purified by the author and found to be 98 to 100 per cent. pure γ-globulin by electrophoretic examination. This degree of purity probably represents the limit of accuracy of the Tiselius apparatus, hence no more precise figures for purity can be given.

Twenty mesenteric lymph nodes were obtained within one hour after death of a patient, a fifty-four year old white female who died of arteriosclerotic heart disease, with pulmonary edema and terminal bronchopneumonia. The nodes were dissected free of fat and connective tissue, washed in saline, and sliced into narrow sections (2–5 mm in thickness) with a razor blade. These slices were suspended in 25 ml of saline, shaken vigorously for 5 minutes, and filtered through cheesecloth. The filtrate, containing about 95 per cent. small lymphocytes and about 5 per cent. large lymphocytes, was centrifugalized and the cells washed twice in 25 ml and finally in 1 ml of saline. The supernate, following the last washing, failed to react with antiserum to γ-globulin. The cells were resuspended in 1 ml of saline and frozen and thawed three times; smears made at this time showed practically all cells to be lysed. The supernate, after centrifugalization, reacted with the antiserum to γ-globulin, and failed to react with normal rabbit serum. If diluted until it failed to precipitate with the antiserum, the lymphocytic extract, when mixed with the serum, inhibited the ability of the antiserum to precipitate purified human γ-globulin or to form a precipitate when overlaid with normal human serum. Extracts of washed slices of human liver failed to react with the antiserum.[9]

The occurrence of normal γ-globulin in lymphocytes, when coupled with the demonstration of lymphoid hyperplasia accompanying antibody production[10,11] and the failure of lymphocytes to adsorb antibody *in vitro*,[5] suggests that the specific alteration of γ-globulin to cause the molecule to become reactive toward a given antigen occurs within the lymphocyte.

EDWARD H. KASS
DEPARTMENT OF PATHOLOGY, MEDICAL SCHOOL,
UNIVERSITY OF WISCONSIN

RETENTION OF THIAMINE, RIBOFLAVIN AND NIACIN IN DEEP FAT COOKING[1]

THE doughnut continues to increase in popularity as shown by the following records of sales in this country: 1929, 201 millions of dozens; 1937, 258 millions; 1939, 336 millions and estimated for 1943, 665 millions. A food material of this importance in the national dietary merits attention with respect to its contributions to the daily regimen. The present report indicates the losses in vitamins which occur in the process of cooking.

The doughnuts were made in a commercial machine. The dough ring is ejected into the hot fat (approximately 375° F.) and rises to the surface due to the immediate leavening action. Half the doughnut is immersed in the cooking fat for 45 seconds, then the doughnut is turned mechanically and for the rest of the 90 seconds total cooking time the other half is immersed.

Quantitative estimations were made of the concentration of thiamin, riboflavin, niacin and iron in the dry doughnut mix containing enriched flour and in the freshly cooked doughnut. The thiochrome method[2] was used for thiamine, the procedure of Snell and Strong[3] using *Lactobacillus casei* for riboflavin and the method of Krehl, Strong and Elvehjem[4] using *Lactobacillus arabinosus* for niacin. The composition of the finished doughnuts (30 gm each) was as follows:

Protein	1.84 gm
Fat	6.03 "
Carbohydrate	14.70 "
Calcium	13.40 mgm
Phosphorus	92.70 "
Iron	0.57 "
Thiamine	0.085 "
Riboflavin	0.066 "
Niacin	0.600 "
Moisture	6.84 gms
Calories	123.6

Making allowance for the addition of water to the dry mix in preparing the dough and also for the fat absorbed during frying, it was found that the average loss in thiamine during cooking was 22.9 per cent. and in niacin was 20 per cent., whereas there was no measurable loss in riboflavin or in iron.

The loss of thiamine in this type of food in the course of deep fat frying is within the limits observed by Melnick, Oser and Himes[5] in baking various kinds of cake made from enriched flour. They found that as the pH of the cake batters increased from 5.9 to 7.9 the losses of thiamine during baking generally increased. In the present study the pH of the doughnut batter was 6.1, a value not ordinarily con-

[9] Extraction by similar means of lymphocytes obtained from a case of visceral sporotrichosis gave similar results. The nodes in this case, however, could scarcely be called normal.

[10] W. E. Ehrich and T. N. Harris, *Jour. Exp. Med.*, 76: 335, 1942.

[11] A. Rich, *Proc. Soc. Exp. Biol. and Med.*, 32: 1395, 1935.

[1] This study was supported by a grant from the Doughnut Corporation of America.

[2] D. J. Hennessy, *Cereal Chemists Bul.*, 2: 1, 1942.

[3] E. E. Snell and F. M. Strong, *Ind. Eng. Chem., Anal. Ed.*, 11: 346, 1939.

[4] W. A. Krehl, F. M. Strong and C. A. Elvehjem, *Ind. Eng. Chem., Anal. Ed.*, 15: 471, 1943.

[5] D. Melnick, B. L. Oser and H. W. Himes, *Cereal Chemistry*, 20: 661, 1943.

sidered favorable to the destruction of thiamine. Melnick[6] found little loss of niacin during the baking of bread; it would appear, therefore, that the cooking in hot fat exerts a more deleterious effect upon this vitamin than does oven baking. The observation on the stability of riboflavin in the present study agrees with the published results of Andrews, Boyd and Terry[7] on the stability of riboflavin during baking. As would be expected, no loss of iron could be demonstrated.

GLADYS J. EVERSON
ARTHUR H. SMITH

WAYNE UNIVERSITY

EFFECT OF REDUCED ATMOSPHERIC PRESSURE ON HATCHABILITY OF THE HEN'S EGG

THE shipment of hatching eggs by plane from this country to Europe and elsewhere has been proposed as a practical measure in the restoration of depleted stocks of fowl. Describing the results of tests carried out by R. E. Phillips, M. A. Jull states that hatching eggs transported by air from the University of Maryland to Los Angeles and return (maximum altitude, 12,000 feet) and to Miami, Fla., and return (maximum altitude, 7,000 feet) did not differ significantly in hatchability from non-shipped controls.[1] Aside from other considerations, the proposal made by Jull raises the interesting question of effect of reduced atmospheric pressures on subsequent hatchability of the hen's egg. Tests undertaken to clarify this point, at least in preliminary fashion, are reported on at this time.

Eggs were collected from the same flock of Rhode Island Red hens during the two days preceding each test, divided into experimental and control lots, and next morning were weighed and placed in vacuum desiccators. The experimental eggs were maintained under reduced pressure from 9:00 A.M. to 9:00 P.M. during the next three days. The desiccators containing the control eggs were covered but under normal atmospheric pressures during these hours. Covers were removed from all desiccators between 9:00 P.M. and 9:00 A.M. except in the test run at 6.9 inches Hg. At 9:00 P.M. of the third day under test the eggs were again weighed. Incubation was begun the following morning.

Reduced pressures were maintained by a vacuum pump and manually controlled by-passes in all but the test at < 0.5 inch Hg. In this final test the system was under the lowest pressure which the pump could maintain. Pressures were observed against a mercury column. All tests were carried out at room temperatures, which ranged from approximately 70 to 80° F, during hours of test and somewhat lower at night.

Our results are recorded in the accompanying table. Under the conditions of test set forth, the hatch of fertile eggs remains independent of atmospheric pressures over the range 29.9 (controls) to 0.9, and possibly to 0.6 inch Hg. The lower pressure limit (0.9 inch Hg) corresponds to a standard altitude of about 78,000 feet. In view of these data it seems altogether improbable that reduced atmospheric pressure incidental to air transport of fertile eggs might result in subsequently impaired hatchability.

TABLE 1

HATCHABILITY AND WATER LOSS OF EGGS SUBJECTED TO REDUCED ATMOSPHERIC PRESSURE FOR 36 HOURS (12 HOURS DAILY FOR 3 DAYS)

Pressure	Altitude	Eggs set	Fertile eggs		Hatch of fertile eggs		Water loss during test
In. Hg	Feet	No.	No.	Per cent.	Per cent.	T/C	g/100 g
23.6	6,500	138	127	92	80	0.96	0.48
29.9	200	141	130	92	83		0.49
16.2	16,000	136	122	90	87	1.04	0.51
29.9	200	137	123	90	84		0.43
6.9	35,000	130	118	90	92	1.08	...
29.9	200	130	115	88	85		...
5.9	39,000	133	124	93	86	0.97	0.38
29.9	200	133	122	92	89		0.29
4.4	45,000	139	126	91	83	1.05	0.32
29.9	200	140	124	89	79		0.27
0.9	78,000	111	93	84	90	1.01	0.71
29.9	200	107	89	83	89		0.42
0.6	87,000	135	124	92	80	0.95	2.63
29.9	200	132	114	86	84		0.22
<0.5	>90,000	118	98	83	45	0.49	7.57
29.9	200	112	96	86	92		0.36

T/C is the ratio of test to control percentage hatches.

The final test appearing in Table 1 (< 0.5 inch Hg) resulted in the hatch of only 45 per cent. fertile eggs and a water loss of 7.57 per cent. of initial egg weight. This is not an excessive water loss in hatching eggs held for ten days or two weeks, but under test conditions the loss occurred in 36 hours or at the abnormally high rate of about 5 per cent. of initial egg weight daily. We can not exclude the possibility that loss of water at this rate directly or indirectly impairs hatchability.

It is notable that water loss increases only moderately with reduction of pressure from 23.6 to 0.9 inches Hg, but very rapidly as pressures are reduced below 0.9 inch Hg. Hatchability also is affected only by pressures less than 0.9 inch Hg. Further study of the relation between water loss and hatchability at pressures below about 1 inch Hg may prove of possible interest in connection with other and more complex reactions at low atmospheric pressures.

RICHARD M. FRAPS

BUREAU OF ANIMAL INDUSTRY,
U. S. DEPARTMENT OF AGRICULTURE,
BELTSVILLE, MD.

[6] D. Melnick, *Cereal Chemistry*, 19: 553, 1942.
[7] J. S. Andrews, H. M. Boyd and D. E. Terry, *Ind. Eng. Chem., Anal Ed.*, 14: 271, 1942.
[1] Morley A. Jull, *Hatchery Tribune*, 18: 80, 1944.