THE
BOSTON MEDICAL AND SURGICAL JOURNAL.

VOL. LXIX.

THURSDAY, SEPTEMBER 10, 1863.

No. 6.

CLIMATOLOGY OF CONSUMPTION.

[Read before the Boston Society for Medical Improvement,* August 24, 1863, and communicated for the Boston Medical and Surgical Journal.]

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THE very elaborate inquiry of Dr. Bowditch to ascertain the circumstances which lead to the development of consumption in Massachusetts, resulting in the conclusion that its prevalence is intimately connected with, and apparently dependent on, the humidity of the soil, and that *soil moisture* is the only known characteristic connected with the consumption-breeding districts, has invested the etiology of this disease with a new interest. It may be questioned whether this relation as cause and effect has yet been so far proved as to be entitled to the appellation of *a law*, but it is certainly one well-established step towards it.

In a recent examination of the Registration Returns of Deaths, &c., in Massachusetts, I very naturally was led to observe what light these Returns would throw upon the question, and whether any new facts might be elicited. To enlarge the field of inquiry as much as possible, I compared the returns of this State with those of the United States Census for 1860. This Census has afforded an opportunity of tracing this and other diseases over a wider extent of territory and greater range of climate and variety of soil than has ever been enjoyed before, in any age or country. Reports of isolated and widely remote cities and military stations have been given already, but never has an inquiry throughout the whole land, at the same time and under the same auspices, been made.

Various opinions have been entertained as to the comparative prevalence of consumption North and South. Northerners are accustomed to say, and perhaps believe, that it is quite as great at the South as at the North; and an examination of the mortuary records of some of the larger Southern cities would well nigh justify their impression. The Southerner, on the other hand, declares that there would be no consumption at all at the South, except for the Northerners who come South to die. In order to arrive at something

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positive on this point, I prepared a table showing the whole number of deaths ascribed to consumption in each of the States; then, the number of persons living to one who died of consumption; and, finally, the percentage of deaths from consumption to deaths from all other specified diseases, excluding deaths from violence. The States are arranged in the order of greatest mortality from consumption, as shown by this latter column.

STATES.	CONSUMPTION.			FEVER.			Sum of Percentages.
	No. of Deaths.	Population to one Death.	Percentage to all Deaths.	No. of Deaths.	Population to one Death.	Percentage to all Deaths.	
Maine	2,169	290	29.888	616	1,019	8.500	38.388
New Hampshire	1,163	280	26.971	340	959	7.885	34.856
Rhode Island	567	308	24.220	81	2,155	3.460	27.680
Vermont	779	404	24.043	253	1,245	7.809	31.852
Massachusetts	4,845	254	23.758	965	1,276	4.732	28.490
Connecticut	1,269	363	21.611	341	1,349	5.807	26.418
District of Columbia	255	294	20.565	60	1,251	4.838	25.403
New Jersey	1,350	498	18.794	314	2,140	4.371	23.165
New York	8,207	473	18.265	1,663	2,333	3.701	21.966
Pennsylvania	5,012	579	17.375	1,930	1,506	6.681	24.056
Michigan	1,187	631	17.058	636	1,177	9.141	26.199
Maryland	1,197	574	16.916	392	1,753	5.539	22.455
Delaware	201	558	16.905	77	1,455	6.475	23.380
California	524	725	16.176	301	1,262	9.281	25.457
Minnesota	151	1,140	14.965	83	2,073	8.226	23.181
Ohio	3,495	669	14.741	1,650	1,418	6.959	21.700
Wisconsin	910	852	13.519	485	1,599	7.206	20.725
Indiana	1,704	792	11.669	1,763	766	12.079	23.748
Kentucky	1,742	663	11.131	1,669	693	10.665	21.796
Iowa	748	902	10.773	878	769	12.646	23.419
Illinois	1,948	879	10.545	2,329	735	12.602	23.147
Tennessee	1,440	771	10.036	1,745	636	12.162	22.198
Virginia	2,109	757	9.942	1,453	1,097	6.881	16.823
Oregon	21	2,498	9.170	17	3,086	7.423	16.593
Kansas	107	1,002	7.839	334	321	7.839	32.307
Missouri	1,302	908	7.742	2,363	503	14.050	21.792
Louisiana	843	839	7.244	1,384	512	11.893	19.137
North Carolina	761	1,304	6.394	1,503	660	12.626	19.020
Florida	97	1,556	5.950	235	597	14.417	20.367
Alabama	596	1,618	5.027	1,466	651	12.366	17.393
Mississippi	554	1,428	4.853	1,710	463	15.002	19.855
Texas	420	1,439	4.833	1,346	449	15.491	20.324
South Carolina	390	1,804	4.279	1,120	628	12.290	16.569
Georgia	491	2,153	4.156	1,455	727	12.311	16.467
Arkansas	329	1,323	3.878	1,510	651	17.800	21.678
United States	48,803	899+	13.129	34,467	1,426	9.271	22.400

The result is not a little remarkable; and, as might have been expected, does not justify either the Northern or the Southern view, though it must be admitted that the Southern view accords most nearly with facts. If we arrange the States in the order of greatest fatality as shown by the proportion of persons living to one dead from consumption during the year, they read as follows:—Massachusetts, New Hampshire, Maine, District of Columbia, Rhode Island, Connecticut, Vermont, New York, New Jersey, Delaware, Ma-

ryland, Pennsylvania, Michigan, Kentucky, Ohio, California, Virginia, Tennessee, Indiana, Louisiana, Wisconsin, Illinois, Iowa, Missouri, Kansas, Minnesota, North Carolina, Arkansas, Mississippi, Texas, Florida, Alabama, South Carolina, Georgia, Oregon. In this list we seem to be travelling directly from north to south through the States, finding scarcely a State out of its place, the District of Columbia, Louisiana and Oregon being the only notable instances of displacement. The proportions range from one death in 254 persons in Massachusetts to one in 2,498 in Oregon. In twenty-one States the deaths are above the average (one in 899), all of which are as far north as Virginia, except Louisiana; and fourteen are below the average, all of them as far south as Virginia, excepting Minnesota, Iowa and Oregon. In regard to the latter (and the same may be said of the new Territories not here enumerated) the unusual immunity is accounted for by the nature of the population, mostly robust emigrants, and by their out-of-door lives. In regard to the new Northwestern States, about the upper Mississippi and Lakes, the same remark will to a great extent apply, in addition to the well-known freedom of these regions from great and sudden variability of climate.

If we arrange the States according to the percentage of deaths from consumption to deaths from all other specified *diseases*, excluding deaths from violence, which is a still more accurate test of the liability to consumption in any region, the sequence from north to south is still more exact. They then read, Maine, New Hampshire, Rhode Island, Vermont, Massachusetts, Connecticut, District of Columbia, New Jersey, New York, Pennsylvania, Michigan, Maryland, Delaware, California, Minnesota, Ohio, Wisconsin, Indiana, Kentucky, Iowa, Illinois, Tennessee, Virginia, Oregon, Kansas, Missouri, Louisiana, North Carolina, Florida, Alabama, Mississippi, Texas, South Carolina, Georgia, Arkansas. The coincidence of the two lists, considering that the data are only for one year, is wonderfully great. The percentages of deaths from this disease to deaths from all other specified diseases range from 29.90 in Maine to 3.86 in Arkansas. This range is surprisingly great; and however liable to slight fluctuations in reality, or from inaccuracies in registration, the great fact is demonstrated, so as to demand acceptance as a general law, that, other things being equal, consumption positively, uniformly, and largely diminishes as we proceed from the Northern to the Southern States. Seventeen of the States are above the average percentage (13.30), all of which are north of Kentucky; and eighteen are below the average, all of which are south of the same line, excepting Illinois, Indiana, Iowa and Oregon. In fact, a line drawn east and west through the States, at about the 38th or 39th parallel of latitude, somewhat variable in direction, as all isothermal lines are, striking about the middle of the course of the Ohio river, would separate the territory where the percentage of

deaths from consumption exceeds the average percentage for all the States, from the territory where it is below.

The above figures respecting the several United States enable us to take another decided step in the etiology of consumption, and to draw another line within which the truth as to its cause must lie. As this line is indicated solely by latitude, it follows, at least it is fair to infer, that cold is the agent concerned; and that cold must be added as another element no less obvious than moisture in the genesis of this disease. The well-observed fact that monkeys, serpents, and a large proportion of the tropical feline animals, when removed to cold climates, die of tuberculosis, has a significant bearing on this point. Nor can it be said that it is the mere degree of cold which has so marked an influence in inducing or fostering the disease, for we find the Northwestern States about the great Lakes—Iowa, Minnesota and Wisconsin—standing high on the list of immunity, though quite as far to the north as New England. These two districts lie between 41 and 47 degrees of latitude; and according to the records kept at military stations, the average annual temperature in New England is $45^{\circ}09$ of Fahr., and $44^{\circ}34$ in the Northwest District; the number of inches of rain in the former forty-one inches, and in the latter thirty and a half inches, showing a very great similarity of climate, so far as heat and moisture are concerned. The extremes of heat and cold in the two districts are very nearly alike also, being 104° to -32° , a range of 136° , in New England; and 104° to -38° , a range of 142° , in the Northwest. The comparative frequency and rapidity of the changes, in other words the temporary variability of the climate, it is not easy to ascertain. Yet in the New England States the average of deaths from consumption to deaths from all other specified diseases is about 25 per cent., and in the Northwest it is but about 14 per cent.

No one will be disposed to doubt the validity of Dr. Bowditch's *law*, as he terms it, that moisture is one of the main causes of consumption, everywhere else as well as in New England; and *soil-moisture* may be more pernicious than other moisture. But it would seem that moisture alone cannot be the sole or principal cause, any more than cold; for in all the low grounds and damp atmosphere of the South and Southwest there is comparatively little consumption. The writers quoted by Dr. Bowditch—Drs. Forry, Drake, Blodgett and Lawson—as we understand them, do not lay any particular stress upon moisture alone as a proximate cause. The Report of Dr. Coolidge on the health of the U. S. Army, throws very little light on this subject. The military stations referred to are mere points, chosen simply for strategic purposes, and do not represent the general conditions of the territory around them; their occupants are not denizens, but gathered from all quarters of the country and from all nationalities; their stay is transient; and the small and widely diverse proportions of those dying to those treated show how valueless the re-

turns are in this respect. For instance, of the 21 cases treated in New England, only 6 died; of 26 treated at St Louis, 24 died.

These two lines of investigation, that of Dr. Bowditch and the returns of the United States Census of 1860, show, we think, that cold combined with moisture, in other words *cold moisture*, is the meteorological condition which exercises the principal agency in the induction of consumption; and that neither agent, without the other, can have any very controlling influence as its cause. As a concomitant and subsidiary influence, great and sudden changes, *variableness* of climate, must be added in determining this as well as other diseases. Favorable and unfavorable limited localities, on a small as well as on a large scale, are shown to exist, both by the researches of Dr. Bowditch and by the census. Moisture on a northern slope and driven by north or east winds will be more potent in inducing diseases than moisture on a southern slope, or driven by south or west winds. We refer in this remark to winds on our Atlantic coast. Warm moisture and dry cold, we apprehend, will ever be found favorable to exemption or relief from consumption. But rain does not always mean moisture, nor heat dryness, in a meteorological sense; and the whole subject is so connected with the physical laws which regulate dryness and moisture as to demand much further research and generalization before the real telluric and climatal conditions most likely to develop or mitigate consumption can be determined. We can only claim to have determined one of the elements in the problem.

As the rate of mortality from all causes is larger at the South than at the North, it being one in every 67 of the living population in the Gulf States, and only one in 74 in the New England States, the inquiry arises, what class of diseases has taken the place of consumption in its regular decrease from North to South. We know that fever, in its various forms, is the disease most prevalent and most fatal at the South. The opinion has been expressed that moist, intermittent-fever countries are not liable to consumption. The deaths from fever of all types have been shown in connection with consumption in the table given in this paper. It will be seen that, in the order of fatality, the list of States is nearly reversed. The causes of fever being of miasmatic origin, are liable to greater variation than those of consumption, and the sequence of States in regard to fever would be less constant than in regard to consumption. But the generally reversed sequence in regard to these two diseases is sufficiently remarkable. The extremes in the case of consumption are 3.86 per cent. of deaths from all specified diseases in Arkansas, and 29.90 per cent. in Maine; the extremes in the case of fever are 3.25 per cent. in Connecticut, and 24.46 in Kansas. But if we add the percentages from the two causes in each State, the extremes are reduced to 16.54 per cent. in Oregon to 32.30 in Kansas, the average for all the States for the two diseases

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being 22.4 per cent.; so that these diseases are to a very great degree complementary to each other.

RUPTURE OF THE UTERUS—RECOVERY.

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[Communicated for the Boston Medical and Surgical Journal.]

NOVEMBER 9th, 1859, I was called to see, in consultation with Dr. J. H. Warren, of Neponset, Mrs. K., Irish, aged about 32, then in labor with her first child. The patient had been in labor for a long time, the os uteri was fully dilated, and the membranes were broken, but the child had made no advance. It was deemed best to turn and deliver. This was accomplished only after reducing the size of the head by perforation through the "foramen magnum." The patient recovered without any trouble.

Dec. 9th, 1860, I was again called by Dr. Warren to this same woman, again in labor. I saw her between 9 and 10 o'clock, P.M. At 6, P.M., her pains, after long continuance, had suddenly ceased. There had been vomiting, with extreme prostration. Stimulants had been freely given. On laying my hand upon the abdomen, I felt what seemed to me to be some part of the child, with only the abdominal walls interposed between it and the hand. Examining per vaginam, I could just reach the head. The child was turned and extracted, as before, after perforation through the foramen magnum. The placenta followed without any difficulty.

Wishing to verify our diagnosis, I again passed my hand into the vagina, and found a rupture in the side of the uterus, which extended completely through the neck. Through this rupture I passed my hand to the umbilicus, where it could be distinctly felt by Dr. Warren. I could feel and grasp the intestines. The patient recovered, and her case was published by Dr. W. in this JOURNAL for March 21, 1861.

I did not again see the patient until the latter part of last May, when curiosity led me to look her up, to know if she had been again pregnant. I found her expecting to be confined within a week or two. She requested my attendance, which I promised her, Dr. Warren having joined the Army. I directed her, on the first symptoms of labor, to see that the rectum was evacuated, and to send for me immediately.

June 21st, 1863, I saw her at 2 o'clock, P.M. The os uteri was well dilated, and the pains were just commencing. The membranes were broken. On examination, I found the funis in the vagina, but could not reach any part of the child. Aided by Dr. Blanchard, of Neponset, I etherized the patient and proceeded to turn. On passing my hand I felt, first the funis, secondly the hand, and lastly the head. The arm was lying by the side of the head. I brought