TABLE 1

SIGNIFICANT VARIATIONS IN ORAL TEMPERATURE READINGS UNDER SPECIFIED CONDITIONS

Measure evaluated	Source of error estimate	Degrees of freedom	Components of error estimate	Significant variation (°F)	
				5%	1%
Any single reading in comparison with some hypothetical value, e.g., "normal temperature"	S × H × D	168	σ^2 (Sampling error: random trial-to-trial variations of readings after eliminating major sources of variability)	0.5	0.7
Difference between any two single readings	S × H × D	168	Same as above	0.7	0.9
Comparable readings made upon two individuals at same time of day; or two readings made upon one individual at same hour on different days	S × D	56	$\sigma^2 + 4\sigma^2_{m(s \times d)}$ (Sampling error plus variation among 87 means representing 4 observations each)	1.2	1.5
Two readings made upon one individual at different hours, either on same day or on different days	H × D	6	$\sigma^2 + 29\sigma^2_{m(h \times d)}$ (Sampling error plus variation among 12 means representing 29 observations each)	1.6	2.4

from 97.2° to 98.5°; the 4 hourly means ran from a low of 97.5° at 8:00 A.M. to a high of 98.2° at 6:00 P.M., while the 3 daily means varied by less than 0.1°.

A conventional analysis of variance yielded mean squares significant at the 1% level or beyond for "between subjects," "between hours," and 3 interactions, "subjects × hours," "subjects × days," and "hours × days." Significance of the first-order interactions was established by testing them against the residual variance or "subjects × hours × days" interaction; the main variables, "subjects" and "hours," were evaluated in terms of the appropriate first-order interactions. Furthermore, a series of Bartlett tests, applied to different groupings of the original data, justified certain assumptions concerning homogeneity of variance which would permit the use of all the interactions except, possibly, "subjects × hours" in evaluating individual temperature readings. The latter is suspect for this purpose, because the variance "within hours," estimated from the 29 means of 3 daily readings each, appeared to differ significantly from one hour to the next.

Standard deviations representing the several sources of variation may be obtained by extracting the square roots of the mean squares resulting from the analysis of variance. Those derived from the 3 usable interactions were employed to establish the magnitudes of significant variations at the 5% and the 1% levels of confidence for a number of comparisons frequently made in practical work (*4*). These values are presented in Table 1, together with suggestions for their appropriate use and information concerning the components of the error estimate in each case (*5*). If, for example, any two readings differ by 0.9° F or more, the chances are 99 in 100 that a real difference exists between the actual temperatures in question. If, however, the readings are made at different times of day, the difference must equal at least 2.4° for the same level of confidence, since, in this case, a component of the hourly variation must be included in the error estimate. In general, any given reading must deviate from some hypothetical value or from another reading by amounts as great as or greater than those shown in Table 1 before one may safely conclude that there is a significant difference in oral temperature itself.

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Manuscript received October 7, 1953.

Use of the Thymus Gland in Chicks to Elucidate Interrelationships Between Pteroylglutamic Acid and Biologically Related Substances[1]

Gerald Brody[2, 3]

Department of Bacteriology and Public Health, Michigan State College, East Lansing

Sadun *et al.* (*1*) reported that a pteroylglutamic acid (PGA) deficiency in chicks infected with *Ascaridia galli*, the large roundworm of chickens, fed a highly purified semisynthetic diet resulted in atrophy of the thymus gland. At the time Sadun's studies were carried out, vitamin B_{12} was unavailable and therefore

[1] Journal Article 1553, Michigan Agricultural Experiment Station. Portion of a thesis submitted by Gerald Brody to the Graduate Faculty of Michigan State College in partial fulfillment of the requirements for the Ph.D. Degree. This research was supported by a grant from Lederle Division, American Cyanamid Co., Pearl River, N. Y.

[2] Present address: Research Department, Moorman Manufacturing Co., Quincy, Ill.

[3] The author is indebted to William D. Lindquist for his valuable guidance in this project.

TABLE 1

EFFECT OF VITAMIN B_{12}, VITAMIN C, AND LEUCOVORIN ON THE THYMUS GLAND IN PGA DEFICIENT CHICKS INFECTED WITH *Ascaridia galli*

Expt. no.	Diet	No. animals		Thymus weight
		Start	Finish	
5	Basal (no PGA)	27	7	.063
	Basal + 200 μg PGA/100 g diet	14	14	.513
7	Basal (no PGA, no B_{12})	25	10	.104
	Basal + 5 μg B_{12}/100 g diet	24	8	.089
	Basal + 100 mg vitamin C/100 g diet	24	22	.088
	Basal + B_{12} + vitamin C	21	7	.197
	Basal + B_{12} + vitamin C + PGA	24	23	.597
10	Basal (no PGA, no B_{12})	20	7	.069
	Basal + B_{12}	21	11	.131
	Basal + PGA	18	18	.380
	Basal + PGA + B_{12}	14	14	.543
	Basal + 400 μg leucovorin/100 g diet	18	18	.531

it would seem that Sadun was actually working with a deficiency of both PGA and vitamin B_{12}. From this one might also assume that his control birds which were given adequate PGA were still deficient in vitamin B_{12}. Closely related to the biological activity of vitamin B_{12} and PGA is leucovorin and vitamin C. It is currently believed that leucovorin is the active form of PGA (*2*), and that vitamin B_{12} participates in the formation of leucovorin from PGA in chicks (*3*). Vitamin C on the other hand appears to be synergistic in nature. Dietrich *et al.* (*4*) reported that vitamin C enhanced vitamin B_{12} activity and both vitamin C and vitamin B_{12} stimulated *in vivo* synthesis of PGA.

In view of these intimate metabolic interrelations, studies were initiated to ascertain the effect of PGA, vitamin B_{12}, vitamin C, and leucovorin on *A. galli* infections and on the thymus gland of infected chicks. The action of these compounds on *A. galli* infections as well as complete information as to techniques employed and composition of the basal ration will be reported elsewhere (*5*). Day-old white leghorn chicks, obtained from a commercial hatchery, were used in all experiments. Chicks were infected at 2 wk of age and 3 wk later were autopsied. Thymus weights were obtained using a Roller-Smith balance and recorded as thymus weight/100 g body weight.

The dramatic atrophy of the thymus gland in the absence of PGA (Expt. 5) could be used to elucidate the interactions of PGA with other compounds. The addition of vitamin B_{12} (5 μg/100 g diet) to a basal diet deficient in both PGA and vitamin B_{12} had no consistent influence on thymic growth. Likewise the addition of vitamin C (100 mg/100 g diet) to this basal diet did not stimulate the growth of the thymus gland. However, the addition of both vitamin C and vitamin B_{12} did increase the thymus weight but did not approach the level produced by the addition of PGA (200 μg/100 g diet) to the diet (Expt. 7).

On the other hand, the relative weight of the thymus gland in the presence of leucovorin (400 μg/100 g diet) is almost equal to the weight level of the thymus gland in the presence of both PGA and vitamin B_{12} (Expt. 10). The weight of the thymus gland in the presence of leucovorin is significantly greater than the weight produced by PGA alone, or by vitamin B_{12}.

As had been mentioned earlier, vitamin B_{12} has no consistent effect on the thymus gland in the absence of PGA, but in the presence of PGA, vitamin B_{12} significantly increased the weight of the thymus gland equal to the weight produced by leucovorin alone. Limited numbers of noninfected control chicks were run simultaneously in all 3 experiments with the same results reported herein. Using the weight of the thymus gland in chicks as a criterion, evidence is presented to support the concept that leucovorin is the active form of PGA and that leucovorin is biologically equivalent to PGA plus vitamin B_{12}.

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Manuscript received September 21, 1953.

Report of a Second Example of the Rh Agglutinogen c^v, with Some Comments on Its Relation to the Agglutinogen f [1]

Alan Richardson Jones, Arthur G. Steinberg,[2] Fred H. Allen, Jr., and Louis K. Diamond

The Blood Grouping Laboratory, Boston, and the *Department of Pediatrics, Harvard Medical School*

The recent discovery of a new member of the Rh family of agglutinogens known as f (*1*) has raised several issues both of practical and theoretical importance. In a previous communication (*2*) the present authors reviewed the genetic theories which would most adequately explain the inheritance of the new factor and also made the suggestion that the antigen f might possibly be determined by a "position effect" (*3*) of the genes *c* and *e*. Essentially it was proposed that the presence on one chromosome of the gene combination *ce* would give rise to the f antigen in red cells. Replacement of either *c* or *e* by the alleles *C* or *E*, respectively, would destroy the position effect, and the f antigen would accordingly be absent from the cells. It was predicted that the replacement of the genes *c* or *e* by alleles which caused even minor modification of the corresponding cell antigens might be

[1] Research supported in part by Public Health Service Grant No. H 1227.

[2] Geneticist, Children's Cancer Research Foundation, Children's Medical Center, Boston.