

Documented Differences Between Natural & Synthetic Vitamins

1. GENERAL OBSERVATIONS ON SYNTHETIC VITAMINS

Clinical and Laboratory Comparison:

“The Section d-alimentation of the Comite Consultatif d’hygiene at Vichy France] determined to organize the systematic distribution of vitamins A, B, and D, Professor Lesne, a *specialist in vitamin research, believes that the effect of natural vitamins is superior to that of the artificial ones, For instance,, the treatment of scurvy by giving 50 cc. of lemon juice containing 25 mg. of ascorbic acid produces quicker results than 25mg. of ascorbic acid administered as a medicament. The artificial vitamins, especially vitamin C, are quickly absorbed and also quickly secreted by the kidney. These vitamins have to be administered every day in order to be efficacious. Besides, there exists an antagonism among the different artificial vitamins. The body eliminates, for instance, vitamin C if vitamin A or D is administered simultaneously. Professor Lesne said at a meeting of the Academic de Medicine that if good results have been realized with the administration of artificial vitamins ‘they are not able to mend the deficiency due to inadequate food’”*

JOURNAL OF THE AMERICAN MEDICAL ASSOC.,
118, 6:475. February 7, 1942

Natural Vitamins Contain all Fractions:

“By simultaneous supply of water-soluble and fat soluble vitamins together a **hypervitaminosis cannot be produced**, though they may be given in very large quantities....”

STEPP, W., KUHNAU. I., p, and SCHROEDER, J.
THE VITAMINS AND THEIR CLINICAL APPLICATIONS
(Die Vitamine und ihre IGINISECHE ANWENDUNG)
Ferdinand Rake, Stuttgart, Germany 1936

“Natural forms of vitamin E [complex] lose up to ‘99% of the potency when separated from their natural synergists.”

ANNUAL REVIEW OF BIOCHEMISTRY 1943 p.381

“When female rats are reared and bred on Steenbock and Black I’s rachitogenic diet number 2956 supplemented with viosterol (synthetic vitamin D) to forestall the development of rickets, *congenital malformations appear in about one third of their offspring.*

“...Abnormal and normal offspring can be obtained alternatively from the same female when the deficient diet and the diet supplemented by liver are fed alternatively. The experimental results described have been obtained in two different strains of rats, It seems that the normal prenatal bone development of *these* rats depends on a nutritional factor which is absent or inadequate in the deficient diet and present in large amounts in liver.”

JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION,
Soc. Proc., 118, 12:1002, March 21, 1942

“Attention is called by V. P. Sydenstricker, M. D., of the University of Georgia, School of Medicine, Augusta to the fact that among *human beings more than one vitamin is concerned in the production of any deficiency*. The development of avitaminosis is due to the failure or perversion of normal biochemical reactions which can be completed only when adequate supplies of different vitamins are available.”

MODERN MEDICINE, 9, 10-35, October -1941

“Until all the factors lost in milling are known and it is known that each of the others is adequately supplied by other foods, the logical solution of the problem presented is the restoration of the grain embryo itself to the diet.”

MARKS, H.E., *Vitamin Deficiencies and Restored Foods*,
Letters to the Editor of the: JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION,
114, 6:512, February 10, 1940

2. VITAMIN A

Clinical and Laboratory Comparison:

Stephenson found that a crude (alcohol-light petroleum) *extract c/dried carrot when added to a fat lacking in vitamin A conferred upon its growth-promoting properties and protected rat from Xerophthalmia while carotene extracted from carrots was without effects.*

SHERMAN, H., and SMITH, S.,
THE VITAMINS Second Edition, Monograph Series No. page 244
The Chemical Catalog Company, Inc, New York, 1931

“The occurrence of increased amounts of carotene in the blood of patients with diabetes mellitus has long been recognized both by the clinical observation of xanthosis and by the results of laboratory tests. A group of 20 patients with juvenile diabetes mellitus were studied, and all were found to have poor light adaptation by the Frober-Faybor biophotometer. Three of the group *were* subjectively aware of night blindness, and nine showed cutaneous changes compatible with

vitamin A deficiency. *The daily administration of 60,000 U.S.P. units of vitamin A in the form of crystalline carotene dissolved in vegetable oil for as long as 14 days did not affect the light adaptation of the patients with diabetes mellitus. The daily administration of 60,000 U.S.P units of vitamin A to patients with diabetes mellitus in the form of concentrated fish liver oils caused their light adaptation to return to normal or nearly normal in periods ranging from 3 to 21 days. The cause of poor light adaptation in patients with juvenile diabetes mellitus appears to be an inability to convert carotene to vitamin A.*"

BRAZER, J., and CURTIS, A.,
ARCHIVES OF INTERNAL MEDICINE, 1940
as abstracted by ENDOCRINOLOGY, 26, 5-936, May, 1940

...A unit of vitamin A in butter, determined chemically, is apparently more efficient biologically than a unit of vitamin A in cod liver oil determined in the same way.'

FRAPS, G., and KEMMERER, A.,
Texas Agr. Expt. Sta., Bull. 560, 3-21 (1938)
abstr. From CHEMICAL ABSTRACTS, 32-8:3039, April 20, 1938

"Spinach vitamin A. is ten times as potent, unit for unit, as vitamin A from Fish liver oil *in* the treatment of night blindness."

FREDERICHSEN, and EDMUND,
Studies of Hypovitaminosis A: II A New Method of
Testing the Resorption of Vitamin A from Medicaments,
AMERICAN JOURNAL OF DISEASES OF CHILDREN,
53:89-109, Jan., 1937, Clin. Expts. In the Vit-A bal. in children
after various diets, *ibid*, 53:1179-1201, 1937

3. VITAMIN B COMPLEX

Clinical and Laboratory Comparison

"The addition of yeast or Peters' eluate to the diet regularly prevented this liver damage. *Rich and Hamilton* observed the development of cirrhosis of the liver similar to the Laennec type in all of fourteen rabbits which were kept on diet supplemented by various vitamins but lacking yeast. *These investigators determined that the injury was due to lack of some factor contained in yeast other than vitamin B1, B2, B6 or nicotinic acid.*"

HAS, W., Annual Review Physiol., 3:259-282, 1941

“The nutritive value of straight-run white flour (73% extraction, tested on young growing rats) has been found inferior to that of wholemeal flour, even when the defects *of* the former in protein, minerals and vitamin B1 have been corrected.”

CHICK, H., THE LANCET, 2:511-512, October 26, 1940

“It (stomatitis) does not respond to treatment with vitamin B6, riboflavin, or nicotinic acid, singly or in combination. Restoration of the mouth *to* normal was accomplished only after intensive therapy with the vitamin B complex. *The factor or factors responsible are present in the vitamin B complex and may be any of the less well-known fractions which have not as yet been isolated or synthesized and consequently have not been applied in human nutrition studies.*”

ROSENBLUM, I., and JOLLIFFE, N.,
JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION,
117:2245, December 27, 1941

“I am very familiar with the difficulties involved with the fortification of foods with synthetic vitamins or concentrates of individual vitamins, and the results in Chart 1 clearly emphasize the problem in question. In this case chicks were placed on the modified Goldberger diet alone and supplemented with various synthetic vitamins and concentrates of some of the new members of the B complex. In *most* cases some improvement in growth was noted due to the feeding of each additional vitamin, **but normal growth was not obtained until a fair amount of a natural food such as liver, kidney or, yeast was added.** *Likewise, synthetic vitamins should be used with caution in order to prevent the development of deficiencies more serious than the deficiency we set out to control.*”

ELVEHIEM, C.,
JOURNAL OF THE AMERICAN DIETETIC ASSOC.,
16, 7:654, August, September, 1940

“In dogs fed a low protein diet supplemented with thiamin hydrochloride, nicotinic acid, riboflavin, pyridoxine hydrochloride and either pantothenic acid or purified liver extract, a deficiency state developed characterized by loss of appetite, substantial loss of weight, moderate to severe anemia and peptic and cutaneous ulcers, The condition was prevented by an increase of protein diet. [Disease] was not cured or prevented by the addition of cystine, choline, paraminobenzoic acid, inositol or an eluate of clay absorbate of liver extract.”

FOUTS, P.,
JOURNAL OF THE AMERICAN MEDICAL ASSOC.,
Soc. Proc., 118, 12:1002, March 21, 1942

4. VITAMIN C

Clinical and Laboratory Comparison

“I had a letter from an Austrian colleague who was suffering from a severe hemorrhagic diathesis. He wanted to try ascorbic acid in his condition. Possessing at that time no sufficient quantities of crystalline ascorbic acid, I sent him a preparation of paprika that contained much ascorbic acid and the man was cured by it. Later with my friend, St Rusznyak, we tried to produce the same therapeutical effect in similar conditions with pure ascorbic acid but we obtained no response. It was evident that the action of paprika was due to some other substance present in this plant.”

ALBERT SZENT-GYORGYI,
OXIDATION, pp. 73-74,
Williams and Wilkins, Baltimore, 1939

“It was demonstrated that guinea pigs, fed vitamin C-free diets, could be more thoroughly protected against infections with pneumococci by lemon juice or orange juice than by pure ascorbic acid.”

STEPP, W. KUHNAU, J. and SCHROEDER,
The Vitamins and Their Clinical Applications
(Die Vitamine'und ihre Ininisdhe Anwendung)
Ferdinand Enke, Stuttgart, Germany, 1936

“The use of vitamin C when increased capillary permeability is due to deficiency of that vitamin is of course specific. *The fruit juices are more effective than the synthetic vitamin C.*”

MADISON F.,
comments by, on the paper of
Fowler and Barer,
JOURNAL OF THE AMERICAN
MEDICAL ASSOCIATION

“Three cases of hemorrhagic intestinal disease did not improve after daily intravenous injections of ascorbic acid, but *were* cured by lemon juice.”

LUND, H., and ELMBY, A.,
abstr. from BRITISH JOURNAL OF
CHEMISTRY AND PHYS,
page 678, August, 1938

“...treatment with natural vitamin C had reduced the incidence of typical paralysis by about 1/3 as compared with the controls (from 92.8 to 59.1 per cent) while the reduction for the two synthetic preparations combined was less than 1/5 (from 92.8 to 75.2 per cent).”

JUNGBLUT, C., J., *Exp. Med.*, 66, 4459-4771 October 1, 1937

In a speech before the Texas Pediatric Society in Dallas in 1937, H. Poncher MD, stated he had observed that *‘frequently the hemorrhagic manifestations do not stop as promptly with pure ascorbic acid as with citrus fruit juices. The implication appears that possibly the citrus fruits and natural sources of vitamin C may contain something in addition to pure ascorbic acid which is important in the management of scurvy.’*

PROCEEDINGS OF TEXAS PEDIATRIC SOCIETY, 1937

“The group receiving ascorbic acid seemed to decline in weight much more rapidly and to develop more marked symptoms of avitaminosis than did the controls. This deleterious effect may be attributed to the stimulating action of an excess of vitamin C (ascorbic acid) on the metabolism as has recently been demonstrated by Mosonyi and Rigo. An excess of one vitamin may thus prove decidedly injurious.”

GROLLMAN, A., and FIROR, W.,
JOURNAL OF NUTRITION, 8:572, November 1934

“One of the clinical tests for latent (early) scurvy is ‘the measurement of the resistance of the capillaries (microscopic blood vessels) in the skin to rupture when the pressure within them is artificially increased by the application of external pressure. In human scurvy the capillary resistance is low. After crystalline vitamin C (ascorbic acid) became commercially available it was found in many cases that the capillary resistance could not be increased even by administration of large doses of the crystalline vitamin. On the other hand, lemon juice appears to be effective in improving this condition. One group of workers interprets these findings as evidence ‘that there is another vitamin which is also important in the prevention and cure of human scurvy. They do not dispute the necessity of vitamin C (ascorbic acid) but their contention is that this other factor, which they call vitamin P, is also essential. “Little is known at present regarding the properties of or distribution of this postulated vitamin P. It appears to be abundant in lemon juice and it is probably present in other citrus juices. Until the uncertainty regarding the actuality of vitamin P is removed, it is preferable whenever possible to use the natural antiscorbutic foods--the citrus and tomato juices and vegetables--rather than the pure crystalline vitamin.”

BORSOOK, HENRY, Ph.D., MD,
Professor of Biochemistry,
California Institute of Technology.
VITAMINS Vikings Press, 1941. Pages 109-110

5. VITAMIN D

Greater Potency of Natural Vitamin:

“Ergosterol and yeast when activated anti-rachitically by ultraviolet radiations are inefficient sources of vitamin D for the chicken. Whereas 1% of cod liver oil of average potency resulted in normal bone production, it required from 40-120% cod liver oil equivalence as irradiated ergosterol and from 7.5% to 60% cod liver oil equivalence as yeast to produce the same results.”

STEENBOCK, H., KLETZIEN, S., and HALPIN
J.9J. Biol Chem., 97:249, July, 1932

“Vitamin D factor in viosterol and cod liver oil are not identical. Ten times as many vitamin D units in viosterol do not give as much protection as plain cod liver oil.”

De SANCTIS, A., and CRAIG, J.,
New York State Medical Journal, 34, 16:712-714, 1934

“A chart taken from the work done by Mellanby indicates that in these studies vitamin D of viosterol was probably less effective than the vitamin D of cod liver oil, in respect to the prevention of caries.”

MELLANBY, Medical Research Council,
Spec Report Series, No. 211, His Majesty's
Stationary Offices London, 1936

“A recent report states that the rat unit of natural vitamin D is about 100 times *more* potent in protecting chickens and children from rickets than the rat unit of irradiated ergosterol.”

SUPPLEE G., ANSBACHER, S., BENDER, R.,
and FLINIGAN, C., J., Biol. Chem. 141,
1:957-107, May, 1936

“It is well known that the administration to children of irradiated ergosterol meets with less clinical success than the older therapy of cod liver oil unless the unit dosage of the former is greatly increased over that of the latter.”

BUNKER, J., and HARRIS, R.,
NEW ENGLAND JOURNAL OF MEDICINE,
211, 25:1141, December 20, 1934

“The point was brought out that the relative effectiveness of the vitamin D of cod liver oil and the vitamin D of irradiated ergosterol varies with experimental conditions. Under the conditions of the present experiment, cod liver oil was fifty times as effective as the rat-equivalent amount of irradiated ergosterol for promoting calcification in the femurs of chickens.”

BILLS, C., MASSENGALE, O., McDONALD, F.,
and WIRICK, AMERICAN JOURNAL OF
BIOLOGY AND CHEMISTRY,
108, 323-300-330, February, 1935

“In rats, calciferol, the vitamin D of irradiated ergosterol, exerts greater toxic effects at lower levels than does the vitamin D of fish liver oil.”

MORGAN, A., KIMMEL, L.,
and HAWKINS, N., J.
Biol. Chem, 120, 1:85-102, August, 1937

“Among 90 women who received viosterol and calcium lactate, the placenta showed calcification “beyond normal expectation or experience.” Calcification extended into the normal uterine wall in one case. Definite calcification of the kidneys was also noted, *fetal heads were less moulded, suture lines less distinct and general appearance of ossification or post-maturity was noted. Labors were prolonged.*”

“Among ninety women who received viosterol only, lesser but definite areas of calcification “beyond normal expectation or experience were found, In ninety women who received calcium only and also ninety women who received cod liver oil and calcium lactate the placenta did not show abnormal calcification, fetal heads were normally moulded, fontanelles were open and sutures not fused. The same was true in two groups of ninety women each who received only cod liver oil or who had a normal diet without viosterol, calcium or cod liver.”

BREHM, W., OHIO STATE MEDICAL JOURNAL,
33:990-993, September, 1937, as reviewed by
Modern Medicine, p. 62, October, 1937

6. VITAMIN K

Natural Concentrates are Complex in Nature

“In our experience, concentrates prepared from alfalfa and with a potency of one unit in about 39 micros are *quite complex in composition* and contain several chemical individuals with varying vitamin K potencies, as investigations by several chromatographic analyses on calcium sulfates show. Some of these fractions are deep *red*, others are yellow, but our most potent concentrates were nearly colorless. It should be noted that our process of isolation is different from that employed by other investigators and this may be one of the reasons why we were able to obtain

concentrates which had such a high potency but did not give the typical color reaction for vitamin K.”

ANSBACHER, S., FERNHOLZ, E.,
and Mac PHILLAMY, H., *Proc Soc. Exptl.*
Biol. and Med., 42:655-658, November

7. NATURAL VITAMINS CONTAIN MANY FRACTIONS

“The Nutrition Committee of the National Health and Medical Research Council considered the proposal fully but decided that the addition of synthetic vitamin B1 alone to white flour involves a wrong principle. It is well known that *there* are many instances in which mixtures occurring in natural products have a *more* beneficial effect than the administration of the isolated single substances, e. g., in the treatment of pellagra, in which it has been found that whereas the primary deficiency is of nicotinic acid, the best results are obtained by the administration of additional members of the vitamin B complex... Instead, it is recommended strongly that an investigation be made into the possible use as additions to the diet of products such as cereal by-products [*refined-out impurities*], dried milk and other sources of the B complex rather than the use of imported synthetic products, since such by-products would supply other known essentials besides vitamin B1.”

JOURNAL OF THE AMERICAN MEDICAL ASSOC.,
Foreign Letters Section, 116, 9:882, March 1, 1941

“It was by no means certain that Yeast extract or art extract of wheat germ which was very rich in vitamin B could be replaced, as far as the B complex was concerned by the synthetic vitamin. Some factors had evidently not yet been identified. Hence the reluctance to depend on other than the natural foods. However, when a mixture of synthetic Vitamins was combined, there was always the fear that some essential factor as yet unidentified, might be left out.” (Professor J. Drummond, Scientific Advisor to the Ministry of Food, England).

JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION,
118, 10:33, March 7, 1942

“In the present observations these changes took place during a period when the intake of food containing vitamin B was inadequate and were relieved by therapeutic agents (brewer’s yeast and liver) *known* to be rich in vitamin B. Further identification of the substance liver extract responsible for the changes noticed must remain incomplete until various factors now grouped together as vitamin B are identified, and separately tested.”

ELSOM, K., and SAMPLE, *Am. J. Clin. Invest.*, 16:4632, 1937

Clinical Deficiency Not of Single Factor

“Nicotinic acid may aid in the restoration of health but among the pellagrins here described a considerable amount of ill health, such as anemia, underweight, diarrhea, and a few subjective symptoms, persisted.”

KOOSER, J., and BLANDENHORN, M.,
JOURNAL OF THE AMERICAN MEDICAL ASSOC.,
112:2581-2584, June 24, 1939

“It is obvious that pellagra, as it occurs in human cases, is a multiple deficiency. This seems only reasonable because of the close association of the various components of the B complex in their natural occurrence. It now seems clear from the work of many investigators that complete cure of pellagra will not take place through the administration of nicotinic acid alone, particularly if the deficient diet is maintained.”

GORDON, E., and SEVRINGHAUS, E.,
Vitamin Therapy in General Practice,
The Year Book publishers Inc., Chicago, 1940

“Our investigations have shown that definite deficiency of vitamin B₁ is not uncommon among hospital patients in England and *we wish to emphasize that vitamin deficiencies in man are almost always multiple and are therefore usually inadequately treated by administration of a single pure substance.*”

GOODHART, R., and SINCLAIR H.,
Biol. Chem., 132:11-21, January, 1940

“Clinical conditions presenting a lack of a single dietary constituent are rare, it is more common to encounter multiple deficiency states... Therapy for deficiency disease therefore usually involves the use of more than a single constituent as the subsequent discussion is intended to show...”

“While a deficiency of thiamin probably still remains the most etiological factor in beriberi, *there is strong evidence to indicate that the nerve degeneration of polyneuritis is due to a lack of some other factor or factors, possibly riboflavin or pantothenic acid. Until this matter is settled; practical therapeutic measures must involve the known B components, and special attention should be paid supplying an adequate intake of the entire B complex.*”

GORDON, E., and SEVRINGHAUS, E.,
Vitamin Therapy in General Practice,
The Year Book publishers Inc., Chicago, 1940

The following quotation is taken from a speech made by Russell L. Haden MD, chief of the medical division of the Cleveland. Clinic, Cleveland, Ohio, before the International Medical Assembly of the interstate Post Graduate Medical Association of North America held in St. Louis, October 18-22, 1937 (Published in DRUG TRADE NEWS, October 25, 1937).

“By feeding his patients yeast, Dr. Haden explained, he was able to give them all of the various components of the vitamin B complex. “The trouble with so many of the deficiency diseases, is that they are multiple,” he said, “so what I try to do is to have patients use foods which contain them all or give them extracts that contain several.”

8. TOXICITY OF SYNTHETIC VITAMINS

Attention should be given, Dr. Morgan concludes from these experiments, “to this possible danger of the administration of large amounts of certain vitamins such nicotinic acid to persons subsisting on diets having multiple deficiencies. Fortification of food with those vitamins such as thiamin or nicotinic acid which are available in large quantities may precipitate conditions *worse than the subacute deficiency state produced by the usual diet balanced in its inadequacies.*”

SCIENCE NEWS LETTER, 39,
12:183, March 22, 1941 (Science, March 14, 1941)

“The above case histories would seem to indicate that large doses of vitamin B1 are capable of irritating *the* peripheral nerve plates. Apparently, this toxic symptom occurs in only a very small percentage of cases treated with massive doses of vitamin B1. However, one should be on guard in the use of this substance.”

STEINBERG, C., Am. J. Dis., 5:680-681, December, 1938

“(In rats) a daily dose of 100 ug (*gamma*) of thiamin results in female sterility in the second generation. A daily dose of 200 ug (*gamma*) of thiamin produces toxic effects in lactation in the third generation. A daily dose of 400 *gamma* of thiamin results in “entire failure in lactation in the third generation.” (Note: This article states that the daily requirement of B1 for rats is 50 ug)

SURE B.,
JOURNAL OF NUTRITION, 18, 2:187-194,
August 10, 1939

“The symptoms of thiamin overdosing are similar to those of hyperthyroidism (1) fast pulse, (2)

irritability, (3) tremor, (4) weakness. Twenty to forty Mg should not be used except in deficiency cases.”

MILLS C.,
JOURNAL OF THE AMERICAN MEDICAL ASSOC.,
May 3, 1941. abstr. in Clinical Medicine 48, 9:211, September, 1941