rapidly than the time-honored method of "independent groups." The difficulty of a planned program in such an instance is obvious: a considerable concentration on much detail in relatively few directions. The probability of hitting the correct solution would depend simply on having one of these few directions coincide with a particular, a right, method of approach. Looked at in this manner, the probability of hitting the correct solution is not very good.

While I am by no means a specialist on the cancer problem, I feel that it is justifiable to say that as yet we do not have a clear-cut line of approach to the solution. We are still irradiating with electromagnetic energy and with radioactive materials, we are still using surgery, etc.; in a word, we are doing much the same things that were being done years ago, in the factual sense of the word. To be even more specific, I would say that we are still completely at a loss, and that no one can predict which of the many branches of the physical science will eventually lead to the answer. While the promising lines should be pushed by sheer "man-hours," there must be at least a corresponding support of the "individual groups" which, not being tied to a definite approach, would have, in my opinion, a greater chance of indicating the right direction to be followed by the mass-effort, which would not be too difficult to finance once the probability of success begins to approach unity.

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On the Theory of Acids and Bases

There is one theory in our biochemical and biological sciences that needs drastic revision, and that is the idea of acids and bases.

It seems to me that we should accept the theory that an acid is "anything" (ions, molecules, or particles) that yields hydrogen ions and that a base is "anything" that combines with hydrogen ions. This would get rid of the idea, for example, that a sodium ion is a base and brings forth the idea that such ions have other functions in the animal body, such as irritability and osmotic pressure regulations.

Many biochemists and biologists say that a food is basic in reaction because it contains sodium. This seems incorrect, because the negative ion should be considered the base. For example, if one takes sodium citrate into the body, the citrate ion is the base which, when oxidized, yields the bicarbonate ion, one of the most important bases of the blood. Vegetables are basic forming foods because they produce bicarbonate ions. The production of such a base takes place because there must be as many negative as there are positive ions, and when carbon compounds are oxidized in the body, they will yield bicarbonate ions if there is a positive ion with which to combine; otherwise, the $HHCO_3$ formed is eliminated as CO_2 and H_2O. When a chloride or sulfate ion, as in table salt, is already present in the food, the $HHCO_3$ is also eliminated as stated above.

The theory that the kidney functions in acid-base balance because it retains sodium when the acids are formed in the body is out of date. It seems more logical to say that ammonia is formed in the kidney which combines with the acid to be excreted, so that the body does not deprive itself of the sodium needed for osmotic pressure and nerve regulations and in order that the bicarbonate ion (alkali reserve) will not be used up. For example, we can show:

$$\underset{\text{base}}{2\,Na^{+} + 2HCO_3^{-}} + \underset{\text{strong acid}}{H_2SO_4} \longrightarrow \underset{\text{very weak base}}{2\,Na^{+} + SO_4^{--}} + \underset{\text{weak acid}}{2H_2CO_3}$$

$$H_2CO_3 + \underset{\text{base}}{K^{+} + Hb^{-}} \rightleftarrows \underset{\text{weak acid}}{HHb} + \underset{\text{base}}{K^{+} + HCO_3^{-}}$$

$H_2CO_3 \rightleftarrows CO_2 + H_2O$ or to prevent loss of alkali reserve,

$$\underset{\text{base}}{2\,NH_3} + \underset{\text{strong acid}}{H_2SO_4} \longrightarrow \underset{\text{weak acid}}{2\,NH_4^{+}} + \underset{\text{very weak base}}{SO_4^{--}}$$

$$\text{Organic acid} \xrightarrow{(o)} CO_2 + H_2O$$

is therefore not acid in reaction when metabolized in the body. Why say the potassium or sodium ion is a base when it does not enter into the reactions?

It should be made clear that meats act acidic in the body because when they are metabolized they form H_2SO_4 and H_3PO_4, which are strong acids and must be neutralized. Sodium chloride and sodium sulfate are not basic, because the chloride and sulfate ion are very weak bases, while monoacid phosphate and bicarbonate ions are rather strong bases. Why can't such ideas be used in the explanation of acid-base balance in the animal body? This would get rid of the ridiculous idea that a sodium ion is a base.

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Injection vs. Oral Administration of Folic Acid in the Chick

Previous experiments (D. V. Frost, F. P. Dann, and F. C. McIntire. *Proc. Soc. exp. Biol. Med.*, 1946, **61**, 65) indicated that 10 μg. daily of synthetic folic acid (*L. casei* factor, kindly supplied by Lederle Laboratories and identified as pteroyl glutamic acid) was sufficient to produce good growth, normal feathering, and near-normal pigmentation in chicks over an 8-week period when the material was given by intramuscular injection. When 10 μg. daily of folic acid was given orally under similar conditions, growth, feathering, and pigmentation were relatively poor. At levels of 2.5 and 5 μg. daily of folic acid there was an equally marked difference in the response between injection and oral administration. The following experiment was set up to resolve clearly the question whether synthetic folic acid was more active by injection than when given by mouth.