catabolic enzyme that is controlled by a specific protein inhibitor, similar to the inhibitor described for deoxyribonuclease(6). Such an inhibitor would not necessarily be apparent in the assay procedure for enzyme activity. In Group AE Aminopterin apparently interferes with synthesis of inhibitor, which is consistent with ability of Aminopterin to inhibit incorporaton of glycine and serine carbon into proteins(1). Estrogen in Group AE stimulates synthesis of phosphoprotein but hydrolysis proceeds at an equal rate, thus preventing a net increase in phosphoprotein and accounting for the very high turnover of phosphorus. In Group E production of inhibitor would be unimpeded, preventing the high turnover rate and resulting in increased accumulation of phosphoprotein.

Harris(7) observed that some controlling factor must exist for phosphoprotein phosphatase of frog eggs but he believed that pH of the yolk was that factor. Johnson and Albert(5) suggested that a specific inhibitor might exist in mammalian tissues, but the hypothesis obviously requires direct experimental support, particularly in view of Feinstein's unsuccessful attempt to demonstrate such an inhibitor in rat intestine(8).

Summary. Total phosphoprotein phosphatase activity of rat uterus increases in response to estrogen as uterine weight increases, but activity/g fresh tissue does not change appreciably. Aminopterin administered simultaneously with estrogen inhibits the increase in total activity/uterus as it inhibits uterine weight increase. The changes in enzyme activity could not be correlated with changes in uterine phosphoprotein and the possible existence of a phosphatase inhibitor was discussed.

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Influence of Water-Treatment on Nutritional Value of Barley.* (23183)

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Fry *et al.*(1) showed that feeding value of barley for chicks was not improved greatly by removal of the fibrous hull through pearling. Results on metabolizable energy content analysis (with chicks) of barley and pearled barley obtained on material sent from our laboratory showed that pearled barley contained *less* metabolizable energy than regular barley.† These findings suggested that the carbohydrate in barley, aside from crude fiber, is much less available than similar carbohydrates in corn. Studies were undertaken to determine whether the nutritional value of barley could be improved by different treatments. The results obtained in 2 of these experiments are here presented.

Procedure. As the basis of a working hypothesis, it was assumed that the lower nutritional value of barley could be due to a number of reasons such as: (1) Presence of an inhibiting substance or substances; (2) existence of structural linkages in the carbohydrates of barley that are not attacked by enzymes endogenous to the chick; or (3) outright deficiency in carbohydrate content of

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barley. The third possibility did not seem logical since the proximate analysis of barley or pearled barley indicates that this grain has as much or more carbohydrate than corn. It was decided, therefore, to select a treatment which might destroy or counteract inhibitors or alter the structure of the carbohydrates. McGinnis and Polis(2) showed that simple water treatment of linseed oil meal markedly improved nutritional value of this protein supplement. This improvement was later shown by Kratzer(3) to be through the inactivation of a pyridoxine antagonist. A water treatment of pearled barley was, therefore, undertaken. It was also felt that such a treatment might alter the carbohydrates in barley by permitting action of enzymes contained in the grain. Coarsely ground pearled barley was mixed with an equal weight of tap water (40°C) and allowed to stand at room temperature (21°C) approximately 8 hours. By the end of this time all of the water was absorbed by the grain. The wet barley was then spread on trays to a depth of one to 2 inches and placed in a forced draft electric oven at 70°C for approximately 15 hours, or until dry. It was then ground in a hammer mill through a 1/8 inch screen. No attempt was made to prevent or retard microbial action during the above treatment. Similar procedures were used in conducting the 2 chick experiments. Three replicate groups of 10 New Hampshire chicks each were fed each diet in Exp. 1, with the exception of the water treated pearled barley diet in which only 2 replicates were used. In Exp. 2, 3 replicate groups of 9 chicks each were given the experimental diets. The chicks were maintained from day-old to 4 weeks in electrically heated batteries with wire screen floors. Feed and water were supplied *ad libitum*. Composition of the diets for each study was the same except for the grain component. The percentage composition of diets was as follows: Grain (corn or pearled barley), 64.2; soybean oil meal (50% protein), 24.3; herring fish meal, 5.0; dehydrated alfalfa, 2.5; bone meal, 2.5; limestone, 0.5; salt, 0.3; premix, 0.7. The premix supplied the following/pound of diet: vit. A, 1200 I.U.; vit. D, 200 I.U.; vit. E, 5 I.U.; riboflavin, 2 mg; Ca Pantothenate, 4 mg; niacin, 7 mg; choline Cl, 400 mg; penicillin, 2.5 mg; methionine, 227 mg; $MnSO_4$, 60 mg; Butylated hydroxy toluene, 57 mg.

TABLE I. Effect of Water Treating Pearled Barley on Chick Growth and Feed Efficiency.

Grain in diet	Avg wt at 4 wk		Feed/gain	
	By replicate	By treatment	By replicate	By treatment
Exp. 1				
Corn	365		1.87	
	364	363*	1.95	1.93*
	361		1.97	
Pearled barley	299		2.19	
	309	306	2.25	2.31
	310		2.50	
Water-treated pearled barley	406		1.72	
	431	420*	1.71	1.72*†
Exp. 2				
Corn	382		1.91	
	381	383*	1.97	1.96*
	387		1.99	
Pearled barley	332		2.39	
	325	319	2.21	2.30
	300		2.31	
Water-treated pearled barley	394		1.79	
	401	388*	1.75	1.78*†
	368		1.80	

* Significantly better ($P < .01$) than untreated pearled barley.
† *Idem* than corn.

Results. Table I shows outline of experiments and the results obtained on chick growth and feed efficiency. The values are given for replicate groups and also for treatment averages. The improvement in nutritional value of pearled barley by water treatment was very striking in both experiments. The results show that treated pearled barley was equal to corn for supporting chick growth. Feed efficiency for the diet containing treated pearled barley was significantly better than for corn ($P < .01$). Both diets gave significantly better growth and feed efficiency than the diet containing untreated pearled barley. The data were analyzed by Duncan's Multiple F test(4) and by the modification of Kramer(5).

Discussion. The marked improvement in nutritional value of pearled barley by the water treatment described was probably caused by increased availability of energy. Previous results(1) have shown that addition

of tallow to similar diets containing untreated pearled barley gave chick growth and feed efficiency almost comparable with a diet containing corn. The possibility that an inhibiting substance was destroyed by the treatment cannot be eliminated, since appropriate experiments have not been conducted.

Summary. The results obtained in 2 independent experiments demonstrated that a simple water treatment of pearled barley markedly improved the nutritional value of this cereal grain. Treated barley was equal to corn for chick growth. The diet containing treated pearled barley gave significantly better ($P<.01$) feed efficiency than the diet containing corn or untreated pearled barley.

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Immunogenicity of Poliomyelitis Vaccine Prepared with Ultraviolet Irradiation and Mild Heat.* (23184)

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In previous reports(1,2) it was demonstrated that poliomyelitis vaccines produced by inactivation with ultraviolet irradiation alone or in combination with heat were safe and effective when used in human volunteers. In this paper, experiments showing effects of varying intensities of ultraviolet irradiation with and without subsequent exposure to mild heat on inactivation of poliomyelitis virus and on antigenicity of the resulting vaccine in animals, are presented.

Material and methods. The vaccines were prepared from poliomyelitis virus propagated in monkey kidney tissue culture. Some preliminary work was done with vaccines made from virus grown in our laboratories; however, the bulk of the virus preparations used to prepare vaccines for this study was supplied by Parke, Davis and Co. and contained Mahoney (Type I), MEF-1 (Type II), and Saukett (Type III) strains. The material, except in one experiment, was irradiated as trivalent pools after preliminary studies had demonstrated that all 3 types of virus were essentially equally susceptible to ultraviolet irradiation, as shown in Table I. Just prior to initial irradiation the virus suspensions were filtered through a series of sintered glass filters (coarse, medium-fine and ultra-fine). In cases where 2 irradiations were employed in series (see below), an intermediate fine sintered glass filter was used. The irradiation was carried out in centrifugal filmers described in detail elsewhere†(3). Two filmers were connected in series in such a manner that samples could be taken after the virus suspensions had passed through one or both of them. The quantity of ultraviolet energy absorbed/ml of virus suspension was varied by passing the respective materials through the machine(s) at different rates. While exposure time is relatively constant, the net biological effect produced by irradiation is dependent upon a number of factors, discussed elsewhere†(1,3). At a flow rate of 200 ml/minute in the particular machine used, the film thickness is about 18 μ. An increase in flow rate results in an increase in film thickness, thereby reducing the quantity of energy absorbed per unit volume irradi-

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