Comments and Communications

Catalytic Effect of the Chromic Ion in the Barker Method for Protein-bound Iodine Determination[1]

In attempting to use S. B. Barker's method (*J. biol. Chem.*, 1948, 173, 715) for the determination of protein-bound iodine, we at first obtained unsatisfactory results because of high reagent blanks. All batches of chromic acid tested appeared to be contaminated with iodine. With any given set of reagents the blank varied considerably from day to day. This suggested that the blank reading did not represent iodine alone, but was in part due to the effect of some other substance. Since traces of chromic ion may be carried over into the trap during distillation, the ability of this ion to catalyze the reaction between ceric ammonium sulfate and arsenious acid was investigated. The catalytic effect of the chromic ion proved to be quite sufficient to account for the high and variable blanks.

We had been using the quantities of reagents recommended by Barker for the catalytic reaction, except that we used one and one-half times as much sodium chloride. However, with an Evelyn colorimeter a final volume of 11.5 cc was more convenient than the 5.9-cc volume originally described. Our final *concentrations* of sulfuric acid, arsenious acid, and ceric ammonium sulfate were thus about one-half those used by Barker. Although these lower concentrations were entirely satisfactory for pure solutions of iodide, it seemed possible that the lower acidity might favor the catalytic effect of the chromic ion. Accordingly, the acid concentration was progressively increased. With each increase the catalytic action of the chromic ion waned, while that of iodide was but slightly affected. Thus, with sulfuric acid concentrations of 0.20 *N*, 0.44 *N*, 1.07 *N*, and 2.33 *N*, the catalytic effect of 5.8 μg of Cr^{+++} was equivalent to that of 0.0202, 0.0115, 0.0038, and 0.0008 μg of iodide respectively. An increase in the sodium chloride concentration (from 32 mg % to 152 mg %) enhanced the catalytic effect of iodide but not that of the chromic ion.

When the revised procedure for the catalytic determination was applied to the whole Barker method, the results were markedly improved. With an acid concentration of 0.23 *N*, the mean reagent blanks in 11 analyses had been 0.109 μg of apparent iodide, with a standard deviation of ± 0.017 μg, and the mean recovery of 0.1 μg of iodide added before digestion in 21 analyses had been 89% with a standard deviation ± 21%. When the acid concentration was increased to 1.07 *N*, the mean reagent blank in 8 analyses was 0.095 μg, with a standard deviation of ± 0.005 μg, and the mean recovery of 0.1 μg of added iodide in 26 analyses was 97%, with a standard deviation of ± 10%. When the acid concentration was still further increased to 2.33 *N*, the mean recovery of 0.1 μg of added iodide in 34 analyses was 102%, with a standard deviation of ± 7%. The mean blank values are not strictly comparable, since the batches of reagents and the "carrier" protein differed in each series, but the striking reduction in variability of both blanks and recoveries is evident from the much smaller standard deviations obtained with increased acidity.

For convenience, the increased amounts of sulfuric acid[2] and sodium chloride may be added to the arsenious acid reducing solution when this reagent is being prepared. The quantity of arsenious acid itself has not been changed, since in a few experiments doubling its concentration did not significantly affect the results. None of the other reagents has been changed.

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[2] The arsenious acid solution should be carefully cooled during the addition of the sulfuric acid; if this is not done, the arsenious acid may crystallize out of solution during the next 24 hr.

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The Role of Lemmings at Point Barrow, Alaska

Lemmings (*Dicrostonyx rubricatus* Richardson and *Lemmus alascensis* Merriam) are the most numerous mammals in the vicinity of Point Barrow on the coast of the Arctic Sea and without doubt the most significant from the point of view of biological role. In appearance they suggest large, squat mice with abbreviated tails, the *Dicrostonyx* being richly patterned in grays and browns, the *Lemmus* being rather uniformly dark tawny. Although their numbers fluctuate markedly, they are generally the basic food for such carnivorous animals as the snowy owl, pomarine jaeger, and arctic fox.

Field work in 1949[1] confirmed brief observations in 1948 indicating that lemmings play a far more important role in the life of the tundra than is generally realized. From the regurgitated pellets of the snowy owl consisting of lemming fur and bones, larvae of the common midge of this region, the chironomid or tendipedid, *Spaniotoma*, and springtails or Collembola were taken in 1948 (Weber, N. A. *Ent. News*, 1949, 60, 118).

The most numerous and significant arthropods of the tundra were found to be various species of true flies or Diptera, including the *Spaniotoma*, and springtails and mites (Weber, N. A. *Ent. News*, 1948, 59, 253; 1949, 60, 118). Many of these form important links in the food chain between the tundra vegetation and the largest animals. They are basic in the sense that they feed directly upon the vegetation or on animal remains and in turn are fed upon by larger animals.

By the spring of 1949 lemmings had built up to large populations and, as the snow cover disappeared in June,

[1] Sponsored by the Office of Naval Research and the Arctic Institute of North America.

great numbers of their fluffy winter nests and the runways leading to them were left exposed. Not hibernating, they had consumed most of the vegetation in many areas and left the surface littered with shredded grasses and sedges. During June many lemmings were found dead, and it is possible that exhaustion of the food supply and starvation had been an automatic brake on their increase.

These fluffy nests, 15 cm to 30 cm in diam, with their runways created ideal environments for the three major types of arthropods and large numbers were consistently found in them. From one nest about 1,100 springtails, 100 mites, and 40 *Spaniotoma* larvae were taken. From another nest 1,670 *Spaniotoma* larvae, 545 mites, and 2,830 springtails were counted. Other invertebrates such as oligochaete worms and staphylinid beetles are also found here regularly. The surrounding tundra by contrast contained far fewer numbers of these, and it is obvious that this part of the arthropod fauna fluctuates with the numbers of lemmings and is largely dependent on them. When the lemmings increase too greatly they consume plants faster than they can grow in this cold climate and so starve themselves. This may lead to a general decrease in the three major arthropod groups, followed by a luxuriant development of the vegetation, and thus prepare the basis for another cycle. A more comprehensive report will be given elsewhere.

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Temperature and Man

Associating the Dark Ages with a receding polar ice cap and a warmer climate (Clarence A. Mills, *Science*, 1949, 110, 267) leads to some difficulty, if the idea is examined in the light of world history. *World* is used in a broad enough sense to include area outside that in which Western civilization has developed. One of the more advanced periods in Chinese history, the Tang dynasty, coincided with the Dark Ages. The culture of the Indian civilizations of Central and South America of the same period is worthy of respect. Even if we confine our consideration to Europe and North Africa, we notice that while the regression of the polar ice cap was creating optimum temperatures for human activity in the Nordic regions, purportedly stimulating the inhabitants to exploration and settlement, the Islamic world was expanding with considerable energy in the unseasonably warm areas of the Mediterranean.

It is indicated in the paper under discussion that the greater proportion of the Presidents of the United States of America and the persons included in Who's Who were conceived in the more invigorating seasons of the year, yet nothing is said of the seasonal distribution of conceptions of the populace as a whole.

If human activity directed towards the building and maintenance of civilizations could be soundly correlated with environmental temperature, it would still be necessary to recognize indirect effects of temperature upon man such as the effect of temperature upon his natural enemies, particularly microorganisms; the necessity for more forethought and providence where he is faced with a long season in which plant life is nonproductive and during which he must protect himself from the rigors of the climate.

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. . . Among other amazing statements, Dr. Mills says that "college students, given the standard aptitude or intelligence tests at Cincinnati latitudes across the country, achieve ratings only 60 percent as high in summer heat as in winter cold." This would mean that psychological tests are quite worthless for measuring intelligence at Cincinnati, but can be used with reasonable reliability for determining temperatures. If that statement were true, most people rated in winter as of average intelligence would rate as feeble-minded in summer, and some of them would be classified as imbeciles. I don't think that any competent psychologist—even in the hottest Cincinnati summer—would agree with Dr. Mills on this point.

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Scientific Book Register

Harvey Cushing: Surgeon, Author, Artist. Elizabeth H. Thomson. New York: Henry Schuman, 1950. 347 pp. $4.00.

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Applied Sedimentation. Parker D. Trask, Ed. New York: John Wiley; London: Chapman & Hall, 1950. 707 pp. $5.00.

Forest Products: Their Sources, Production, and Utilization. A. J. Panshin *et al.* New York-London: McGraw-Hill, 1950. 549 pp. $6.00.

Chemical Developments in Thyroidology. William T. Salter. Springfield, Ill.: Charles C. Thomas, 1950. 87 pp. $2.00.

Human Ability, a continuation of "The Abilities of Men." C. Spearman and Ll. Wynn Jones. London-New York: Macmillan, 1950. 198 pp. $2.50.

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