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TWENTY-SIXTH SCIENTIFIC MEETING—FOURTEENTH ENGLISH MEETING
JOINT MEETING WITH THE BIOCHEMICAL SOCIETY

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APRIL 28TH, 1945

THE VITAMIN B COMPLEX

Morning Session: Chairman, Professor R. A. PETERS

Professor R. A. Peters (Department of Biochemistry, University Museum, Oxford): We meet today at a time when reports on the part of Holland which has not been liberated are most distressing and extremely alarming. I think, therefore, that this occasion cannot be passed over without expressing our hope that some of our Dutch friends, who are not able to join in today's discussions, will be restored to us safe and sound very soon. I am thinking especially of Professor Jansen who, with Donath, was the first to isolate crystalline vitamin B₁ from rice polishings (Jansen and Donath, 1926), and of Professor Westenbrink. It might be thought that instead of being here we should all be standing by over the Channel to render aid to our friends in their nutritional distress. I feel sure we all would wish to do this if we could; unfortunately we cannot all take part and we have to leave it to those selected.

I think our Dutch friends would be the first to understand our devoting a day to the vitamin B complex; their only comment, perhaps, would be that we should attempt to discuss it *all* in one day because the subject chosen for discussion is now a very large one.

Until the war, mostly with colleagues in Oxford, I was engaged in research in and around this field for many years and felt myself reasonably up to date but, latterly, the growth of new and good work has been so intensive that I think any of us might be excused for finding it difficult to keep well informed. It is possible, however, that some general comments by way of introduction may be of interest because possibly Dr. Chick and myself have had a longer experience in this field than most people in the room today.

My own interest in the problem arose in the laboratory of our great pioneer, Sir Frederick Hopkins, from nutritional experiments on ciliates in 1921-22. We are dealing today with the isolated factors which arose out of the original water soluble B. There were hints 20 to 25 years ago that the action of this was not due to one single factor. It seemed best to me to make progress by following up in yeast extracts the factor curative for head retraction in pigeons. It is rather odd now to realize

that there were not very many people working on this then, nor on the use of the "head retraction" pigeon; in fact, I was regarded as somewhat obstinate to adhere to this test. In the end, we obtained a preparation which we, early, thought had little if any maintenance effect in pigeons (Kinnersley and Peters, 1925). Dr. Chick and her colleagues used our concentrates to demonstrate the presence of two factors for the rat (Chick and Roscoe, 1928) and from this, together of course with the observations of Goldberger, Wheeler, Lillie and Rogers (1926), and of Smith and Hendrick (1926), it soon became definitely established that there were at least two entities in what we had originally known as water soluble B. About 20 years ago when one tried to put down material for an advanced lecture, it was hard to explain all the observations without postulating several factors in the vitamin B complex. Just at that particular point, as is usual, many folk tended to say that the discordant observations in the literature were wrong; personally I believed in most of the experiments quoted and thought that the conflict was due to failure to understand all the complications.

Arising out of the early work, there is one thing in the nomenclature which may give rise to misunderstanding unless its origin is known. If you are trying to isolate new growth factors, there comes a stage when you realize that something has happened, that you have divided your original unitary activity and you have to explain your experiments in terms of two parts. At this intermediate stage in isolation which may be protracted, it is a nuisance to have continually to refer to detailed preparation of the extracts. At such stages, therefore, by agreement, workers in these fields adopted the plan of describing their results by suffixes, B₁, B₂, B₃ and so on. This convention was used to some extent as an experimental convenience though usually the various "B" factors have become chemically defined entities. There were of course continual difficulties, more understandable now. To make this point clear, I can allude to experiences in my laboratory. We found at one stage that three water soluble factors were necessary for pigeon nutrition (Carter, Kinnersley and Peters, 1930) which we called B₁, B₃ (Williams and Waterman, 1928) and B₅. Later, György delineated a factor for the rat, now known as pyridoxin, which he called vitamin B₆ (György, 1935, 1938; *cf.* also Keresztesy and Stevens, 1938; Lepkovsky, 1938). The experimental work on this last factor progressed fastest and led to isolation of the substance; meanwhile it was found that much of the vitamin B₅ effect was produced by vitamin B₆. Now we find that some people are prepared to say that B₅ does not exist, which is of course not really true. The facts are that Carter and O'Brien (1939) found more recently that pyridoxin constitutes a large part, though not all, of vitamin B₅; B₅ is still therefore an experimental convenience. However, we have now got many chemically defined entities, instead of having letters which we shall all be glad to forget, and the research of 20 years and more will not be complete until we can discard all the suffixes.

Another aspect of fundamental importance in cell biochemistry is the relation of vitamins to co-enzymes. There is much further work to be done in this field in delineating the exact relation between the various enzyme systems and the practical nutrition of the animal. I doubt whether we have a clear connexion set up between nutritional

abnormality and the lack of the factor for any vitamin other than aneurin (vitamin B₁). We have now at last a final proof that aneurin pyrophosphate is the actual factor missing in the avitaminous brain (Banga, Ochoa and Peters, 1939). It has taken long to reach this. Always the physiology will take the longest. The fact is that chemistry and biochemistry have rushed ahead lately and we must not be disappointed if the true nutritional work takes rather longer to do, because it involves physiology. Today we shall be discussing our subject from the dual aspects of pure biochemistry and of nutrition.

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The Vitamin B Complex: Introductory Survey

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The title of today's conference, "The Vitamin B Complex," covers a very wide field. At least a dozen well defined components of the vitamin B complex are now recognized (Table 1). It is obvious, therefore, that

TABLE 1
 COMPONENTS OF THE VITAMIN B COMPLEX

B complex	{	Heat labile (B ₁)	{	Adsorbable	{	ANEURIN, vitamin B ₁	
		Heat stable (B ₂ complex)		Filtrate factors		{	NICOTINAMIDE, P.P. factor
				Others or unclassified			{
					*PYRIDOXIN, vitamin B ₆		
					*PANTOTHENIC ACID		
					p-AMINOBENZOIC ACID		
					INOSITOL		
					CHOLINE		
					BIOTIN		
					"FOLIC ACID"		
					GRASS JUICE FACTOR		
					ETC.		

* At first confused with the P.P. factor.

only a few selected aspects can be considered in the course of a one day meeting. Our object in this opening paper must be to give a preliminary survey of the field as a whole, although in the short time allowed it will have to be somewhat cursory.