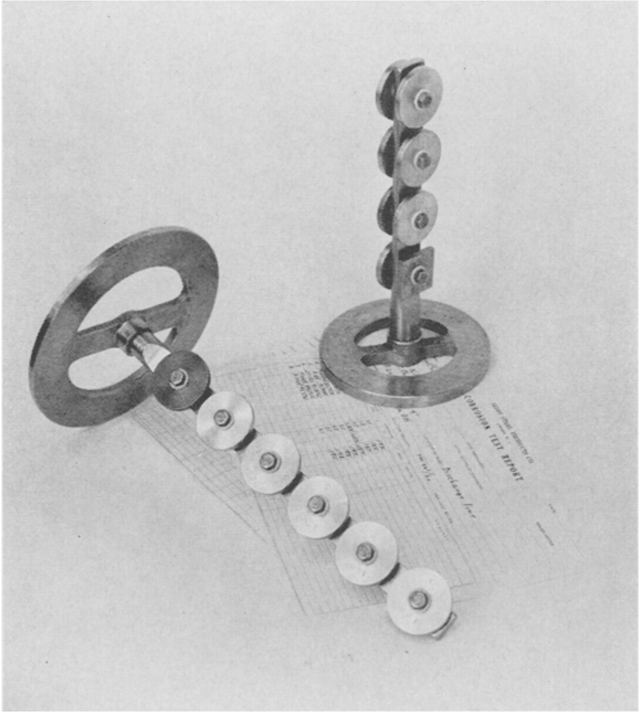

FIG. 2.

60% rosin acids, and 20% tall oil pitch at 509°F. (Table III).

The samples exposed to the solution of 65% fatty acids and 35% rosin acids (Table IV) were heavily attacked except for the 317 alloy sample. The monel sample does not show a high-weight-loss corrosion rate; however selective attack under the metal washer holding the sample and heavy attack at the edges of the specimen would rule out the use of monel. The corrosion rate of 317 alloy would be acceptable for equipment where corrosion allowances can be made. The corrosion rate for 317 alloy is too high for satisfactory use in construction of low-corrosion-tolerance equipment such as valves. Because of this, an additional test rod is presently being exposed to this solution for the purpose of selecting an alloy which would be suitable for equipment such as valves.

These results show the effect of solution composition change on corrosion rate even at the comparatively moderate temperature of 509°F. The corrosion results shown in Tables III and IV demonstrate the very potent effect of solution composition changes on corrosion rate. This appears to be one area where empirical corrosion data are lacking, and additional corrosion work is necessary at the present time.

TABLE IV

Base of Tall Oil Fractionating Tower

Solution: 65% fatty acids, 35% rosin acids, in liquid phase
Temperature: 265°C.(509°F.)
Exposure: 3,216 hrs.

Spec. No.	Alloy	Pen. I.P.Y.	Remarks
B-1	Aloyco 18-8S (304)	......	Completely corroded
B-2[a]	Aloyco 18-8S Mo, 2.2% Mo (316)	......	Specimen lost
B-3[a]	Aloyco 18-8S Mo, 2.5% Mo (316)	0.0342	Very heavily etched, somewhat heavier attack adjacent to metal washers
B-4	Aloyco 20	0.0275	Heavy even etch
B-5	Stainless type 317	0.0087	Moderate to heavy etch, slightly heavier attack in area adjacent to metal washer
B-6	Monel	0.0089	Heavy tenacious protective coating, selective attack under metal washer, heavy attack at edges of specimen, where coating was apparently abraded off
B-7	Carbon steel	......	Completely corroded

[a] Chemical composition of samples B-2 and B-3:

Sample	Heat #	Cr	Ni	Mo	MN	Si	C
B-2	7053	19.32	10.49	2.20	0.52	0.86	.020
B-3	5041	19.33	10.37	2.54	0.55	0.80	.048

Type 316 stainless steel is necessary to withstand the corrosive conditions of the tall oil recovery system. Type 304 is not suitable for this service because of the pitting attack of the solution on this alloy. Worthite and Aloyco 20 alloy were also found to be suitable for the service.

Distillation and fractionation of tall oil requires 316 alloy as a minimum. For some conditions, *i.e.*, higher temperature and some solutions, additional alloying is required, for example type 317. In the test results given in Table III, increase of molybdenum content from 2.2% to 2.5% did not eliminate the minor pitting of the 316 alloy. The process conditions which require molybdenum contents in excess of the 2.5% are not clearly outlined on the basis of data presented here. Additional testing would be necessary to determine more accurately the point to which type 316 of 2.5% molybdenum content is usable and where higher molybdenum contents are required.

With an additional increase in temperature (above 575°F. as indicated on laboratory tests), 317 alloy becomes unsuitable for use. Of the materials tested at higher temperature, Hastelloy C and Inconel have the best resistance to attack.

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• *Letter to the Editor*

On the Origin of Stearic Acid in Ruminant Depot Fat

IN 1951 Reiser (1) reported that rumen contents were capable of partially hydrogenating linolenic acid and later (2) explained that the high level of saturated fatty acids in ruminant fat resulted from hydrogenation by rumen bacteria. Similar studies have been made by others (3, 4). Later the evidence (5) was reviewed, and new data were presented to support the hypothesis.

If it should be true that the stearic acid of ruminant depot fat is from hydrogenated C_{18} unsaturated acids of the diet, it should follow that a ruminant animal reared on a ration free of fat would develop depot endogenous fatty acids similar in composition to those of nonruminant animals.

In order to test this corollary a Jersey steer was placed on the following milk replacer on the sixth day after birth: 55 lbs. of nonfat dried milk, 45 lbs. of dried whey, 0.5 lb. of Aurofac 10, and 100 g. of Silmo-stabilized vitamin A and D concentrate (pelleted). This was fed *ad lib.*, mixed with water, until the calf was three months old and dry thereafter. The daily consumption was: from 6 to 90 days, one pound; 91 to 120 days, 1½ pounds; and 121 days to date of slaughter, two pounds. No other concentrate or forage was fed. Cellulose was offered, but consumption averaged only about one-half pound per day. The addition of molasses to the cellulose resulted in a temporary increase in consumption for a few days. More than two pounds of the milk replacer could not be fed without scours developing.

The animal refused food on the 173rd day and was sacrificed two days later. Although it was quite thin, several hundred grams of adipose tissue were collected from around the kidney. The fat was obtained by extraction of the tissue in a Waring Blendor with chloroform and freed of phospholipide by treatment with silicic acid. Polyunsaturated fatty acids were determined spectrophotometrically (6) and more detailed fatty acid analysis by gas chromatography [1] (Table I). Infrared analysis [1] of the sample indicated only a trace of *trans* isomers.

TABLE I
The Fatty Acid Composition and Chemical Characteristics of the Perirenal Fat of a Jersey Steer Reared for Five Months and Twenty-Two Days on an Essentially Fat-Free Diet

Fatty acid	Gas chromatography	Ultraviolet spectrophotometry
	%	%
Myristic	2.2	......
Palmitic	27.3	......
Palmitoleic	3.7	......
C_{17} saturated	2.1	......
Stearic	29.2	......
Oleic	35.0	......
Dienoic	......	0.51
Trienoic	......	0.31
Tetraenoic	......	0.00
Chemical characteristics		
Iodine value	34	......
Saponification number	199	......
Saponification equivalent	283	......
Mean molecular weight of the fatty acids	270	......

THIS FAT is a typical beef tallow. It could therefore be concluded that the peculiar fatty acid composition of beef tallow is not caused by rumen hydrogenation of dietary C_{18} unsaturated acids. There remains not only the question of the origin of the high stearic acid content of the ruminant fat but also an explanation for the disappearance of the unsaturated fats from the rumen stomach and intestine, previously observed (5). One possible explanation for the latter is that rumen micro-organisms preferentially utilize the unsaturated acids since, in earlier work (5) it was the disappearance of the polyunsaturated acids which was measured and not an increase in saturated C_{18} acids. Another explanation is that the rumen micro-organisms produce a high level of stearic acid and thus dilute the polyunsaturated acid content of the media.

Results of the present study also reopen the possibility that typical ruminant fat arises from biohydrogenation of dioleyl palmitin, as originally described by Hilditch (6). There are however other possibilities. Stearic acid may be synthesized by rumen bacteria from nonfatty precursors or from the short-chain fatty acids produced in the rumen from carbohydrate. It has been shown that rumen micro-organisms do not synthesize polyunsaturated acids (7, 8). It is also possible that the stearate is produced in the ruminant liver from the large amounts of the short-chain acids absorbed from the rumen. And there is, of course, the possibility that the high stearic-acid level of ruminant fat is a normal, endogenous product of ruminant anabolism.

RAYMOND REISER and R. BASU ROY CHOUDHURY,
Department of Biochemistry and Nutrition; and
R. E. LEIGHTON, Department of Dairy Science,
Texas A.&M. College, College Station, Tex.

[1] By L. A. Van Akkeren and R. J. Vander Wal of Armour and Company, Chicago, Ill.

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ABSTRACTS . . . . R. A. REINERS, Editor

ABSTRACTORS: Lenore Petschaft Africk, R. R. Allen, S. S. Chang, Sini'tiro Kawamura, F. A. Kummerow, and Dorothy M. Rathmann

• Fats and Oils

ISOLATION OF BETA-SITOSTEROL FROM CASSIA ABSUS, LINN. A. W. Johnson (Mellon Inst., Pittsburgh 13, Pa.). *J. Org. Chem.* 23, 1814–5 (1958). Beta-sitosterol was identified as a component of an oil obtained from *Cassia absus*, Linn.

PROCESSING OF FOOD FATS—A REVIEW. J. H. Sanders (The Procter and Gamble Co., Ivorydale, O.). *Food Tech.* 13, 41–5 (1959). The food fat processor can purify to a high degree the natural crude oils. He can change the character of the side chain fatty acids by hydrogenation, and change their relative positions in the triglyceride randomly or controllably by interesterification. He can create solids *in situ*, add them or remove them, and have them assume a stiffening or non-stiffening character. With such flexibility he is providing the public with a variety of palatable and nutritious foods: and if the need arises for fats with special nutritional properties, he has the means to produce them.

RECENT PROGRESS IN THE CONTINUOUS REFINING OF FATTY OILS. B. Braae (Aktiebolaget Separator, Stockholm, Sweden). *Chem. & Ind.* 1958, 1152–60. The straight caustic process, soda ash process, short mix process, and the all hermetic process for continuous processing of fatty oils are discussed in detail.