

Laboratory Diagnosis of MALARIA

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In the current effort to eradicate malaria from the United States, epidemiologists and engineers are dependent upon laboratory examinations of blood films for definite proof of the existence of malaria in an area. Among 28,872 blood films examined by the parasitology laboratories of the Communicable Disease Center between July 1948 and June 1949, only four were found positive for malarial parasites. In view of the scarcity of positives and the extreme importance of revealing them, it is appropriate to review some of the factors that contribute to the accurate laboratory diagnosis of malaria.

Whereas the thin blood film is ideal for studying the morphology of malarial parasites, the thick film (figure 1) is far superior as a diagnostic tool. The thick-blood-film procedure is essentially a concentration technique whereby it is possible to find malarial parasites which might be missed in thin films. In addition to revealing more positives, the amount of time spent on the examination of each specimen can be greatly reduced since there is from 10 to 50 times more blood per microscopic field in a thick film than in a thin one. Therefore, whereas it is advisable to examine thin films from 15 to 30 minutes, it is generally sufficient to examine thick films for only 3 to 5 minutes. Likewise, 100 microscopic fields are considered an adequate routine examination of thick films. However, in dealing with suspected cases or epidemiological contacts, it is advisable to study a greater number (at least 150 fields).

The preparation of satisfactory thick blood films is not difficult, but in many laboratories more unsatisfactory blood films are received than almost any other type of specimen. See accompanying illustration, figure 2, page 2, for properly prepared and improperly prepared blood films. In a southern State laboratory that he recently visited, the author was shown a washtub full of

unsatisfactory slides received during the past several months. Anyone preparing blood films for the diagnosis of malaria should determine if the specimens meet the needs of the laboratory.*

Giemsa's stain is recognized as superior to Wright's for the staining of malarial parasites (Wilcox, 1942). It gives more uniform results and can be adapted more easily to routine survey work. When a number of blood films are stained together, precautions should be taken to prevent the possibility of blood transferring from one slide to another. The parasitology laboratories

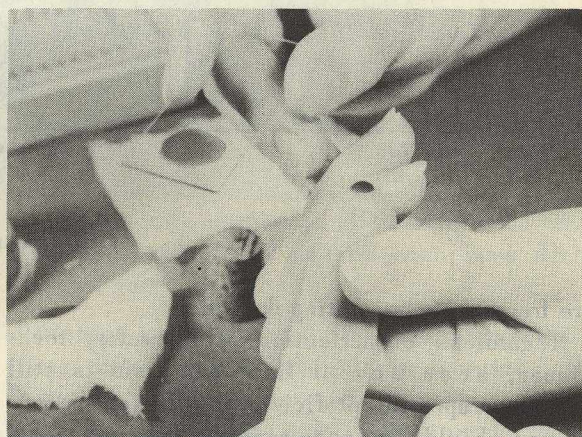


Figure 1. Preparing thick blood film.

of the Communicable Disease Center have evaluated mass staining procedures for malaria and have demonstrated the possibility of false positive diagnoses arising from blood transferred from malarious films to otherwise normal films (Brooke and Donaldson, 1948). Fortunately, the transfer of blood can be virtually eliminated during mass staining procedures by the addition of a small quantity of a surface-active agent (Triton X-30) to the Giemsa solution (Brooke and Donaldson, in press). In addition, the resulting stained blood films are more easily examined, since they

*The correct technique is demonstrated in a movie, "The Preparation and Staining of Blood Films," obtainable from the Film Library of the Communicable Disease Center.

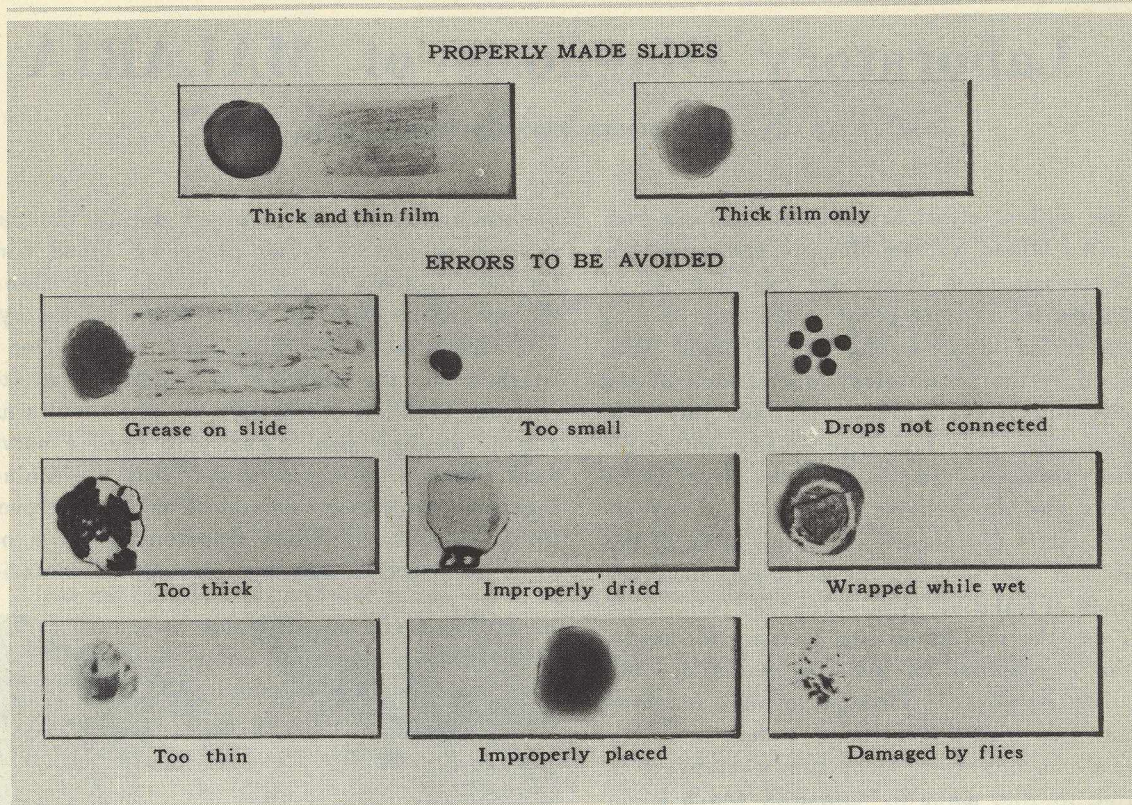


Figure 2.

are freer of contaminating debris.

Regardless of perfection of laboratory techniques, accuracy of final diagnosis is still dependent upon the proficiency of the technician. No one should attempt to render a final diagnosis who has not had adequate training and experience. In this field it is advisable to receive personal instruction in organized training courses. This is particularly true in dealing with thick blood films which may be very confusing without proper guidance. On the other hand, if a person has ample time, sufficient diligence, and reliable illustrations, (e.g. Wilcox, 1942), it is possible to teach oneself to recognize malarial parasites. In either event, after the training period the technician should examine numerous test unknowns before undertaking the examination of survey or clinical blood films.* The grade obtained on the examination of test

unknowns will indicate to the technician his relative ability to identify the organisms. In most instances it requires several months of supervised experience before a technician can be relied upon to render correct diagnoses.

Unfortunately, a person loses the ability to find and identify malarial parasites without continued practice. Since, at the present time, positives are encountered rarely in diagnostic laboratories, technicians periodically should review blood films containing the three common species of malaria. Furthermore, arrangements should be made by the laboratory director to have known positive blood films submitted along with routine specimens. Technicians will welcome the opportunity of finding these positives and the director will have greater confidence in the usual negative findings of his laboratory.

During the years of World War II the laboratory

* Loan sets of test slides soon will be available from the Laboratory Services of the Communicable Disease Center.

diagnosis of malaria reached a high level of proficiency. Numerous military and civilian technicians received intensive training in special courses given by Miss Aimee Wilcox, CDC, and other governmental and private institutions. Recently, practically every major community in this country has had competent technicians capable of diagnosing malaria from thick blood films. It will be difficult to maintain a high level of proficiency, but every effort should be made to do so. Laboratories in the United States currently have the unique opportunity of taking part in eradicating one of the worst scourges mankind has ever known, but if the program is to succeed,

laboratories must do everything within their power to assure correct diagnoses.

References

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A Review of Existing Insect Abatement Legislation

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While the Communicable Disease Center and the various State health departments have been conducting extensive malaria-control programs in the Southern States, it frequently has been indicated that there was a definite need for a means whereby the control of mosquitoes and, possibly, also flies, other arthropods, and domestic rodents could be provided in afflicted areas. This problem is being met satisfactorily in several States by the creation of abatement districts which permit local financing of adequate control measures.

Copies of all existing State laws which establish the procedure for creating mosquito abatement districts within States therefore were secured, reviewed, and analyzed. An attempt has been made to enumerate the better features of all existing State laws.

A brief summary of certain features of the various State laws is presented in table 1. It will be noted that 20 States have mosquito abatement laws, and approximately one hundred permanent mosquito-control districts operate under these laws in various parts of the country. It also will be noted that New Jersey and California were the first States to promulgate State-wide laws pertain-

ing to mosquito abatement (1906 and 1915) while Minnesota and Texas passed such laws during the past year.

District Unit. The majority of abatement districts embrace county-wide areas throughout the State, but there are several exceptions: in Alabama, the law pertains only to one county; Massachusetts limits greenhead-fly control projects to localities along the seacoast; the Texas law concerns only counties bordering the Gulf of Mexico; and the Virginia law pertains to counties and towns in the tidewater section of the State. The Minnesota law is unusual in that abatement districts cannot be set up on a county basis, the "governmental unit" being defined as "any city, village, borough, or town."

There is unanimity of opinion among those who have had considerable experience with the operation of insect control districts that all laws should allow any community or county within a State to create an abatement district if there is a problem of sufficient importance. The limiting of abatement districts to municipalities is an undesirable provision because many of the more troublesome