critical, dispassionate or comprehensive as might be desired. To one acquainted with the subject, his remarks are perhaps adequate, but proof of the assumption that the pollen analysis represents with sufficient accuracy the pollen rain is not clear-cut and convincing. The errors of sampling and treatment of samples are not sufficiently differentiated from errors arising from the imperfections of the pollen record. Perhaps these matters are reserved for a later book on the stratigraphy and paleoclimatology of bogs. Indeed, it may not be possible to discuss all these matters in so brief a space. The absence of a truly critical discussion will leave those whose interest is paleoclimatological and chronological disappointed.

As a manual for the practicing pollen analyst or as a text-book for the aspiring student, the book will find its greatest usefulness. We can be grateful to the editor and his volunteer assistants for successful solution of the problems involved in publishing a text with the author isolated by the war. Errors seem to be at a minimum, but redrawing of some of the illustrations would have been helpful.

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SPECIAL ARTICLES

CORN GERM: A VALUABLE PROTEIN FOOD

IN times of food stringency, such as are with us now and will stay with us until the havoc of war has subsided, the most economical use of available food supplies is imperative, and the introduction of new food materials should be welcome. Cowgill[1] has recently emphasized the importance of supplementing available foods by new or little-used foods, the nutritive value of which has been demonstrated by research precipitated by the war. This note calls attention to the value of corn germ as a potentially valuable protein food in human nutrition. The potential output of defatted corn germ, based on the crop yield of 1942, assuming a processing of 16 per cent. of the crop by dry milling and distilling,[2] and a yield of 7 per cent. of germ, has been estimated[3] at 1,000 million pounds per year.

The nutritive value of the proteins of the corn germ has not been studied by any method, in so far as the authors are aware. The potential availability of this food product in human nutrition warrants a better understanding of its nutritive properties. We therefore undertook a study of the digestibility and biological value of corn germ proteins, using the nitrogen balance method that has been developed in this laboratory.[4,5]

The sample of defatted corn germ tested[6] was solvent-extracted at low temperatures (less than 75° C.) and analyzed as follows: 93.06 per cent. dry matter, 2.94 per cent. ether extract, 4.18 per cent. crude fiber, 21.19 per cent. protein (N × 6.25), and 25.6 micrograms of thiamine per gram. The biological value of the protein in this product was measured with a group of 10 young albino rats with initial weights of about 70 grams, and was compared, by a reversal system of feeding, with that of the proteins of beef round, dried and defatted at a low temperature. Both test foods were incorporated in an otherwise complete diet in such amounts as to provide approximately 10 per cent. of protein (N × 6.25), of which nutrient the test foods

TABLE 1

THE UTILIZATION OF NITROGEN (PROTEIN) IN DEFATTED CORN GERM AND IN AUTOCLAVED SOYBEANS, IN COMPARISON WITH THAT OF THE NITROGEN OF BEEF ROUND

Utilization of corn germ nitrogen				
Rat No.	Coefficients of true digestibility		Biological value	
	Beef round	Defatted corn germ	Beef round	Defatted corn germ
229	100	87	77	84
231	100	84	77	78
233	100	82	74	83
235	100	87	72	80
237	99	79	73	66
230	100	90	77	80
232	100	77	86	79
234	99	87	79	79
236	99	89	77	72
238	100	88	77	75
Averages:	*99.7*	*85.0*	*76.9*	*77.6*

Utilization of soybean nitrogen				
Rat No.	Coefficients of true digestibility		Biological value	
	Beef round	Autoclaved soybeans	Beef round	Autoclaved soybeans
239	100	85	77	73
241	100	83	70	66
243	99	86	75	73
245	98	81	72	70
247	99	86	71	70
240	100	84	76	66
242	98	83	77	67
244	99	84	75	60
246	100	87	77	68
248	100	85	72	62
Averages:	*99.3*	*84.4*	*74.2*	*67.5*

[1] G. R. Cowgill, *American Scientist*, 31: 142, 1943.

[2] Corn germ made by the wet-milling process, due to leaching with water and contact with sulfurous acid, may not be highly valuable, either as a source of protein or of vitamins.

[3] This estimate was made by Ezra Levin, president of the VioBin Corporation, of Monticello, Ill., in a private communication.

[4] H. H. Mitchell, *Jour. Biol. Chem.*, 58: 873, 1924.

[5] H. H. Mitchell and G. G. Carman, *Jour. Biol. Chem.*, 68: 183, 1926.

[6] Obtained from the VioBin Corporation of Monticello, Ill., through the courtesy of Ezra Levin.

furnished practically all. In the first period, 5 rats received the corn germ diet while their pair mates received, in equal amounts, the beef diet. In the second period, all rats received the 4 per cent. egg protein (standardizing) diet, and in the third period the two diets were fed as in period 1, but to opposite pair mates. The results for true digestibility (corrected for metabolic nitrogen in the feces) and biological value (percentage of absorbed nitrogen retained for maintenance and growth) of the nitrogen in the two foods are summarized in Table 1.

It is evident from these data that the protein (nitrogen) of defatted (solvent-extracted at low temperature) corn germ is 85 per cent. as digestible as the protein of beef round, but that its biological value for the growing rat is as high as that of beef round.

The average biological value of 78 obtained for this sample of corn germ may be compared with values of 50 to 65 obtained for the cereal grains, 51 to 60 for a series of nuts widely used in the American diet, 72 for the cashew nut, 94 for whole egg, 90 for raw whole milk, and 62 to 77 for various cuts of meat and edible animal organs.[7] These values were all obtained in this laboratory by comparable methods.

A comparison of the utilization of the protein of corn germ with that of the soybean, a comparatively newcomer in the American diet, was also undertaken. The soybeans tested were dried, defatted and autoclaved at 17 pounds steam pressure for $1\frac{1}{2}$ hours. The data presented in the right half of the table were obtained by an identical experimental procedure with beef protein as a reference food. From these figures, it is evident that soybean protein is about as digestible as corn germ protein, but that the digested protein is appreciably less available in satisfying the protein requirements of maintenance and growth.

Thus, corn germ prepared by dry milling is available in considerable quantities as a protein supplement to the American diet. It is a food rich in protein and also in thiamine. When processed in such manner as to preserve its inherent nutritive properties, its protein is well digested, and after digestion it is as well utilized in satisfying the protein requirements of the body as is the protein of the best cuts of meat. In the difficult times ahead, with food shortage at hand or in immediate prospect, and a protein shortage a distinct possibility, a full utilization for human needs of the corn germ already available as a by-product of the corn milling industry would seem to be a wise eventuality. Furthermore, the withdrawal of corn germ from the corn milling by-products used as animal feeds would not precipitate a serious situation in livestock feeding because the protein thus withdrawn can be amply replaced from sources unfit for human consumption or less well utilized by the human, while the withdrawal of its thiamine is of no significance to animals living so largely on whole grains or forages.

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[7] H. H. Mitchell, *Proc. Seventh Convention of the Royal Academy of Italy, Rome*, 1937, p. 101.

CONTROL OF AIR-BORNE MICROORGANISMS BY ULTRAVIOLET FLOOR IRRADIATION

STUDIES of air-borne bacteria in living spaces have demonstrated that bacterial counts are correlated with human activity and that the highest number of bacterial colonies are recovered in the lower levels of such spaces. There are also reports that cross infections can be reduced to a measurable extent by prohibiting the making of beds immediately before dressings are to be changed and by carefully oiling floors and avoiding dry sweeping. It has long been known that pathogenic microorganisms can be recovered from the dust of rooms where carriers of such organisms are present.[1, 2, 3]

From these facts it may be inferred that bacteria of the air are closely associated with dust particles on floors and lint and dust attached to blankets, linens and clothes. During periods of human activity the momentary turbulence of the air raises dust which quickly subsides after the room is emptied or activity is reduced.

Because of these considerations it was thought that ultraviolet floor irradiation might be more effective in controlling air-borne bacteria than upper-air irradiation or that the two in conjunction might be more effective than the present practice of merely irradiating the upper third of rooms or wards.[4]

To check the effectiveness of ultraviolet floor irradiation several experiments were conducted in a sheet-metal-covered experimental chamber of $9 \times 7 \times 8$ feet. The floor of this room was irradiated by 4 eight-watt low pressure mercury vapor glass lamps, 30 inches from the floor. All radiation from the lamps was reflected downwards. One half hour before each experiment a small amount of fine house dust was introduced into the experimental chamber. Two small fans were placed in opposite corners of the room. The fans were maintained at a constant speed throughout all tests.

Bacteria in the air were quantitated by the open

[1] E. White, *Lancet*, 1: 941, 1936.
[2] J. C. Thomas, *Lancet*, 1: 433, 1941.
[3] M. VanDenEnde and C. H. Andrewes, "Aerobiology," Am. Asn. Adv. Science, Misc. Publ. 17, 1942.
[4] W. F. Wells and M. W. Wells, "Aerobiology," Am. Asn. Adv. Science, Misc. Publ. 17, 1942.