Significance of the Presence and Amount of Carbon Dioxide in

1901

American Public Health Association

THE SIGNIFICANCE OF THE PRESENCE AND AMOUNT OF CARBON DI-OXIDE IN POTABLE WATERS.

By ELLEN H. RICHARDS, Boston, Mass.

Reprinted from the Proceedings of the Twenty-ninth Annual Meeting, held at Buffalo, N. Y., September 16, 17, 18, 19 and 20, 1901.

COLUMBUS, OHIO:
THE BERLIN PRINTING COMPANY.
1902.

T-N
R514

THE SIGNIFICANCE OF THE PRESENCE AND AMOUNT OF CARBON DI-OXIDE IN POTABLE WATERS.

By ELLEN H. RICHARDS, Boston, Mass.

Within a few years discussion has arisen as to the significance of the presence of much or little carbon di-oxide in potable water, the argument being that, like ammonia, it was a product of the decay of organic matter which, as a rule, contains fifty per cent. of carbon and therefore that the presence of much CO_2 might show the recent decay of such organic substances.

Nature does her work by very complex processes and it is rarely the case that the full story can be picked up as easily as a telegraph cable at the bottom of the Atlantic.

Suppose a dead cat or a head of cabbage to be buried under six feet of compact loam. The carbon di-oxide formed would dissolve in the down trickling water and might be carried with this water, becoming colder, long distances in the gravels or through rock crevices until the water was drawn to the surface by a pump or escaped as a spring. If one finds twenty parts in a million of CO_2 in such a water, how is one to know if it came from a cat or a cabbage and if one does not know *that* what is the use of knowing the amount?

The assumption seems to have been made that contaminated surface waters also gave the highest CO_2 and the tests reported herewith were made with that in view.

At first it seemed as if pools full of tadpoles and drains from the roadside did show increased amounts but further study of uncontaminated woodland regions revealed still higher amounts, showing that vegetable decay is the chief source, and leaving the question to be one of the *significance* of this decay.

The results on pools and lakes good enough for water supplies and those in the same region not fit to be so used, failed to reveal a decided difference; not nearly so large variations were found as in the water of different parts of the same lake under varying conditions of vegetation. Obeying the law of solubility as governed by the law of partial pressure of gases, it appears that the tendency of CO_2 is to diffuse into the air above and so to keep an equilibrium in all surface water.

Certain bodies of water are infested with a floating, unattached vegetation, when this consists of blue-green algae in considerable amount the dissolved CO_2 furnishes the carbon in readiest form for their growth and it soon becomes exhausted, the water remaining

alkaline so long as that growth is vigorous and showing an increased amount on the decay of the algae. So far, this effect has been observed only in connection with blue-green algae, not with diatoms or other algae.

More data must be accumulated before an opinion can be ventured as to the value of the determination of CO_2 in ground waters. Taken by itself it is not convicting but considered with the presence of nitrates it *may* give information valuable enough to warrant adding it to the list.

In view of the lack of exactness in the meaning of the results when obtained, it is hardly necessary to go to great refinement of method and for the present the Seyler method would seem to be satisfactory.

SURFACE WATERS—PARTS PER MILLION FREE CARBON DI-OXIDE.

1901.

0.5 Part or Less.

April 4—Jamaica Pond.
May 20—Boston Tap.
May 26—Stream, Sharon, Mass.
May 30—Brook, Newburyport, Mass.
June 17—Lakes Paugus, Winnesquam and Winnepesaukee, N. H.
June 25—Lake Placid, Mirror Lake, Heart Lake, Adirondacks.
July 2—Cascade Lake and Cascade Fall, Adirondacks.
July 12—Boston Tap.
July 17—Buckmaster Pond, Norwood, Mass.
August 17—Crystal Lake, Gardner, Mass.

0.6 to 0.8 Part.

April 4—Boston Tap.
April 29—Boston Tap, Chebacco Lake, Gloucester, Mass.
May 30—Merrimac River, at Newburyport, Mass., and five streams in Newbury.
July 4—Large stream in the heart of the Adirondack woods.
July 9—Jamaica Pond, Ward's Pond, Jamaica Plain, Mass.
July 20—Neponset River, Quincy Tap, Hingham Tap.
August 30—Boston Tap.

1.0 to 1.5 Parts.

April 30—Merrimac River, at Lawrence.
May 26—Lake Mollywallopog, Sharon, Mass.
May 30—Merrimac River, dirty dock, Newburyport.

1.5 to 2.0 Parts.

May 26—Large brook, Sharon woods.
May 30—Roadside pool, Newburyport, frequented by cattle.
June 26—Clear brown brook from the Adirondack woods.
July 9—Muddy lily pond, Arnold Arboretum.

2.0 to 3.0 Parts.

May 30—Pollywog pool, Newburyport, Mass.

3.0 to 4.0 Parts.

May 26—Shallow pool, with bottom of dead leaves, Sharon, Mass.

4.0 to 5.0 Parts.

5.0 to 6.0 Parts.

July 7—Clear water from Adirondack forest.

6.0 to 7.0 Parts.

July 7—Dark brown water from Adirondack forest; roadside pool in the forest where rainwater had collected.

ALKALINE.

Jamaica pond, whenever the oscillaria grew vigorously.
Pond, Boston Public Garden, in August (the frog pond=0.6 part acid).
Duck pond, Franklin Park.
Pond in Leverett Park.
Fresh pond, Cambridge, July and August.
Mirror Lake, Adirondacks, nearly alkaline when the spherozyga appeared.

GROUND WATERS—PARTS PER MILLION, FREE CARBON DIOXIDE.

June	17—Spring from mountain side, near Lake Winnepesaukee..	0.9 part
July	20—Well, Pleasant street, Hingham.....	1.8 "
May	26—"Artesian" well, 150 feet deep, Mattapoisett, Mass.....	2.0 "
May	26—Well, Dalton	2.5 "
July	1—Brookwood spring, Adirondacks.....	3.0 "
March	18—Well, Newburyport, Mass.....	3.0 "
March	18—Well, Cambridge, Mass.....	3.0 "
March	20—Two wells, Hardwick, Mass.....	3.0 "
March	18—Nobscot spring, Framingham, Mass.....	4.4 "
March	18—Everett crystal spring, Everett, Mass.....	5.0 "
March	20—Well at Hardwick, Mass.....	5.0 "
March	20—Ground water pumped from tunnel building for sewer at Jamaica Plain	5.0 "
August	17—Well on Templeton Common, Mass.....	6.0 "
March	20—Well at Hardwick, Mass.....	7.0 "
July	4—Well at Adirondack Lodge, N. Y.....	9.0 "
March	20—Well at Hardwick, Mass.....	10.0 "
July	12—Spring in Franklin Park, Boston.....	11.5 "
March	20—Well at Hardwick.....	12.0 "
June	25—Well at John Brown's grave, Adirondacks.....	14.0 "
August	17—Well by Templeton Inn.....	14.0 "

The last four are polluted waters.