TABLE XIII

Tocopherol in Human Tissues

Tissues of Two Healthy Human Subjects, Killed in Accidents (75)

Subject	Tissue	Tocopherol content		
		Total		γ+δ
		Tissue	Fat	Tissue
		mg./ 100 g.	*mg./ 100 g.*	*mg./ 100 g.*
Male, 30 years old	Muscle, pect. major	1.32	20.9	<0.27
	Muscle, abdom. wall	0.62	15.9	<0.05
	Liver	2.49	40.7	<0.05
	Fat, abdom., subcut.	24.7	29.7	2.63
	Fat, abdom., subcut.	29.2	35.9	3.33
	Heart	1.11	33.1	<0.09
	Testis	2.83	121	<0.08
	Kidney	0.80	12.2	<0.19
	Pancreas	5.49	53.3	<0.13
	Lung	1.16	30.5	0.34(?)
	Spleen	1.88	75.7	0.56(?)
Female, 43 years old	Muscle, rect. abdom.	1.56	25.7	<0.11
	Muscle, psoas	3.80	87.7	1.02
	Liver	2.19	39.6	<0.14
	Fat, abdom., subcut.	49.5	60.5	18.6
	Fat, perirenal	39.2	62.6	11.5
	Heart	1.28	38.7	<0.14
	Uterus	1.47	116	0.31
	Kidney	3.32	72.7	0.85
	Pancreas	10.6	60.9	3.75
	Spleen	4.70	51.0	1.92

Estimated Content of Total Tocopherols in Human Subjects (75)

Tissue	Woman	Man
	mg.	*mg.*
Fat	6180	1885
Muscle	269	285
Blood	45	64
Liver	33	45
Pancreas	10	7
Spleen	7	4
Heart	4	3
Kidney	10	2
Uterus	2	
Lung	....	12
Testis		2
Total tissues investigated	6560	2309
Total on basis of 50 kilos body weight	8120	
Total on basis of 70 kilos body weight		3440

Total tocopherol content in human subjects, in mg./100 g. material

	Mg.	Reference
Serum	0.6-1.4	61
Serum	0.4-1.4	52a
Normal plasma	0.9-1.6 avg. 1.2	76a
Serum, from 12 healthy young individuals	0.59-1.62 avg. 0.96	94a
Blood serum from adults with amyolateral sclerosis	0.67	94b
Placenta	0.5	52b
Milk, 1st week after parturition	0.13-3.6	73b
Milk, fat, 1st week after parturition	7.6-180	73b
Milk, composite samples from 1st to 8th month of lactation	0.11-0.15	73b
Milk, fat, composite samples from 1st to 8th month of lactation	3.7-5.8	73b
Blood serum, in newborn	0.3	49
Blood serum, 2-13 months old	0.44	49
Blood serum, 1-3 years	0.8	49
Blood serum, 3-8 years	0.83	49
Blood serum, 8-16 years	0.94	49
Blood serum, over 20 years	0.87	49
Blood serum	0.54-1.90 avg. 1.07	73e
Plasma, from men and non-pregnant women	1.04, 1.05	35
Plasma, in 1st 24 weeks of pregnancy	1.17	90
Plasma, in 25th to 36th week of pregnancy	1.62	90
Plasma, in mothers at delivery	1.70	90
Cord blood at infant's birth	0.34	90
Plasma of newborn, female	0.355	90
Plasma of newborn, male	0.318	90

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A Laboratory Deodorizer for Fats and Oils[1]

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THE apparatus shown in Figure 1 has been found convenient and effective for steam deodorization of fats and oils under vacuum. The source of water vapor for deodorization is the 100 ml. glass bulb shown at (A). The amount of water evaporating from this bulb is controlled by the temperature of the water bath in which it is immersed (30°C. is usually adequate). The neck of the water reservoir bulb is joined to the flask inlet tube (B) by a 12/30 standard ground glass joint. The inlet tube carries a 1 mm. stopcock for further regulation of incoming water vapor and leads to the bottom of the deodorizer flask containing the heated fat or oil. Although the water vapor entering the flask provides violent agitation as it is superheated by contact with the hot fat, no difficulty with bumping is encountered if the flask and the fat are dry when deodorization is begun.

The flask is a 12 l. round bottom three-necked container with 24/40 joints on the side necks and a 29/42 center joint. It is heated in a 12 l. hemispherical Glas-Col mantle, and the upper hemisphere of the heating mantle may also be used to minimize reflux. A safety glass shield is placed in front of the flask when the apparatus is in operation.

[1] N.R.C. No. 2204.

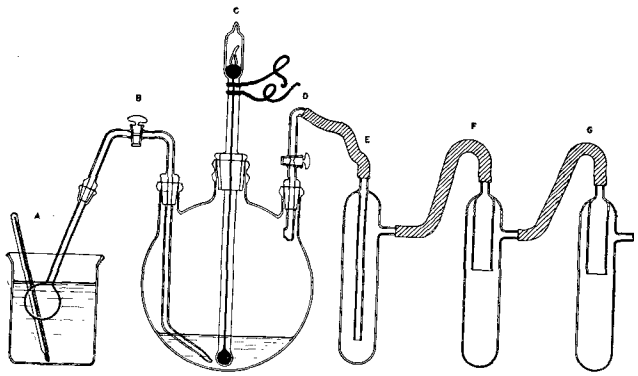

FIG. 1. Laboratory deodorizer.

The temperature of the oil or fat in the flask is controlled by means of the "metastatic type" mercury thermoregulator (C). This differs from the usual mercury thermoregulator by having a ground glass joint and a *spherical* mercury reservoir. The spherical reservoir permits complete immersion of the bulb even with small amounts of material although this type of bulb, having a minimum surface area, is a little less sensitive than a cylindrical bulb. The regulator was made according to specification by the Philadelphia Thermometer Company, and has a 24/40 joint and a bulb about 2 cm. in diameter which will pass through the female portion of a 24/40 joint. A reducing bushing, 29/42 to 24/40, is used in the center neck of the flask, and it is convenient to remove and insert the thermoregulator *plus* the bushing since this minimizes strain on the stem of the regulator. The thermoregulator is connected to the lower heating element of the hemispherical Glas-Col mantle through a relay, and the amount of current passing into the element is further governed by a Variac.

The flask outlet tube (D) carries a 1 mm. stopcock to permit isolation of the flask under vacuum and leads into a series of traps (E, F, G) joined to each other by pressure tubing. Trap (E), which catches readily condensable material, is immersed in ice and salt and has a narrow center tube reaching almost to the bottom of the trap. Traps (F) and (G) are held in dry ice and liquid air, respectively, and have short, wide center tubes that will not freeze up readily. They prevent water vapor from passing into the vacuum pump that joins to trap (G) to evacuate the entire system.

The vacuum in the flask can be broken, after cooling the contents, without aerating the fat by rotating the flask on its side until the inlet tube (B) is above the surface of the fat and then admitting air or inert gas through the inlet tube after removal of the water bulb (A) and the traps. This procedure has been found preferable to breaking the vacuum at (D) since small amounts of condensate in the outlet tube might be carried back into the flask.

The details of construction and operation may readily be varied to suit individual requirements. For example, the inlet tube (B) can be provided with a side arm to permit addition of materials during deodorization.

With this deodorization apparatus, using one hour's treatment at 240°C., bland oils and shortenings of low free fatty acid content (less than 0.05%, as oleic acid) have been consistently obtained.

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Thermal Properties of Fats and Oils. VII. Hydrogenated and Unhydrogenated Peanut Oils[1]

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AVAILABLE data on the heat capacity of vegetable oils (1, 2, 3, 4,) do not include any information on peanut oils. It is believed that the present communication is the first report of the calorimetric examination of both hydrogenated and unhydrogenated peanut oils over their complete range of melting. The temperature ranges investigated were, for the hydrogenated oil, 84° to 350°K.(−189.16° to +76.84°C.), and for the unhydrogenated oil, 110° to 330°K.(−163.16° to +56.84°C.). The specific heats of the oils in both the liquid and solid states were determined, and heats of fusion or latent heats of the oils calculated from the specific heat data. In addition, the relative amounts of solid and liquid glycerides in both hydrogenated and unhydrogenated peanut oils at various temperatures over their entire melting ranges have been estimated from the calorimetric data.

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The apparatus used and the general procedure followed in making the calorimetric measurements and calculating the specific heats and heats of fusion have been described in a previous publication (5). The method of Bailey, *et al.*, (6) was used in calculating the amounts of solid glycerides melting over specific temperature intervals.

Materials

The peanut oil used in these experiments was refined, bleached, deodorized, and a portion of it hydrogenated under selective conditions for linoleic and oleic acid. The characteristics of the two oils determined by the Official Methods of Analysis of the American Oil Chemists' Society (7), are given in Table 1. Spectrophotometric examination of the hydrogenated oil indicated the presence of 0.4% of linoleic acid.

Specific Heats

The specific heats of the hydrogenated and unhydrogenated peanut oils in the solid and liquid states are given in Table II. Solution of simultaneous equa-