Tyndale (J. H.)

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THE CONSTITUENTS OF A SUITABLE CLIMATE FOR THE VARIOUS FORMS OF PULMONARY CONSUMPTION.

By J. Hilgard Tyndale, M. D., New York.

THAT there is no rule without exception goes without saying; that exceptions do not invalidate a rule is quite equally true. With this latter maxim in view, we will endeavor to find what constituents of climate combined are suitable to the majority of patients suffering from pulmonary consumption. Nothing could be a greater fallacy than to try to find a specific cure-all, either in the home or climatic treatment of consumption. Nor can we, in the present light of our knowledge of phthisical pathology, look upon that disease as a unit, but rather as a combination of the two main elements of disease, namely *inflammation* and *infection*. This combination and destructive co-operation of a localized inflammation and general infection

presents itself either as a chronic inflammation or an acute one, and as a chronic or acute infection. The various degrees of intensity and of quantitative destruction result from the variety of combinations possible where four constituents are given.

A chronic inflammation may exist alone (fibroid phthisis, cirrhosis); so may a chronic infection (chronic localized tubercle, cheesy centers); both may exist together, this being the most common form of cavities and infiltrations; an acute infection may occur alone (acute tuberculosis); an acute inflammation likewise, which, aside from the acute inflammation of lung tissue, occurs as subacute processes in the vulnerable (strumous) as "catarrh of the apex;" while, during the progress of a phthisis, an acute attack appears in the shape of an *exacerbation.* Lastly, in the progress of a chronic phthisis, made up of the processes of inflammation and infection, one of these processes will assume an intensity out of proportion to the ordinary course, when the result is death from *suppurative peri-bronchitis* or *edema* of the lungs in one case, or from *acute tubercular invasion* in the other.

For the purposes of climate—therapy—it is convenient:

1. To divide the chronic pathological processes in the lungs into a few general divisions, representing three stages of development for two classes of persons: the *robust*, and the *irritable* or *vulnerable*, either of whom may have been drawn below their physiological line by being *exposed.*

2. To find for these various forms of phthisis the best conditions of climate for curing or mitigating the disease—to secure more or less permanent arrest.

This much is prefaced, in order that what follows may be readily understood.

The pathological conditions in consumption are readily fitted into these several frames:

1. Superficial cases—so-called because the inflammatory condition of the respiratory tubes is still superficial, though chronic, with little or no involvement of the sub-

mucous connective tissue, where there is no septicemia, but a lowered *general condition*, this latter constituting the cause of the superficial process, which without it would not exist.

2. Cavities and infiltrations of the regulation sort, slowly but persistently progressive chronic inflammation (ulceration), with more or less septicemia (infection).

3. The same, in the condition of superadded acute or subacute exacerbations, occurring *intermittently* or *remittently*. Long intermissions often give rise to that mistaken idea of "self-limitation."

4. Assuming these forms to occur in the average individual, whether previously particularly robust or not, we find it necessary to assume the same conditions for the "irritable" persons of high nervous tension, chiefly manifested by readily *vulnerable mucous membranes and skins*; the result of an equally irritable circulatory apparatus.

5. The colliquative—the breaking down stage of any case of phthisis; the exacerbations no longer intermittent or remittent, but *continuous*, indicating great intensity of infection (acute tuberculosis) or of inflammation (suppurative peri-bronchitis). We may at once say that these manifestations of an early dissolution are not amenable to climatic treatment.

All of the other forms will be benefited or cured by a change to a climate suitable to their respective manifestations.

Because of the evidences of general depression of vital forces manifest in phthisis, it has been taught until recently, and is to-day believed by a majority, that the two chief therapeutical elements required are warmth and moisture, the fosterers of *equability of temperature;* elements which constitute what is called a mild, soothing or sedative climate. This fact will be shown in connection with the publication of the collected opinions of the pneumatologists of this country.

Dr. Jas. Henry Bennett,[1] of London, has for a number of years advocated the advantages of a cool, bracing and tonifying climate. This is well for a certain class of cases, but is going to the other extreme.

First of all, let it be distinctly understood that no *specific element* which cures consumption, resides in any climate of any part of our globe, whether at land or sea, in the lowlands or at mountain altitudes. But it is no less an error to suppose that any benefit derived from change of climate is to be looked for only in the fact that the air is "pure and plentiful" and constitutes "nourishment to the lungs." Nourishing of the lungs is carried on by the bronchial arteries, and not by that great net-work of pulmonary vessels which carry on the exchange of oxygen for carbonic acid, and thereby regulate our air supply.

Air may be called pure when there is an absence of mechanical and organic admixtures, represented by dust and noxious gases on the one hand, and animal and vegetable germs on the other. (For the literature on this subject see Tyndall on "Floating Matter of the Air."

To the "superficial," above referred to, as well as to many phthisical patients in the more advanced stages, *any change from city to country, from a marine to a continental climate, or vice versa, will be productive of temporary benefit.*

This benefit consists only in an *increase of weight* and a *temporary amelioration of symptoms.* In other words, the general condition will be improved, but the local lesion in the lung will remain in statu quo. The same benefit is reached by ocean voyages, which explains the cures reached by that method.

Drs. C. T. Williams and Brehmer have observed that gain in weight bears no relation whatever to the local process in the lung. I have long been convinced that a mere gain in adipose tissue is a hindrance to absorption of in-

[1] On the Treatment of Pulmonary Consumption—Jas. Henry Bennett, M. D.

filtration in the lung. And more than that; as soon as an increased ingestion of food has re-established the average weight and something of the sensation of strength to the patient—as soon as this trifling change has accomplished all it can do—the phthisical process will resume its onward march. Hence the fallacy of teaching that a patient should "remain in that locality as long as he continues to improve" (Loomis), for by the time the patient recognizes his mistake he is far on the road to dissolution. Dr. Williams[1] says that this "demonstrates, only too faithfully, how all the appearances of an improved state of health may be present, and yet the disease may continue its insidious and steady march unchecked."

Consumptives require more than mere quantity and normal quality of atmospheric air; it should be aseptic (not permitting of the development of infectious germs) or directly antiseptic (antidotal to germ life), as it is claimed for the exhalations of pine forests, and, in a lesser degree, for the salt-air of the sea.

What are the chief constituents of climate in general?

1. Pressure of the air column (barometric pressure), indicative, among other things, of the degree of *elevation.*

2. Humidity of the atmosphere—relative *dryness.*

3. Temperature of the various months and seasons—the mean degree of warmth, and the question of *range* of temperature—indicative of its *equability.*

These three: Dryness, equability and elevation, are the main constituents, the others being the result of the combination of two of them, or resulting from the effects of one upon the other.

a. Intensity of sunlight.

b. Force, direction and frequency of winds.

c. Electricity—its quality and tension.

d. Precipitation of rain and snow.

e. The production of ozone.

f. Mechanical and organic floating matter.

[1] "Influence of Climate on Pulmonary Consumption."

The number of clear days in the year is also of interest.

In selecting our *aseptic climate*, we do nothing else than to look for such conditions of climate as will insure purity of *soil and atmosphere.* Of soil we demand that it should drain water rapidly from the surface and not retain it, and that no ground-water shall be found at little depth, i. e., that there be an absence of *subsoil moisture.*

Of atmosphere we demand that there shall be an absence of *mechanical and organic floating matter.* These two are the elements to which both the robust and vulnerable are "exposed" at their homes quite frequently, and form the well-known immediate causes of consumption.

What constituents of climate favor the development of organic germ-life? Persistent heat and excessive moisture —the right temperature and the right fluid medium. Heat can be avoided by remaining within certain latitudes in the temperate zone. Excessive moisture is to be avoided, and *dryness* sought.

If, then, dryness and coolness (or cold even) are to be primarily sought after, what else is this combination but an *aseptic atmosphere*—a term for which I have frequently been ridiculed—and where are they *constantly* found? Why, at more or less high elevations. So our formula reads: *Dryness and elevation.* But how about equability of temperature? Have we no use for it? Equability of temperature is desirable for those to whom sudden *fluctuations* are hurtful. And who are they? The "irritable" and "vulnerable" of all forms of phthisis. To them the allaying of *irritation* and *low-lived inflammation* is the prime necessity, after accomplishing which they need the services of dryness and elevation. And why? Because equability of temperature in the temperate zone is secured only by the protecting influence of moisture; and we have seen excessive moisture to be our worst enemy, while the greatest equability is found in the company of great moisture. Hence the rule: In the selection of climate for equability, choose rather a reasonable equability with

less moisture, than great equability with excessive moisture unavoidably thrown in.

We have, then, as the desired factors for an antiseptic climate: *Dryness, equability and elevation.*

In their various relations to each other they form so many different kinds of aseptic climate for so many different forms of phthisis—the usual combinations of inflammation and infection.

Dryness is the antidote to infection.

Equability is the antidote to inflammation (of a low type).

It was my intention to add some of the facts regarding the effect of elevation upon respiration and circulation, but the scope of this article forbids it. The same applies to the effect of the other constituents of climate. This much I will say: Where we would have to choose between dryness and equability, we should take into account the importance of elevation, and it will make the choice easier to remember that dryness and elevation are found together, whereas equability is not usually found there, but, on the contrary, in the company of moisture.

Generally speaking, then, an aseptic atmosphere is the requirement for the majority of consumptives. Let us now see what constituents furnish us a reasonable guarantee against acute or subacute inflammatory exacerbations in the more robust. The conditions of climate best adapted to prevent these serious mishaps are the contrary of those which, in other climates, call forth fresh catarrhs and acute processes generally of the respiratory organs. By what are they called forth?

Besides the proofs elicited by Bowditch, Williams and others, Dr. Seibert,[1] of this city, has shown that the following meteorological conditions favor the production of pneumonia:

1. A strong fall in the barometer.

[1] "Influence of Meteorological Conditions upon the Causation of Croupous Pneumonia"—By August Seibert, M. D., New York.—*Amer. Journ. Med. Sciences*, Jan., 1882, p. 108.

2. A low figure of the thermometer.
3. Northerly, and more especially northwesterly, winds.
4. Great velocity of the wind.

"It is principally the sudden appearance and long prevalence of cold, moist atmosphere which exercises this influence." (Op. cit.)

These conclusions coincide with well known facts, namely:

1. That northerly winds of great velocity, in cold weather favor a too rapid and continuous abstraction of heat from the body.
2. That a persistently high percentage of humidity hinders the loss of moisture from our body through the lungs and skin; thus disturbing that equalizer of our well-being—equable water-abstraction from the body.

The natural effect of these disturbances is seen in *internal congestions*. The inability of a consumptive to adjust himself to these meteorological fluctuations is manifested by repeated irritation and subacute inflammation of the pulmonary and gastric mucous membranes.

If these, then, are the elements which cause the mischief, we must look to the contrary conditions for the elements of repair and cure. These contraries are relative dryness, equability of temperature, and absence of strong and frequent winds. This baneful influence of winds reminds us that besides absence of moisture of the soil and admixtures of the atmosphere, we must look to the *movements* of the atmosphere. What is required is *high local shelter* to insure *calmness*.

On this continent, and, in fact, in the whole temperate zone, the combination of our aseptic constituents does not exist. For this reason we must seek to content ourselves with what is within our reach, namely, an aseptic atmosphere, both at elevations in the *mountains* and at low-altitude—a sea-level—including the *ocean* itself. Each one of these surfaces has a certain number of climatic

constituents which are suitable for consumptives, and *neither has all of them.*

Beginning at sea-level, let us see what constituents are found:

1. WITHOUT ELEVATION, AFFECTING BAROMETRIC PRESSURE.

a. Upon the Ocean:

No dryness, but considerable moisture; no elevation. But we do have: *equability of temperature*, coolness, and abundance of sunshine. Added to these is the continuous inhalation of air impregnated with salt, a feeble antiseptic, but present in great quantity. All these advantages combined serve to explain the benefits derived from long ocean voyages.

2. *At the sea-shore:*

Advantages all relative, to-wit: *moderate* moisture: *reasonable* equability of temperature; coolness or cold; sea-coast climates are dependent upon local shelter against cold or moisture-bearing winds; their equability upon proximity of the Gulf Stream and the equalizing influence of the moisture blanket.

3. *Far inland:*

Dryness on account of distance from large bodies of water; no elevation; no equability of temperature; warm, cool or cold. Much depends upon absence of subsoil moisture, of atmospheric organisms engendered by cities of any size, and shelter from too active *movements* of the atmosphere,—the type of *continental* climates, where relative dryness forbids equability of temperature.

d. Islands.

Equability of temperature; sometimes elevation (Sandwich Islands); no dryness. Upon elevation depend relative dryness and calmness—type of *marine* climates.

2. WITH ELEVATION.

Sufficient altitude insures *dryness* and *coolness* with the *elevation*; no equability; abundance of sunshine.

Though, as we have seen, not an absolute *sine qua non*,

equability of temperature is desirable in connection with medium or high altitude, and that degree of dryness which together constitute a perfect aseptic atmosphere. Now, equability of temperature is coupled to moisture at sea-level, and is wanting at altitudes in the temperate zone. We also know that warmth and moisture decrease, or what amounts to the same thing, that coolness and dryness increase, with increasing altitude. It is clear, then, that if we wish to find, combined, elevation and dryness (with coolness), and equability, we must look for an equatorial latitude and for *high* altitude. And why? The warmth of southern latitudes means a high thermometrical reading throughout the year, even on an average; the degree of moisture is throughout a relatively high one, frequently approaching saturation. As it requires about three hundred feet of elevation to find a reduction in temperature of 1° Fahr., and as it requires correspondingly high elevation to expand so much moisture, it follows as a maxim: The *extreme ideal aseptic climate*, in which altitude, with dryness and *sunshine* and coolness, is coupled to equability of temperature, *is found in equatorial latitudes at very high altitude.*

Such a combination is found in the Andes, of South America, in places where local shelter against high winds exists, and wherever the number of inhabitants is not large enough to constitute a fresh breeding-ground for infectious germs.

Such, then, is a general outline of the character and constituents of climates suited to the various forms of pulmonary consumption.

As to what class of cases is suitable for one climate and what to another, there are rules applicable within certain limits, and of these I have given a general outline.

As to the enumeration of the proper localities and sections of country, in accordance with the facts presented, this does not come within the scope of this article. Neither is this the place to point out the points in diagnosis upon which to base your choice of climate.

We need to keep in mind that all cases need an aseptic climate ("aseptic" being a convenient term for expressing an ideal combination of dryness and equability and their consequences); that asepsis *exists at altitudes and at sea-level;* that dryness in its most absolute form (below 50 per cent.) is found at more or less high altitude and is the most important constituent; that the constituents of dryness, equability and elevation exist in various proportions in different regions, forming so many degrees of *aseptic and antiphlogistic* influences, to which the various forms of phthisis can be relegated with benefit; that acute exacerbations (fresh inflammations—the hemorrhagic, "pneumonic") require primarily equability of temperature with calmness, because the co-operation of the opposite conditions produce acute inflammations of the air-passages, and secondarily increased dryness and elevation.

As a general picture of the pathological conditions on the one hand and their requirements on the other, let me present the actual lesions and their remedies, upon which my antiseptic and antiphlogistic home treatment is based. The pathological picture consists of:

1. A local process of destructive ulceration or condensation by infiltration, or both, in the lung tissue.
2. General septicemia—chronic blood-poisoning.
3. An anemic and enfeebled heart, of great frequency of action and weak of impulse.
4. An anemic and half paralyzed stomach and intestines, anemic glands, furnishing secretions poor in ferments; all tending to establish a vitiated digestion and assimilation.

These four combined are the cause of a *lowered vitality.*

In an aseptic and antiphlogistic atmosphere (dryness and equability), the local process in the lung and the septicemic condition meet with their proper remedy for arresting these destructive agencies and pave the way to repair.

In the rarefied air of medium or high altitude, the enfeebled heart, weakened diaphragm and the stagnant di-

gestive functions are stimulated to renewed effort by the increased arterial pressure, consequent upon the lessened pressure of the air-column, and thus make possible repair of defective nutrition, and ultimately of the lung lesion itself.

31 East Twenty-Second Street.