.0	0.008	0.062	0.142	1.03
Spinach	1	90.3	0.086	0.624	0.890	6.46
	2	90.2	0.049	0.360	0.557	4.09
	3	90.1	0.042	0.307	0.427	3.13
	4	90.3	0.033	0.240	0.341	2.48
	5	89.7	0.007	0.051	0.068	0.49
Lettuce	1	92.2	0.080	0.580	1.025	7.44
	2	76.4	0.048	0.347	0.187	1.36
	3	93.0	0.028	0.210	0.400	3.00
	4	74.7	0.024	0.190	0.102	0.75
	5	92.3	0.009	0.071	0.143	1.05
Radish	1	93.2	0.069	0.500	1.020	7.41
	2	95.3	0.050	0.369	1.006	7.85
	3	95.2	0.041	0.300	0.861	6.31
	4	93.9	0.039	0.289	0.638	4.74
	5	95.4	0.037	0.266	0.798	5.78
	6	93.2	0.012	0.103	0.178	1.51
Celery	1	95.8	0.065	0.476	1.559	11.32
	2	94.5	0.034	0.245	0.637	4.62
	3	94.2	0.029	0.200	0.509	3.51
	4	90.6	0.024	0.180	0.307	1.91
	5	94.3	0.018	0.129	0.481	3.50
Turnip	1	91.0	0.065	0.470	0.721	5.21
	2	79.2	0.035	0.256	0.168	1.23
	3	91.7	0.011	0.090	0.134	1.08
	4	85.9	0.005	0.039	0.038	0.28
	5	86.1	0.002	0.017	0.017	0.13
Canned Spinach	1	91.3	0.044	0.322	0.487	3.70
	2	91.4	0.030	0.218	0.350	2.54

Food	Sample No.	Moisture %	Nitrate Nitrogen %	Equivalent to Saltpeter %	Dry Basis Nitrate Nitrogen %	Dry Basis Saltpeter %
Canned Spinach	3	92.9	0.025	0.179	0.348	2.51
	4	91.7	0.024	0.176	0.290	2.15
	5	92.3	0.006	0.048	0.074	0.63
Parsley	1	64.1	0.032	0.241	0.125	0.93
	2	82.7	0.017	0.123	0.098	0.71
Summer Squash	1	96.7	0.031	0.225	0.939	6.82
	2	94.6	0.015	0.106	0.270	1.96
	3	96.7	0.010	0.072	0.303	2.18
	4	94.6	0.007	0.052	0.131	0.96
Onion	1	90.7	0.019	0.139	0.205	1.50
	2	86.9	0.0008	0.006	0.006	0.046
	3	76.4	0.0005	0.0038	0.002	0.016
	4	73.0	0.0004	0.003	0.001	0.011
String Beans	1	92.2	0.015	0.109	0.192	1.40
	2	90.6	0.014	0.104	0.169	1.23
	3	91.5	0.010	0.079	0.117	0.93
	4	91.1	0.001	0.009	0.013	0.10
Cucumbers	1	95.0	0.012	0.088	0.240	1.76
	2	97.3	0.002	0.017	0.085	0.63
	3	96.3	0.002	0.014	0.051	0.38
	4	96.1	0.001	0.013	0.035	0.32
	5	96.7	0.001	0.007	0.027	0.21
Leek	1	89.1	0.011	0.080	0.102	0.73
	2	87.7	0.009	0.064	0.075	0.52
Cabbage	1	93.0	0.011	0.078	0.153	1.11
	2	81.6	0.005	0.036	0.031	0.22
	3	91.6	0.004	0.029	0.046	0.34
	4	82.3	0.002	0.014	0.010	0.75
	5	93.1	0.0008	0.006	0.016	0.09
Cauliflower	1	90.2	0.009	0.064	0.090	0.65
	2	89.9	0.0006	0.004	0.006	0.036
	3	88.9	0.0006	0.004	0.006	0.036
Beans (Navy)	1	12.9	0.002	0.016	0.002	0.018
	2	13.5	0.0011	0.008	0.0014	0.010
" Kidney	3	20.0	0.0004	0.003	0.0005	0.004
" Lima	4	17.2	0.007	0.048	0.0084	0.058
Canned Pumpkin	1	91.2	0.006	0.042	0.066	0.478
German Celery	1	90.0	0.005	0.036	0.049	0.360
	2	89.9	0.004	0.030	0.041	0.297
Canned Kidney Beans	1	76.0	0.004	0.030	0.016	0.119
	2	74.4	0.0008	0.006	0.003	0.023
Bread	1	32.6	0.0009	0.007	0.001	0.010
	2	33.2	0.0006	0.005	0.0009	0.016
Tomato	1	93.8	0.002	0.0147	0.034	0.237
	2	94.2	0.0017	0.0128	0.025	0.188
	3	94.3	0.0009	0.007	0.016	0.123
	4	94.5	0.0009	0.007	0.016	0.123
	5	95.5	0.0006	0.005	0.013	0.111

Food	Sample No.	Moisture %	Nitrate Nitrogen %	Equivalent to Saltpeter %	Dry Basis: Nitrate Nitrogen %	Dry Basis: Saltpeter %
Potato	1	84.3	0.0024	0.015	0.0152	0.097
	2	80.4	0.002	0.014	0.010	0.071
	3	82.4	0.002	0.014	0.007	0.047
	4	83.4	0.0014	0.0108	0.0084	0.065
	5	80.0	0.0009	0.007	0.0045	0.035
Carrots	1	85.5	0.002	0.016	0.014	0.114
	2	85.5	0.0016	0.012	0.010	0.083
	3	93.2	0.0009	0.007	0.013	0.102
Corn Meal	1	13.3	0.0019	0.014	0.002	0.016
	2	12.9	0.0015	0.012	0.0017	0.013
Sweet Potato	1	70.0	0.0029	0.014	0.0096	0.047
	2	74.5	0.0029	0.014	0.0114	0.055
	3	73.2	0.0009	0.007	0.0033	0.026
	4	73.4	0.0009	0.007	0.0033	0.026
	5	73.8	0.0008	0.006	0.0030	0.022
	6	74.3	0.0006	0.004	0.0023	0.017
Canned Tomatoes	1	94.2	0.0017	0.013	0.029	0.220
	2	95.5	0.0004	0.003	0.009	0.067
Plums	1	86.7	0.0013	0.011	0.010	0.081
	2	77.0	0.0009	0.006	0.004	0.027
	3	88.0	0.0006	0.004	0.003	0.018
	4	75.9	0.0006	0.004	0.002	0.017
Bananas	1	73.8	0.0015	0.011	0.006	0.042
	2	70.9	0.0014	0.0106	0.005	0.035
Apples	1	92.3	0.0013	0.0100	0.017	0.130
	2	90.2	0.0012	0.0089	0.012	0.091
	3	92.8	0.0004	0.003	0.006	0.042
	4	83.2	0.0003	0.002	0.002	0.012
Canned Peas	1	75.6	0.0013	0.0095	0.0053	0.039
	2	73.9	0.0010	0.0072	0.0038	0.028
	3	92.9	none	none	none	none
	4	90.5	"	"	"	"
Sweet Corn	1	79.2	0.001	0.009	0.005	0.043
	2	67.6	0.0007	0.005	0.003	0.020
Rice	1	12.3	0.0013	0.009	0.0015	0.0102
	2	11.9	0.0004	0.0031	0.0005	0.0035
Canteloupe	1	90.6	0.0011	0.008	0.012	0.085
	2	93.1	0.0006	0.0045	0.009	0.065
Parsnip	1	80.0	0.001	0.008	0.005	0.039
	2	78.0	0.0008	0.006	0.0036	0.027
	3	80.1	0.0004	0.003	0.0019	0.015
Orange	1	91.4	0.0009	0.0071	0.0100	0.083
Barley	1	11.2	0.0009	0.0071	0.0010	0.008
"Cream of Wheat"	1	11.9	0.0010	0.0072	0.0013	0.008
Watermelon	1	91.5	0.0009	0.0060	0.0106	0.071
Canned Corn	1	76.1	0.0008	0.006	0.0035	0.025
	2	74.7	none	none	none	none
	3	76.3	"	"	"	"

Food	Sample No.	Moisture %	Nitrate Nitrogen %	Equivalent to Saltpeter %	Dry Basis Nitrate Nitrogen %	Dry Basis Saltpeter %
Peach	1	81.0	0.0007	0.005	0.004	0.026
	2	93.5	0.0005	0.003	0.008	0.046
Oat Meal	1	11.1	0.0005	0.004	0.0006	0.005
	2	11.4	0.0004	0.003	0.0004	0.003
Pear	1	80.3	0.0004	0.003	0.002	0.018
	2	83.4	none	none	none	none
Canned Asparagus	1	94.8	0.0006	0.004	0.0115	0.077
	2	...	none	none	none	none
Crab Apples	1	86.1	0.0004	0.003	0.0028	0.022
	2	85.3	0.0004	0.003	0.0027	0.020
Lemon	1	83.3	0.0004	0.003	0.0028	0.0203
Oats	1	12.3	0.0004	0.003	0.0005	0.004
Grapes	1	75.6	0.0004	0.003	0.002	0.012
	2	...	none	none	none	none
Grape Nuts	1	...	"	"	"	"
	2	...	"	"	"	"
Wheat	1	43.8	"	"	"	"

In the tables the nitrates are calculated as potassium nitrate for two reasons: first, it was desired to have the figures representing the nitrates in vegetables and those in meats on a comparative basis, and second, potassium is the principal metallic constituent of the ash of plants. All analyses were made on the edible portions only.

In order to have a comparison of the quantities of nitrates occurring in vegetables and in cured meats a number of samples of hams and bacons of various brands were analyzed and the results appear in the following tables. It is to be noted that the quantities are of the same order—although the maximum is not so great—as that found in vegetables.

Schönbein and others have found that nitrates appear in small quantities in human urine, and they conclude that their origin is probably drinking water and vegetable food (since fresh meats contain no nitrates) According to Weyl and Citron the quantity of nitrates is smallest with a meat diet and greatest with an exclusively vegetable diet. The average amount is about 42.5 mg. per liter. In several samples of urine the nitrate content was determined and the general conclusions of other investigators confirmed. Nitrates were found normally in cattle urine also, as would be expected of herbivorous animals. It would be of course impossible, although desirable, from determinations made on urine, to ascertain the total quantities of nitrates ingested with the food inasmuch as a large proportion is undoubtedly reduced first to nitrites and then to nitrogen in the digestive tract through the action of denitrifying bacteria according to the equations:

$$(1)\ MNO_3 \rightarrow MNO_2 + O \quad \text{and}$$
$$(2)\ NH_4NO_2 \rightarrow 2H_2O + N_2$$

TABLE B.

SALTPETER IN CURED MEATS OF VARIOUS BRANDS AS PURCHASED IN OPEN MARKET.

Product.	Maker	Moisture per cent.	Nitrate Nitrogen per cent.	Equivalent to Saltpeter per cent.	Dry Basis. Nitrate Nitrogen per cent.	Dry Basis. Equivalent to Saltpeter per cent.
Ham	A	66.6	0.014	0.10	0.042	0.30
"	A	67.7	0.001	0.01	0.004	0.03
"	B	65.7	0.003	0.02	0.009	0.06
"	B	66.2	0.003	0.02	0.009	0.06
"	C	59.8	0.024	0.17	0.060	0.42
"	C	66.2	0.009	0.07	0.027	0.21
"	D	63.8	0.032	0.23	0.088	0.64
"	D	63.3	0.032	0.23	0.087	0.63
"	E	64.4	0.032	0.23	0.090	0.65
"	E	65.1	0.038	0.28	0.109	0.80
"	F	65.6	0.014	0.10	0.041	0.29
"	F	66.1	0.007	0.05	0.021	0.15
"	G	63.9	0.005	0.04	0.014	0.11
"	G	62.7	0.009	0.07	0.024	0.19
"	G	64.6	0.003	0.02	0.008	0.06
"	G	58.8	0.017	0.12	....	....
"	H	66.8	0.048	0.34	0.144	1.02
"	H	65.2	0.048	0.34	0.138	1.00
"	H	65.1	0.024	0.17	0.069	0.49
"	H	65.9	0.022	0.16	0.066	0.47
Bacon	A	22.7	0.008	0.06	0.010	0.078
"	B	24.9	0.0007	0.005	0.0009	0.007
"	B	19.8	0.004	0.034	0.005	0.037
"	C	12.0	0.015	0.11	0.017	0.125
"	C	25.0	0.014	0.10	0.019	0.133
"	D	21.2	0.017	0.13	0.022	0.165
"	D	17.2	0.008	0.06	0.010	0.073
"	E	17.7	0.042	0.30	0.051	0.36
"	E	19.2	0.003	0.02	0.004	0.025
"	F	12.2	0.001	0.01	0.002	0.011
"	F	18.3	0.005	0.04	0.006	0.049
"	G	19.8	0.002	0.014	0.002	0.017
"	G	21.8	0.001	0.010	0.0018	0.013
"	G	20.2	0.001	0.01	0.0018	0.013
"	G	20.5	0.001	0.01	0.0018	0.013
"	H	14.4	0.015	0.11	0.018	0.13
"	H	18.2	0.007	0.05	0.009	0.061
"	H	14.9	0.018	0.13	0.021	0.15
"	H	19.8	0.005	0.04	0.006	0.05
Dried Beef	A	62.8	0.010	0.075	0.053	0.20
"	A	59.0	0.021	0.157	0.046	0.35
"	B	52.9	0.034	0.246	0.072	0.52
"	B	56.7	0.030	0.223	0.070	0.51
"	C	61.9	0.020	0.150	0.052	0.39
"	C	56.7	0.028	0.207	0.064	0.48
"	D	60.2	0.027	0.200	0.069	0.50
"	D	65.9	0.020	0.150	0.059	0.43
"	E	66.2	0.024	0.174	0.071	0.51
"	E	63.8	0.025	0.182	0.069	0.50
"	F	54.1	0.017	0.120	0.037	0.26
"	F	60.5	0.009	0.070	0.023	0.18

In the second equation the presence of ammonium salts is assumed. In spite of our inability to determine from the nitrates of the urine the total quantity ingested, it is interesting to know that nitrates are regularly taken into the system with the food and regularly eliminated by the kidneys, and when we consider that there is present of nitrates in various fresh vegetables, including beets, squash, parsley, turnips, radishes, celery, cabbage. lettuce, cucumbers, spinash, string beans, and egg plant the equivalent or more than the equivalent of the quantity of saltpeter ordinarily present in cured meats, and considering also the relatively small quantity of meat and particularly of salt meat included in the average diet, we must conclude that the average person obtains a larger quantity of nitrates from his vegetable than from his meat foods.

A diet consisting largely of fresh vegetables is not considered injurious and has not been known to cause injury. Yet, it is possible that on such a diet a person, as a vegetarian, might easily consume the equivalent of one to two grams and possibly more, of saltpeter daily.

In the following table a few calculations are made of the quantities of nitrates figured as saltpeter which would be consumed by a person eating the kinds and quantities specified. All of the percentages are taken from the tables. Those samples containing the largest quantities of saltpeter are purposely selected.

Vegetable	Weight consumed grams	Saltpeter %	Weight Saltpeter consumed grams
	EXAMPLE No. 1		
Beets	100	1.327	1.327
	EXAMPLE No. 2		
Egg Plant	100	0.801	2.168
Spinach	200	0.624	
Celery	25	0.476	
	EXAMPLE No. 3		
Radish	25	0.500	1.645
Turnips	200	0.470	
Lettuce	100	0.580	

Even after making a liberal allowance for nitrates extracted by boiling and pouring off the water during the preparation for the table of some of the foods shown, it will be seen that from one to two grams of nitrates figured as saltpeter could easily be consumed. In passing, it should be noted that the quantities of foods assumed to be eaten per 24 hours are moderate for a person on a mixed diet and extremely moderate for a vegetarian.

No case is known of injury traceable to the consumption of saltpeter contained in cured meats and it is known that persons may eat considerable quantities of such meats even for long periods, without injury. In the light of these facts it would seem that saltpeter as used in cured meats must be classed as a harmless substance.

It has been persistently reported[1] that the sole object in using saltpeter in the curing of meats is for the purpose of maintaining a red color. This is only one of several objects gained in using the substance. That it is an essential curing agent and that a large percentage of sour meats (in the trade sense) would result if its use were discontinued, can not be successfully controverted. While it must be admitted that saltpeter is not an antiseptic in the sense ordinarily understood by this term it appears to protect in some way the nitrogenous tissue against bacterial invasions.

Possibly the most beneficent rôle of saltpeter in the curing of meats is its transformation of what would otherwise, be anaerobic conditions, into aerobic ones in the bacteriologic sense, a full discussion of which is reserved for a later paper. I need only say here that it has been shown that aerobic bacteria will develop in the absence of air if saltpeter is present in the culture medium and that anaerobes refuse to grow in the absence of air and presence of saltpeter[2]. The fact that typical putrefaction (faülnis) is an anaerobic process[3] and that this process can be transformed into an aerobic one by the presence of saltpeter, is a most important point in the curing of meat.

The presence of nitrates in one other food product is of interest. It was anticipated that inasmuch as nitrates are normally ingested and eliminated there was a possibility of their being present in various bodily secretions particularly milk, although it has been reported in the case of milk as in the case of musts and wines that the presence of nitrates indicated watering. We found nitrates present qualitatively and quantitatively in three out of four samples examined, as follows:

Sample No.	Nitrate Nitrogen %	Equivalent to Saltpeter %
1	0.0016	0.012
2	0.0011	0.007
3	0.0009	0.005
4	none	none

Summary

1. Nitrates are of general occurrence in plants in all stages of growth, and particularly in the early stages.

2. In the mature parts of plants such as ripe seeds and fruits only small quantities of nitrates are found.

[1] Leach, Food Inspection and Analysis p. 173. Rideal, Disinfection and Preservation of Food, p. 148, 409, 417. Mitchell, Flesh Food, p. 107. Ostertag-Wilcox, Handbook of Meat Inspection, p. 803. Wiley, Foods and Their Adulteration, p. 50. Thresh and Porter, Preservatives in Food and Food Examination, p. 166. König, Chemie der menschlichen Nahrungs und Genussmittel, II, p. 518 and 443.

[2] Pakes and Jollyman, J. Chem. Soc. Trans., **1901**, 322, 386, 459 and Frankland, Ibid., **1888**, 373.

[3] Flugge, Die Mikroorganismen, I, 259. Lehmann and Neumann, Bacteriology, II, p. 88. Kolle und Wasserman, Pathogenen Mikroorganismen I, p. 110. Lafar, Technical Mycology, I, p. 291. Lafar, Handbuch der Technischen Mykologie, Vol. 3, p. 86.

3. In some cases notable quantities of nitrates remain in the mature plant: instance ripe beets and turnips.

4. The amounts of nitrates found in vegetables are of the same order but rather more in many instances than those found in cured meats.

5. A person on a diet consisting of fresh vegetables, wholly or largely would consume more nitrates than one on a mixed diet consisting in part of cured meats.

6. As much as the equivalent of from one to two grams of saltpeter daily could be consumed by a person eating fresh vegetables.

7. Inasmuch as a fresh vegetable diet is entirely harmless and as no case of injury from saltpeter in cured meats is on record, saltpeter in the quantities used in cured meats must be classed as a harmless substance.

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CORRECTION.

On page 573, lines 5, 6 and 7, of the current volume of the Journal, is found the sentence, "3 cc. of nitric oxide gas mixed with three liters of air will efficiently bleach a kilo of flour." In writing the sentence, I intended to use the word "distinctly" instead of "efficiently," just as I did in the parallel experiment with bromine vapor given at the bottom of the preceding page.

S. AVERY.

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