present value in the Northern Hemisphere would thus yield important meteorologic data on the mixing rate of the atmospheres of the two hemispheres. If information on the power of all the weapons exploded to date were available, the rate of $C^{14}$ increase in the Northern Hemisphere with time could be calculated fairly accurately. From a comparison of the atmospheric $C^{14}$ specific activity with time in the two hemispheres, it should be possible to elucidate the mechanism and rate of the main mixing processes.

Should atomic weapons testing cease, the $C^{14}$ specific activity of the atmosphere would begin to return to the pre-atomic bomb level as the result of exchange of $CO_2$ between the atmosphere and the oceans. The observation of this decrease and also of the change in $C^{14}$ specific activity of surface water of the oceans would provide a valuable check on the exchange constants currently assumed for these reservoirs (*8*).

T. A. RAFTER
G. J. FERGUSSON
*Division of Nuclear Sciences, Department of Scientific and Industrial Research, Lower Hutt, New Zealand*

### References and Notes

1. T. A. Rafter, *New Zealand J. Sci. Technol.* B37, 20 (1955).
2. H. Craig, *Geochim. et Cosmochim. Acta* 3, 53 (1953).
3. H. E. Suess, *Science* 122, 415 (1955).
4. Unpublished data.
5. G. J. Fergusson, *Nucleonics* 13, No. 1, 18 (1955).
6. H. Craig, *Tellus* 9, 1 (1957); H. Revelle and H. E. Suess, *ibid.* 9, 18 (1957); J. R. Arnold and E. C. Anderson, *ibid.* 9, 28 (1957).
7. W. F. Libby, *Science* 123, 657 (1956).
8. A fuller discussion of these results will be published in the *New Zealand Journal of Science and Technology.*

27 June 1957

## Effect of Rat Intrinsic Factor on Vitamin $B_{12}$ Absorption in Pernicious Anemia

Castle's intrinsic factor greatly improves the intestinal absorption of vitamin $B_{12}$. In pernicious anemia, both normal human gastric juice and hog-stomach preparations are sources of the intrinsic factor.

Rats in which the glandular part of the stomach has been resected do not absorb radioactive vitamin $B_{12}$, unless rat gastric juice or homogenized rat stomach is administered simultaneously (*1*). Normal human gastric juice and different preparations derived from hog stomach are ineffective in the gastrectomized rat. On the contrary, some of these intrinsic factor preparations were found to decrease the absorption of vitamin $B_{12}$ in the normal rat (*2*). These studies suggested the species specificity of rat intrinsic factor.

It was decided to supplement these data by a study of the effect of rat intrinsic factor on the absorption of radioactive vitamin $B_{12}$ in patients with pernicious anemia. For this purpose, a modification of the urinary excretion technique described by Schilling (*3*) was used. Human gastric juice collected from normal donors after the injection of histamine was neutralized after filtration through gauze. It was pooled and kept frozen.

Rat gastric juice was obtained from animals in which the pylorus had been ligated after an overnight fast. Eight hours after the ligation the animals were sacrificed, and the gastric juice was collected. After filtration through gauze, it was neutralized. The nearly clear, slightly yellow, and tasteless fluid was kept frozen.

The excretion of radioactive vitamin $B_{12}$ in the urine, collected over 48 hours after a test dose of 1 μg of $CO^{56}$-$B_{12}$, varied from 14.2 to 46.4 percent, average 29.1 percent, in 30 control subjects. In 14 patients with pernicious anemia, 0.05 to 4.35 percent, average 1.68 percent, of the test dose was recovered in the urine. After simultaneous administration of 25 ml of human gastric juice, the urinary excretion increased to 12.9 to 35.9 percent, average 22.3 percent, in 13 of the patients with pernicious anemia.

Data about the clinical activity of rat intrinsic factor are given in Table 1. The intrinsic factor activity of 25 ml of rat gastric juice was less than that of the same quantity of human gastric juice. In dialysis experiments performed by us, 1 ml of rat gastric juice was able to bind 0.029 μg of vitamin $B_{12}$, while human gastric juice bound 0.077 μg of vitamin $B_{12}$. If the amount of rat gastric juice given, together with the test dose of vitamin $B_{12}$, was increased to provide the same binding power as 25 ml of human gastric juice, rat intrinsic factor appeared to be about as active as human intrinsic factor in patients with pernicious anemia, at least in this short-term experiment.

Table 1. Urinary radioactivity expressed as a percentage of the test dose of 1 μg $CO^{56}$-$B_{12}$.

| Treatment | Case number | | | | | Average |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| $B_{12}$ only | 2.71 | 4.35 | 0.84 | 0.44 | 0.82 | 1.83 |
| $B_{12}$ + 25 ml of human gastric juice | 25.1 | 25.8 | 12.9 | 21.2 | 27.3 | 22.5 |
| $B_{12}$ + 25 ml of rat gastric juice | 11.6 | 11.3 | 7.76 | 5.56 | 3.47 | 7.9 |
| $B_{12}$ + 70 ml of rat gastric juice | 19.1 | 23.4 | 22.8 | 20.6 | | 21.5 |

These findings in human beings, who are able to utilize intrinsic factor derived from human, hog, or rat sources, are in striking contrast to the results previously obtained in the rat (*4*).

J. ABELS, M. G. WOLDRING,
J. J. M. VEGTER, H. O. NIEWEG
*Department of Medicine and Radioisotope Laboratory, University of Groningen, the Netherlands*

### References and Notes

1. C. G. Clayton, A. L. Latner, B. Schofield, *J. Physiol. (London)* 126, 56 (1955); G. M. Watson and H. W. Florey, *Brit. J. Exptl. Pathol.* 36, 479 (1955); H. O. Nieweg *et al.*, *Proc. Soc. Exptl. Biol. Med.* 91, 328 (1956).
2. C. Rosenblum *et al.*, *Proc. Soc. Exptl. Biol. Med.* 87, 268 (1954).
3. R. F. Schilling, *J. Lab. Clin. Med.* 42, 860 (1953).
4. This study was made possible by a gift of radioactive vitamin $B_{12}$ from the N. V. Philips-Roxane Co., Weesp, the Netherlands. Technical assistance was given by J. H. Jans and A. O. de Vries.

18 June 1957

## Distribution of Lysogenic Streptomyces

Temperate bacteriophage might be responsible for outbreaks of *Streptomyces*-phage during antibiotic fermentation. However, few examples of lysogeny among the *Streptomyces* have been reported (*1, 2*). Recently, three strains of *Streptomyces* which had been maintained in the laboratory for more than 2 years, with frequent colonial isolation, were found to be lysogenic. This prompted a survey of other laboratory strains and of some strains newly isolated from soil samples collected in Minnesota (*3*).

All strains were purified by at least 15 serial replatings from well-isolated colonies on AMC agar (*4*). Temperate phages were isolated from peptone-yeast extract broth cultures inoculated with fragmented aerial hyphae and incubated at 30°C on a reciprocal shaker. Although the cultures were sampled frequently, no free phage was detected until autolysis became evident. Phage-enriched autolysate was made by adding germinated spores of other strains of *Streptomyces* to an autolyzing culture. This frequently increased the numbers of free phage considerably but in no case led to the detection of a new lysogenic strain. In a few instances the addition of spores masked the phage already present in the autolysate.