Address.**THE CONQUEST OF THE TROPICS FOR THE WHITE RACE.***

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AFTER looking over the ground very carefully, I can find no particular field of work that should be called to the attention of the Association. We have progressed markedly in the last ten years along the line of raising the standards of medical education. This was the great aim the Association had in its formation. We should continue to push this work during the coming year as in the past.

During the past few years the Association has also done excellent work along the line of examining into various medicinal preparations put on the market and expressing an opinion as to their genuineness. This is a very useful work and should be continued.

We have recently begun to try to influence legislation in a direction favorable to medical and sanitary matters. Our field for usefulness in this direction is very great. These activities have been well covered by the Association during the past year, and I have no doubt they will be equally well sustained during the coming year.

It has been customary for the incoming president to urge on the Association some line of action which he thinks particularly useful. It seems to me best that the Association follow, during the coming year, along the lines mentioned above, just as it has done during the past year.

Dr. S. Weir Mitchell, of Philadelphia, has suggested that our Association should erect in the national capital some suitable monument in memory of the medical officers on both sides who lost their lives in the performance of their duties during the war between the states.

Our Association now represents the medical profession of the whole United States. No period in the history of our profession can be selected in which greater devotion to duty was shown than was evidenced by the medical officers who served in this war, nor can any war be pointed out in which a greater number of medical officers gave up their lives in the performance of their duties.

I, therefore, recommend that the Association take steps looking to the erection in the national capital of a suitable monument in memory of the medical officers on both sides who gave up their lives in the performance of duty during the war between the states.

I have consulted with my friends, and have given careful thought as to what lines my address should follow, and I have concluded that, as I believe no special recommendations from me as to action on the part of the Association are needed, it would be best to outline some phase of our sanitary work at Panama, the description of which would be generally useful, and, possibly, generally interesting. With your permission, then, I will make this address on our sanitary work at Panama, as it bears on malaria and as to how these measures could be applied in other localities.

* President's address at the sixtieth annual session of the American Medical Association, at Atlantic City, June 9, 1909.

I hold that it has been proved that malaria is carried from person to person by the bite of the female of a particular species of mosquito — the anopheles — and that it is conveyed practically in no other way. Our measures are principally directed to the destruction of this species of mosquito. The anopheles propagates itself by laying its eggs, about a hundred at a laying, on the surface of fresh water. These eggs float around until they are hatched by the heat of the sun. The young live a larval and pupal stage of about eight days in the water, at the end of which time they have developed into full-grown mosquitoes.

This mosquito seeks clean fresh water in which grass and algæ are abundant. As soon as the eggs hatch, the larvæ flee to the grass and algæ for protection from small fish and their other natural enemies. The adult anopheles is weak in flight and does not habitually move about much. We place a hundred yards as practically its ordinary flight. The adult is much afraid of wind and seeks undergrowth, grass and plants near the ground for its protection.

The anopheles, then, require clean, fresh water in which there is plenty of grass and algæ for the development of its larvæ, and, when grown, does not fly farther than a hundred yards. It also needs brush and grass for its protection against the wind. Our measures for destruction are based on these two peculiarities. We destroy all the breeding-places within a hundred yards of the locality we desire to protect, so that the mosquito can find no water in which to lay her eggs, or where her larvæ can develop. At the same time we clear off the brush within the same area, so that the adult cannot find protection against the wind.

Measures for the destruction of breeding-places have to vary with the locality. Wherever we can drain at a reasonable cost, we do so. This drainage is generally done with superficial ditches or subsoil tiling. Subsoil tiling is the ideal anti-malarial drainage system. It does away entirely with the mosquito breeding, and after it is once laid in, there is no further expense for keeping the ditch open. In the tropics vegetation grows so rapidly that a ditch has to be cleaned out every two weeks so as to keep the channel free from breeding places. This is so heavy an expense that we find it much more economical to concrete all superficial ditches. A concrete ditch should be swept out frequently, else obstructions will form many small pools. Drainage is *par excellence* the great means for anopheles destruction. But in many instances, on account of the too great expense, drainage cannot be resorted to; if, for instance, the town is situated near a large swamp or lake. In such cases the mosquito larvæ can live only around the edges, where they are protected from the small fish by grass and algæ, or in holes made by the feet of animals in the soft soil at the margins of the water. In such cases we keep the brush and grass cut along the edge of the water near the town and see that animals are not allowed access here. Or the town may

be situated near the bank of a small stream. In this case we would keep the stream and banks free from grass and algæ in the neighborhood of the town. When we can do so safely, we use sulphate of copper for killing algæ. When we cannot use the above methods, we kill the larvæ with either crude petroleum or phinotas oil. Petroleum destroys the larvæ by spreading over the surface and smothering them. Phinotas oil acts by directly poisoning them. The above are the principal methods for destroying larvæ, and I look on the destruction of larvæ as the principal means for controlling malaria.

We keep the brush and grass cut within a hundred yards of the point to be protected. Both grow very rapidly at Panama, and this is a large item of expense. It is a great economy to get the ground in such condition that horse mowers and scythes can be used. Using the subsoil tile greatly facilitates getting the ground into this condition. Along the line of the canal most of the localities at which we have been at work for a year or longer are already in this condition. Brush-cutting I consider as only second in importance to drainage as an antimalarial measure. If brush and grass are thick about a dwelling, mosquitoes seek them as shelter from the wind. If brush and grass are continuous, the female anopheles will wander from a breeding-place by short flights for a mile or more. A cleared space of a hundred yards or more will, in general, stop her flight.

In adapting these measures to special conditions as they arise, practice and experience are of great advantage. And the greater knowledge a man has of the habits of the mosquito with which he is dealing, the more likely he is to succeed. My surprise has not been so much at the difficulties of getting rid of mosquitoes as at the great results of apparently inadequate measures.

Colon, a town of fifteen thousand inhabitants, is built on an island just above sea level. The houses, where the ground has not been filled in, have to be built on piles from two to four feet high, and approached by wooden footways raised above the water. The heavy rains in the wet season make this part of the town a fresh-water swamp. Mosquitoes of all varieties were very numerous in Colon. The brush was cut away for half a mile back of the town. This area was then intersected by several small canals twenty feet wide by six feet deep, and all the swamp connected with these canals by surface ditches. This allowed the fresh water to run off and all ditches to be filled daily with sea water. We also looked carefully after all water-containers, cisterns and barrels in the town. The result has been that Colon is almost free from mosquitoes of all kinds. Such results were not expected. It was hoped by these measures to get rid of the hurtful mosquitoes, the stegomyia and anopheles, which do not fly far. But it was not expected to affect to any great extent the culex, which is strong on the wing and still breeds for many miles in the swamps beyond.

Besides measures directed at mosquito destruction, we screen with wire gauze the houses of all

employees. Most of our houses are built with galleries on to which the doors and windows open. These galleries are screened rather than the doors and windows. This leaves only one or two openings to a house which have to be looked after with regard to being kept closed. The screening should always be supervised by some one of experience in mosquito work, as there are many points that are overlooked by the ordinary carpenter. We also urge on the people the use of mosquito-bars. Most of us, however, have become careless about this, as in the well-drained district, where the houses are well screened, mosquitoes are rare. All employees are urged to take three grains of quinine daily as a preventive against malaria. On the average, about 20,000 doses of quinine are taken daily by our 45,000 employees.

To carry these measures into effect we have the forty-five miles of country along the line of the canal divided into seventeen districts, each district in charge of an inspector, and the whole under the charge of one chief inspector.

The chief inspector has in his office a man familiar with the life history of mosquitoes; another, expert in tiling and ditching, and a general inspector. These men keep in constant touch with the district inspectors and act as their teachers and instructors.

The district inspector is held responsible for his district. He has twenty-five or thirty men for ditching and brush-cutting, a force of carpenters for keeping screens in repair, and one or two quinine dispensers. The men are not required to take quinine. The dispensers visit all the camps and barracks daily offering quinine to such men as care to take it. Each district inspector is notified monthly that he must keep his expenditures within a certain sum. The chief inspector keeps in such touch with the various districts that this sum can be increased or decreased as necessity arises.

The medical officer in each district reports weekly the number and locality of the employees in his district suffering from malaria. This report is consolidated every week in the central office, giving for each district the number of employees in that district, the number of cases of malaria which occurred during the week among these employees, and what percentage the number of cases of malaria is of the whole number of employees. A copy of this report is sent weekly to each district inspector. The work of the district inspector is judged by this report. If the malarial rate rises in a district the special inspectors from the central office go out to the district and they, with the district inspector, are expected to find the cause of the rise and correct it.

The results as to malaria have so far been very satisfactory at Panama. Table 1 shows the malarial rate:

TABLE 1. MALARIAL RATE AT PANAMA.

Year.	Force.	Cases.	Rate per 1,000.	Deaths.	Rate per 1,000.
1904.....	6,747	422	125	9	2.66
1905.....	16,511	8,496	514	92	5.57
1906.....	26,705	21,938	821	199	7.45
1907.....	39,344	16,709	424	138	3.51
1908.....	43,890	12,372	282	59	1.34

You will see from this table that there has been a steady decrease in the malarial rate and that at present it is less than one fourth of what it was in 1905. I see no reason why, if the proper methods are kept up, the rate should not continue to decrease indefinitely.

The general health of our force is excellent. Considering the whole population under our sanitary jurisdiction, including the cities of Panama and Colon, the death-rate is shown in Table 2:

TABLE 2. DEATH-RATE IN THE POPULATION UNDER AMERICAN SANITARY JURISDICTION.

Year.	Population.	Number of Deaths.	Rate per 1,000.
1904.....	35,000	1,224	52.45
1905.....	42,699	2,793	65.41
1906.....	66,011	3,544	49.10
1907.....	102,133	3,435	33.63
1908.....	120,097	2,983	24.83

The Canal Zone, where the health work is under the chief sanitary inspector, the rates are as shown in Table 3:

TABLE 3. DEATH-RATE IN CANAL ZONE.

Year.	Population.	Number of Deaths.	Rate per 1,000.
1907.....	54,306	1,708	31.60
1908.....	67,146	1,273	18.95

While this is not small as compared with most parts of the United States, it is small for tropical regions and small as compared with many parts of Europe.

The death-rate among the employees of the United States government from all causes (including violence), considering the whole force, has been as shown in Table 4:

TABLE 4. DEATH-RATE AMONG GOVERNMENT EMPLOYEES.

Year.	Force.	Number of Deaths.	Rate per 1,000.
1904.....	6,213	82	13.26
1905.....	16,511	427	25.86
1906.....	26,705	1,105	41.37
1907.....	39,343	1,132	28.77
1908.....	43,890	571	13.01

The rate for 1908 is probably not any higher than that of a similar body of men doing the same work in New York state.

The rate for Americans from all causes, including violence, has been shown in Table 5:

TABLE 5. DEATH-RATE FOR AMERICANS IN PANAMA.

Year.	No. of men.	Deaths.	Rate.	No. of women and children.	Deaths.	Rate.
1904.....	805					
1905.....	3,029					
1906.....	5,000	35	7.00	800		
1907.....	4,300	42	9.76	1,337	9	6.73
1908.....	5,459	42	7.69	2,674	26	9.72

This is certainly no higher than for a similar population in any healthy part of the United States.

I believe that the debility from which the white man has suffered in the past at Panama and in other tropical countries is due to malaria principally, and that if he protects himself from this infection he will remain vigorous and strong in the same degree as he will in a temperate climate;

and as a reason for this belief I advance the condition of the Americans at Panama. We have about eight thousand of them living under about the same conditions as they would live at home if doing the same work. They are exposed to the weather fully as much as they are at home, a large proportion of them being exposed for eight hours daily to the tropical sun and rains. Yet the figures I have quoted above show that their general health remains fully as good as it was at home.

The only difference between ourselves and the whites formerly in Panama is that we have protected ourselves from yellow fever altogether and malaria to a great extent. Yellow fever has a great effect on the death-rate of a non-immune population, but very little effect in causing debility; whereas malaria is a disease which may last for years in the individual, and in a locality like Panama causes a widespread debility in the whole population.

For the white man going to the tropics it is neither difficult nor expensive to protect himself from malaria. All that is necessary is to screen his house well and drain and clear off the brush within a hundred yards of his residence. This is much less expensive than the measures a man has to take in the temperate zones to protect himself from cold.

The advances in tropical sanitation in the last fifteen years have shown that the white man can live in the tropics with as good health as he can in the temperate zones. This has been demonstrated by both of our military occupations of Cuba, and also by our occupation of Panama.

The white man can protect himself against disease in the tropics at no greater expense than he would have to undergo in order to protect himself against cold in the temperate zones. The returns for his labor are many fold greater in the tropics than in the temperate zones. I think, therefore, that the tendency in the next few centuries will be for the white man to drift to the tropics, and I dare predict that, by the time the year 1909 is as old as is the present day the Norman conquest of England, localities in the tropics will be the centers of as powerful and as cultured white civilization as any that will exist in temperate zones.

I believe that our work in Cuba and Panama will then be looked on as the earliest demonstration that the white man could flourish in the tropics and as the starting point of the effective settlement of these regions by the Caucasian.

I am inclined to think that at this time the construction of the Panama canal will be known less as a great commercial accomplishment or engineering feat than as the first demonstration of the fact that the white man could flourish in the tropics in spite of those most trying conditions which have in the past rendered it impossible for him to thrive.

OPPOSITION TO A STATE TUBERCULOSIS SANITARIUM.—The governor of Texas has vetoed a bill for a tuberculosis sanitarium on the ground that such an institution would attract indigent invalids to the state. — *Medical Record*.