The importance of sunlight as a source of vitamin D for man

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'When you can measure what you are speaking about and express it in numbers, you know something about it, and when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind'.

Since Lord Kelvin expressed this view as the ideal to which scientists should aim there has been an assumption, particularly in modern times, that this aim is achieved. In nutrition, however, there are severe limitations on the extent to which achievement of this aim is possible. In the case of vitamin D nutrition it was over 50 years before even moderate progress, in the form of an assay for vitamin D status, could be made. This long delay before nutritionists had a means of measuring what they were talking about has caused a number of problems. For example there are gaps in our knowledge of vitamin D of which most nutritionists are unaware, because previous generations of investigators either were unable to obtain or did not realize the necessity of obtaining crucial information. Further complications have arisen because of the prolonged period taken to understand the physiology and biochemistry of vitamin D and as a result a number of erroneous attitudes have become established. During this period there were times with very little development in these areas of vitamin D which were taken by some people to mean that a full understanding of these subjects had been reached. In general it is not realized that our views on various aspects related to vitamin D are not on as sound a basis as is believed. In addition it is not appreciated that the recent advances in our knowledge of vitamin D physiology require previous results to be reconsidered. In the last two or three years my colleagues at the Dunn Nutritional Laboratory, Dr D. Fraser and Dr M. Davie, and I have been developing a new approach to nutritional aspects of vitamin D and in this...
article I would like to describe some results which have caused us to reconsider
the need for dietary vitamin D. In the course of this, I will try to illustrate some
of the points made above.

Included among the important findings leading to our current understand­
ing of the need of animals for vitamin D and the role of dietary vitamin D in
the prevention of rickets are:

(a) The development of an animal model for rickets;
(b) The demonstration of the efficacy of certain foods and of ultraviolet
light in curing rickets in animals and later in children;
(c) The isolation and chemical identification of vitamin D$_2$ and later
vitamin D$_3$;
(d) The use of vitamin D and cod liver oil in the prevention and treatment
of rickets;
(e) The fortification of food, including baby foods, with vitamin D.

Thus, some 20 years after the discovery of the existence of vitamin D, rickets
had ceased to be a public health problem in Europe and America, apparently
as a result of the raising of dietary vitamin D levels. It should be noted, however, that:

1. Vitamin D has never been isolated from any food (chemists used yeast
as a source of the provitamin ergosterol for conversion to vitamin D$_2$);
2. Vitamin D status could, until very recently, only be assessed in a
qualitative manner by clinical examination supplemented by some
simple biochemical measurements of blood constituents and by
radiological examination of the bones;
3. Although the presence of antirachitic activity could be shown in
certain foods, particularly those rich in fat, it was never shown that the
diet was the source of this activity for man.

Investigation of this last point has had to await the discovery of a chemical
method of assessing vitamin D status. Nevertheless, early investigators
attempted to draw some valid conclusions on the relative contributions of
sunlight and diet in prevention of rickets in man. For example, Chick and her
colleagues$^1$ showed that sunlight was very effective in the cure of rickets in
children, yet despite this observation the disease was present in areas of
plentiful sunshine such as Southern California$^2$. Consequently it appeared
that the antirachitic substance in food belonged to that class of substances
which animals are no longer able to synthesize (usually because of a deficiency
of a certain enzyme but in this case of ultraviolet light) and as a result the
compound should be classed as a vitamin. Fortification of the diet with
vitamin D seemed appropriate as no food was found which was both rich in
this substance and widely consumed. Infants seemed to be particularly prone
to develop a deficiency of this vitamin.

A few years ago, however, as a result of major changes in our understanding