

TABLE I.
Showing Percentage Composition of Diets Used in Refined and Unrefined
Dicalcium Phosphate Metabolism Studies.*

Diet No.	150	151	152	155	156
Wheat Gluten	20.0	20.0	20.0	20.0	20.0
Sodium Chloride	1.0	1.0	1.0	1.0	1.0
Yellow Corn	77.0	75.56	75.56	74.5	76.68
Calcium Carbonate	2.0	—	—	—	—
Calcium Citrate	—	—	—	4.5	—
Tricalcium Phosphate	—	—	—	—	2.32
Dicalcium Phosphate (unrefined)	—	—	3.44	—	—
Dicalcium Phosphate (refined)	—	3.44	—	—	—
Calcium	1.065	0.903	0.944	0.911	0.673
Phosphorus	0.307	0.833	0.922	0.307	0.653
Ca : P	3.47	1.02	1.02	2.97	1.03

* This diet differed from the Steenbock diet only in that only 2% of calcium carbonate was present rather than 3%, the difference being made up in yellow corn. This change was made so as to avoid extreme bone pathology during the course of the experiments such as would have resulted from the higher calcium:phosphorus ratio.

of the bones, even to the extent of actual losses of calcium from the body. 4. The greater efficiency with which calcium is utilized when provided in the form of unrefined and refined dicalcium phosphate is demonstrated roentgenographically by the extent of calcification of the leg bones. 5. The efficiency with which the phosphorus content of the diet is utilized is dependent upon the form in which calcium is supplied. 6. In respect to the efficiency with which the bone-forming elements, calcium and phosphorus, are utilized, unrefined dicalcium phosphate and refined dicalcium phosphate rank superior to tricalcium phosphate or bone-meal, and the latter in turn ranks above the non-phosphorus-containing salts, calcium carbonate and citrate.

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Secondary Calcium Phosphate Prevents and Cures Rickets Without Vitamin D. 2. Calcification Studies.

CHARLES JAMES BLOOM. (Introduced by Charles W. Duval.)

From the Graduate School of Medicine, Tulane University of Louisiana.

The preventive and curative methods for experimental rickets were employed. The standard rickets-producing diet had the following composition: Yellow Corn, 76%; Wheat Gluten, 20%; Calcium Carbonate (precipitated chalk), 3%; Sodium Chloride, 1%. Since the precipitated chalk was not 100% calcium carbonate, the resultant calcium content of this diet was 1.13%.

Corresponding diets were made up containing refined, *i. e.*, pure, dicalcium phosphate* and unrefined dicalcium phosphate† in place of the calcium carbonate, the amounts being 4.54% and 4.25%, respectively. These diets provided the same calcium content (1.13%) as the calcium carbonate diet. The above figures were derived from the fact that the calcium content of the various salts, as determined by analysis, were: Precipitated Chalk, 36.69%; Refined Dicalcium Phosphate, 24.81%; Unrefined Dicalcium Phosphate, 26.56%.

The higher proportion of inorganic salt introduced by refined or unrefined dicalcium phosphate was compensated by a corresponding reduction of corn content.

Healthy albino rats were divided into 5 groups:

Group A received the calcium carbonate diet only, for a period of 35 days.

Group B received the refined dicalcium phosphate diet only, for a similar period.

Group C received the unrefined dicalcium phosphate diet only, for a similar period.

Group D received the carbonate diet for a period of 3 weeks and was then put on the refined dicalcium phosphate diet for 5 succeeding weeks.

Group E received the carbonate diet for 3 weeks and was then changed to the unrefined dicalcium diet for 5 weeks.

The bones of the animals in Group A, which showed +++ or ++++ rickets roentgenographically, yielded an average ash value of 30.69%, which is characteristic of rickets. On the other hand, the groups of animals receiving their calcium in the form of refined dicalcium phosphate and unrefined dicalcium phosphate showed average bone ash values of 50.27% and 51.16%, respectively. These figures corroborate the state of calcification shown by the roentgenographs.

The groups of animals which were allowed to develop rickets and were later cured by substituting for the calcium carbonate, refined dicalcium phosphate and unrefined dicalcium phosphate gave average bone ash values of 49.19% and 46.33%, respectively. These values are normal and are substantiated by the roentgenographs.

Conclusions. The substitution of refined dicalcium phosphate or unrefined dicalcium phosphate for calcium carbonate in the rickets-producing diet resulted in the prevention and cure of rickets. Dis-

* Dicalfos, manufactured by the Bay Chemical Co., New Orleans, La.

† Dicapho, manufactured by the Bay Chemical Co., New Orleans, La.

TABLE I.
Bone Ash Values of Rats Receiving Calcium Carbonate, Refined and Unrefined Dicalcium Phosphate Diets.

Group	Type of Experiment	Calcium Salt	Bone Ash (Dry, fat-free basis)
A	Preventive	Carbonate	%
			30.33
			28.97
			32.74
			28.42
33.00			
		Average	30.69
B	Preventive	Dicalcium Phosphate (refined)	45.64
			51.79
			53.19
			Average
C	Preventive	Dicalcium Phosphate (unrefined)	49.68
			52.26
			51.53
			Average
D	Curative	Dicalcium Phosphate (refined)	47.26
			51.11
			Average
E	Curative	Dicalcium Phosphate (unrefined)	43.92
			48.74
			Average

regarding the effect of an external supply of phosphorus in the diet, these experiments indicate that from the standpoint of bone formation, refined dicalcium phosphate or unrefined dicalcium phosphate are infinitely superior to calcium carbonate in its various forms, such as precipitated chalk, crushed limestone, or crushed shells. Hence it is proper to refer to refined and unrefined dicalcium phosphate as being indicated in cases of rickets, or leg weakness of chicks.