

action of this toxic base and that of a calcium salts^{7, 8} it is likely that guanidine when its concentration in the blood is appreciably increased tends to increase the severity and hasten the onset of tetany.

Experiments which demonstrate this relationship and show the conditions under which the incidental hyperguanidinemia occurs will be reported subsequently.

6588

The Hydrogen-ion Concentration and Buffer Capacity of Oyster Liquor of the Chesapeake Bay.

JOHN C. KRANTZ, JR. (Introduced by E. Uhlenhuth.)

From the Bureau of Chemistry, State of Maryland Department of Health.

The hydrogen-ion concentration of oyster liquor is determined in the routine examination of oysters as a measure of the stage of decomposition.¹ A range of hydrogen-ion concentration has been established for "Good Oysters" between pH 6.25 and 7.00 (cresol red indicator). Stale oyster liquor and slightly sour oyster liquor exhibit a higher hydrogen-ion concentration. KoKubo² studied the pH of the blood and pericardial fluid of the *Ostraea circumpecta* and found the former to be pH 7.24 and the latter pH 7.16.

The purpose of this investigation is to determine the pH and buffer capacity of the fresh oyster liquor of *Ostraea virginica* from the Chesapeake Bay and to study their variations in different natural environments.

Experimental. The oysters were collected during the winter months and preserved at a temperature not exceeding 5°C. The determinations were made at a period not exceeding 12 hours after collection. The sea water was taken from above the oyster beds at the time the oysters were collected.

The hydrogen-ion concentration determinations were made immediately after the liquor was taken from the shell. The determinations were carried out on the composite liquor of at least 12 oysters.

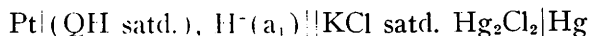
⁷ Kühnau, J., and Nothmann, M., *Z. f. d. ges. Exp. Med.*, 1924-5, **44**, 505.

⁸ Minot, A. S., and Cutler, J. T., *J. Clin. Invest.*, 1928, **6**, 369.

¹ Hunter, A. C., and Linden, B. A., *Am. Food J.*, 1923, **18**, 538.

² KoKubo, Seiji, *Science Repts., Tohoku Imp. Univ.*, 4th series, 1929, **4**, 207, through *Chem. Abs.*, 1929, **23**, 4274.

The hydrogen-ion concentration of the liquor and dilutions was determined by means of the following set up



at $25^\circ \pm 0.5^\circ\text{C}$. A saturated potassium chloride agar bridge was employed. The Leeds and Northrup laboratory type potentiometer was used. The readings were reproducible to 0.02 pH.

The hydrogen-ion concentration of the sea water was determined colorimetrically by comparison with standard buffer solutions. No correction for salt-error was made. The values were reproducible within 0.1 pH.

In 1925 Ramage and Miller³ determined the salt error of cresol red in solutions of varying degrees of salinity. The average concentration of NaCl in the Chesapeake area from which these oysters were taken is about 6 gm. per L. or approximately 0.1 M. NaCl. Likewise, the ionic strength of the solution would closely approximate 0.1. Ramage and Miller set the salt error for cresol red at this salinity at -0.12 pH. However, as pointed out by Kolthoff, (pH and Electrotitration p. 56) at this concentration the error is practically zero as the ionic strength of the buffers used in comparison are from about 0.08 to 0.1 ionic strength.

In this work as the buffer comparisons and the solutions meas-

TABLE I.

No.	Date	Area	pH of liquor	pH of sea water
1	1/ 9/31	Choptank River	6.95	8.2
2	1/29/31	Tangier Sound	6.95	8.3
3	2/10/31	Miles River	6.95	8.5
4	2/13/31	Severn River	6.95	8.5
5	3/ 6/31	Harris Creek	6.95	8.7
6	10/29/31	Choptank River	6.93	8.5
7	11/11/31	Tangier Sound	7.08	8.9
8	11/24/31	Magothy River	7.15	8.2
9	11/19/31	Back Creek	6.97	8.2
10	11/24/31	Bodkin Creek	6.92	8.2
11	11/27/31	Miller's Island	6.88	8.1
12	12/ 5/31	Chincoteague	6.92	8.2
13	12/15/31	Back Creek	6.95	8.2
14	1/13/32	Severn River	7.06	8.2
15	1/14/32	Rock Point	6.87	8.2
16	1/22/32	South River	6.94	8.2
17	2/ 8/32	Holland Point	6.98	8.0
18	2/ 9/32	Upper Steps	6.92	8.1
19	2/18/32	Choptank River	6.98	8.2
Median		6.95	P. E. of Mean	± 0.011
Mode		6.95	P. E. of Standard Deviation	0.007
Mean		6.96	Coefficient of Variability	1.0
Standard Deviation		0.07		

³ Ramage and Miller, *J. Am. Chem. Soc.*, 1925, **47**, 1230.

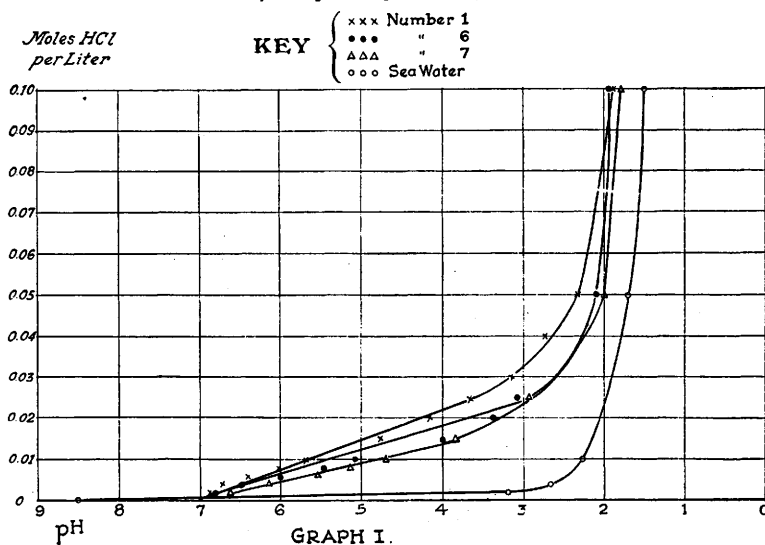
ured were of approximately the same ionic strength $\text{pH} = \log [\text{aH}^+]$, corrections were unnecessary in the author's opinion. The slight variations between pH and $-\log [\text{aH}^+]$ were of the magnitude of ± 0.02 pH .

Results. 1. *Hydrogen-ion concentration of oyster liquor.* (See Table I.)

2. *Buffer capacity of oyster liquor.* The buffer capacities of samples Nos. 1, 6 and 7 were determined by the addition of hydrochloric acid according to the method of Van Slyke.⁴ With sample No. 6 the buffer capacity of the sea water was determined in this area as has been done by other investigators⁵ in other areas.

The results are shown in Graph 1.

Buffer Capacity of Oyster Liquor and SeaWater



From the curves in Graph 1 the average buffer capacity of these 3 samples of oyster liquor at approximately $\text{pH} 7.0$ is $\beta = -\text{dB}/-\text{dpH} = 6.3 \times 10^{-3}$. On the other hand the value of β for sea water is 3.6×10^{-4} at $\text{pH} 8.5$.

With 13 samples a long range average buffer capacity was determined by adding hydrochloric acid in the ratio of 0.01 mole to one liter of liquor. These values are shown in Table II.

Summary. The hydrogen-ion concentration of the liquor of *Ostraea virginica* taken from various portions of the Chesapeake

⁴ Van Slyke, D. D., *J. Biol. Chem.*, 1922, **53**, 528.

⁵ Thompson, T. G., and Bonnar, R. U., *J. Ind. Eng. Chem. Analyt.*, 1931, **3**, 393.

TABLE II.

No.*	pH of liquor	pH after addition	$\frac{-\Delta B}{-\Delta pH} \times 10^{-3}$
4	6.95	5.64	7.6
8	7.15	4.85	4.3
9	6.97	4.55	4.1
10	6.92	5.30	6.2
11	6.88	4.70	4.6
12	6.92	3.50	2.9
13	6.95	3.15	2.6
14	7.06	4.30	3.6
15	6.87	4.05	3.5
16	6.94	4.85	4.8
17	6.98	4.10	3.5
18	6.92	2.75	2.4
19	6.98	3.50	2.9
			Mean 4.1 $\times 10^{-3}$

* Numbers are taken from Table I.

Bay shows little variation from the established norm of pH 6.95. The hydrogen-ion concentration of the liquor was not influenced by the hydrogen-ion concentration of the environmental sea water in the number of samples studied. The buffer capacities of the oyster liquors showed a wide variation.

The author wishes to acknowledge his indebtedness to Mr. S. J. Caskey for the collection of the oysters, and to Mr. J. F. Muller for the preparation of the graph, each from the Bureau of Sanitary Engineering of the State of Maryland Department of Health.

6589

Carbohydrate Fractions from *Vibrio Cholerae*, and Related Organisms.*

RICHARD W. LINTON AND D. L. SHRIVASTAVA.

From the All-India Institute of Hygiene and Public Health, Calcutta.

We have shown¹ that the carbohydrate substances extracted from *Vibrio cholerae*, and related organisms, are so closely allied that cross-reactions will occur between them and immune sera at high dilutions. This cross-relationship was independent of the agglutination reaction, to differentiate the presumably pathogenic from

* This work was done under the auspices and with the support of the Indian Research Fund Association, and is published by permission of the Secretary.

¹ Linton, R. W., *Ind. J. Med. Res.*, 1932, **20**, 347.