WHAT THE ENGINEER CAN AND SHOULD DO TOWARD PREVENTION OF MALARIA AND MOSQUITO NUISANCES

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PROMINENT engineering journals recently commented on the memoirs of Ronald Ross, the pioneer in malaria elimination, but omitted mentioning the fact that much of the future success to be achieved along this line, as well as the methods to be followed, must be devised or created by engineers.

Ross did not stress the point, although it is true, that due to engineering practice as now carried on, the engineer is frequently responsible for the creation of mosquito pest nuisances as well as the spread of malaria, or as an American malaria field worker remarked, "How long will it be before our engineers stop building malaria in, instead of building it out?"

Much man-made malaria or "engineer-made Anopheles production" is going on in other countries as well as in our own, and the time is at hand for our engineering societies to inquire why this is so, and to determine what should be done about it. Some of our engineers at Panama, during the canal construction period, considered the anti-yellow fever and anti-malaria measures as more or less of a joke, and referred to the field workers as "mosquito chasers."

Eight years later, the chief engineer of one of our largest American corporations working in a foreign country was selected and appointed to direct measures against yellow fever which at that time threatened their business interests. He promptly ordered one thousand tents, employed several hundred men to do work that had no relation to the problem involved, and wasted many thousand dollars, but did not accomplish one cent's worth of results toward yellow fever control or elimination.

During the recent epidemic of dengue fever that swept through our southern states from the Atlantic Ocean to Texas, no reference was made by our public press, engineering publications, or engineering societies, to the fact that our street storm water catch basins, present by hundreds in many cities and towns, are sources of millions of the mosquitoes involved in mosquito-borne disease. Yet, without question, a well selected committee of our American sanitary engineering associations could devise an economical modification for the catch basins now in use, so they would become self-draining and no longer a potential or actual menace to the health of the communities where they are now used.

An earnest effort was made recently by the Committee on Engineering of the National Malaria Committee to correct these and other defects and to so arrange that engineering students of our technical schools could learn in a short time, by a single lecture if necessary, not to permit engineering construction operations to become a source of serious epidemic disease outbreaks.

Unquestionably, more far-reaching results could be obtained if some of our prominent engineering associations could be interested in this matter and determine what is being taught in our technical schools relative to that part of applied public health that will be of actual use to our future engineers, and also determine which of these schools show the

students where they can easily and quickly obtain such facts—should they some time later have occasion to need them.

Also, these same associations through their professional journals could at least invite attention to the necessity of practicing and consulting engineers considering the public health problems involved in or connected with many engineering operations, such as irrigation, major drainage projects for agricultural drainage, impounding of water, extension of town suburbs, construction of highways and railroads, sewer outlets, borrow pit construction and similar projects.

Apparently the essentials of this subject, or the relation of engineering construction to public health problems, should in a brief way be presented to all students in our army engineering school, so that any small but very necessary item of expenditure necessary for malaria control in connection with government impounded water projects, or other large engineering projects, could and would be made and included in the appropriation or budget before the project is started. It would be too late to try to apply a remedy after the country surrounding the project is rendered unfit to live in.

In order to make this paper brief and to the point, a partial list of what the engineer can do is given below, and it is hoped that your association, coöperating with other engineers, will determine what should be done and then start devising means for accomplishment.

WHAT THE ENGINEER CAN DO

(a) Devise a means of presenting this subject before the national and state engineering associations.

(b) Obtain the coöperation of these associations so that a practical plan can be adopted to prevent the constantly changing county highway commissioners and county highway engineers allowing borrow pits and roadside ditches to be so constructed that they become intermittent or permanent sources of malaria-bearing mosquitoes and sources of potential foci of malaria.

(c) In this connection in each state, for the benefit of the roads as well as the proper drainage thereof, there should be a state association of county highway commissioners, and the county and state highway engineers should attend the annual meeting of that association.

(d) A strong effort should be made to interest the general managers and chief engineers of the railroads in the malaria belt of the United States, in the financial losses now caused to railroads by malaria, including:

Inefficient labor employed
Increased labor turnover
Retarded development of territory served
Decreased output of mills and manufacturing agencies
Reduction of freight hauled

(e) The state engineering associations should be invited to investigate the anti-malaria operations being carried out by the state board of health of their state, and act as a body in endorsing or giving constructive criticism on what is now being done toward malaria elimination, rate of control progress, and like matters.

(f) The engineer should interest consulting and municipal engineers in the mosquito problem, and let a sufficient number of them understand that a relatively mosquito free community will suffer from heavy mosquito infestation as soon as water of natural drainage courses becomes polluted with sewage water; that the production of pestiferous mosquitoes in clear water as against strong sewage polluted water may be as 1 to 1,000.

(g) The engineering profession must let the local government officials and the public know that sluggish water courses in town suburbs are a public nuisance; often the main source of our town mosquito pest problem, and frequently a menace to health. In the malaria belt of our country the normal (non-storm water) flow should travel through a properly devised concrete lined section in the bottom of the water course, or by pipe line to a point beyond mosquito flight range.

(h) Our underground culverts used in place of large pipe, and carrying a small normal flow of water, should not have flat bottoms. A depressed rounded central channel along the center line of the floor, and gently sloping

sides, will prevent mosquito production. Long culverts with flat grades to convey storm water under town suburbs are yet being built, and are sources of our mosquito pest. They are frequently so designed or constructed that it is not practical to prevent mosquito production in them.

(i) In view of the fact that state development will rapidly follow the proper development of hydro-electric power, impounded water projects constructed by our Federal Government should be so planned as to produce a practical minimum of malaria, and the methods of malaria control used thereon should be a standard for private enterprises to follow. In the past this phase of the public health problem has not been given consideration.

(j) Most of our practicing engineers, engineering construction corporations and contractors, have not been taught what serious malaria problems are, and do not recognize them at sight. The engineer can build malaria into a community for all time to come or build it out of a community. Which is he going to do, and why?

(k) Such small items as the location of a municipal swimming pool, recreation park, or automobile tourist camp, etc., where no consideration is given to the Anopheles problem near it, can seriously affect the annual malaria rate of the nearby town.

(l) Sir Ronald Ross states that it takes ten years for a nation to get a new idea. It was twelve years after the first successful anti-malaria campaign, carried on by Americans in Cuba, before we started any worth-while similar work in our own country.

Nevertheless, the writer does not accept the idea that it will be another ten years before the engineering profession of our country appreciate the commercial and financial value of malaria elimination.

Possibly greater progress has been made in our country than in any other in devising more economic and more rapid control measures, but the rate of progress can be increased tenfold if our American engineers will become seriously interested in this subject which affects the normal development of thirteen states and the comfort of the public in many others.

Malaria in Southern Georgia.—The roads are in many cases flanked on either side by cypress swamps. The trees rise out of two to three feet of algæ-covered water. When close to human habitation these swamps provide ideal breeding places for the malaria bearing mosquito. Drainage is practically impossible; therefore the only solution would seem to be to remove the people. In the low hilly country, these mosquitoes breed in lime sinks, and if they are not too numerous, the larvæ may be killed. The borrow pits also provide an excellent place for the *Anopheles* to deposit her eggs.

Frequently the plantations are surrounded by swamps, and most of the children and young adults have malaria. The lumbermen too suffer, since they must live in or near the swamp in order to cut cypress and pine. But those in charge of the lumber camps are making every effort to protect their workers by providing clean, well-ventilated, screened houses. The plantation houses, on the other hand, are ugly and ill-kept. The negroes are not jolly and care-free, but slow moving and anemic hosts for the malaria parasite.

The "poor white trash" inhabiting the section below the Black Belt are a miserable lot, thousands of them being infected with malaria and a large proportion having hookworm. Their complexions are pale and sallow, and their blood placed on a glass slide is pale orange, not red. Their chief diet is corn in some form.

"The crying need of these forlorn and God-forsaken people is a little divine discontent." They are too willing to accept things as they are, and too poor to make any move.

The solutions to the problems of malaria and hookworm are quite clear—draining, screening, furnishing shoes to the people, and teaching them cleanly habits, but "the whole thing is as simple and easy as it would be for a one-armed man to empty the Great Lakes with a spoon."—"Malaria," Thomas J. LeBlanc, *American Mercury*, Sept., 1924, pp. 366–371.