

HISTOPLASMIN SENSITIVITY AND PULMONARY CALCIFICATION IN KENYA

BY

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Histoplasmosis was first described by Darling (1906); Da Rocha-Lima (1912) recognized it as being due to a mycotic infection; and the causative organism, *Histoplasma capsulatum*, was first grown by De Monbreun (1934). At first the disease was regarded as a generalized and fatal illness involving the reticulo-endothelial system and often simulating visceral leishmaniasis. More recently it has been recognized that fatal cases are the exception and that there is a benign and asymptomatic form of histoplasmosis which radiologically simulates tuberculosis. There is strong evidence to show that, like tuberculosis and coccidioidomycosis, histoplasmosis will produce pulmonary calcifications observable on an x-ray film.

Most of the reported cases of histoplasmosis have occurred in the U.S.A., and up to 1951, 146 cases had been described, chiefly arising in the east-central area of the States. Outside the U.S.A., Mochi and Edwards (1952) were able to collect reports of 46 cases, 24 of which had occurred in South America. Only seven cases were reported from Africa, two being described from French West Africa, one from the Anglo-Egyptian Sudan, and four from the Union of South Africa.

As the result of surveys with histoplasmin-sensitivity tests, Mochi and Edwards indicated those areas, so far as have been investigated, where high, moderate, and low levels of sensitivity exist. Only five surveys have been reported from Africa, four of which were carried out in South Africa. In the Transvaal 140 persons were tested, on the Drakensberg 893, on the coast 693, and in a Durban factory 1,336 workers. The tests were performed with 1:1,000 histoplasmin, lot H 15, and the sensitivity rate ranged from 0 to 8% in the four areas. The fifth survey was carried out in Egypt, where 380 adult factory workers were tested at Mehalla with 2:1,000 histoplasmin, lot H 40. No positive reaction was observed. The criterion of a positive reaction in these surveys was an area of induration of 5 mm. or more read after 48 hours in the South African surveys and after 72 hours in Egypt.

Present Investigation

This investigation was first considered after x-raying some Suk tribesmen in 1949, when calcification was noted in the chest films of a few persons who showed a negative Mantoux reaction to 1 mg. of old tuberculin (O.T.) on more than one occasion. This suggested the possibility that pulmonary calcification was caused by a mycotic infection such as that due to *H. capsulatum* or to *Coccidioides immitis*. Towards the end of 1951 an opportunity presented itself for performing histoplasmin tests during the course of a survey carried out on African miners in the gold-mines and in another being carried out on prisoners in Nakuru gaol. These two groups of African males were chosen as in both cases investigations were being performed which made it necessary for tuberculin tests and a certain number of chest x-ray films to be done. It therefore seemed a good opportunity to carry out histoplasmin tests as an incidental investigation so that the results obtained could be correlated with the tuberculin rates and the radiological findings.

Histoplasmin Test.—A total of 833 histoplasmin tests were done—768 with lot H 42 of 1:100 dilution, and 65 with a lot obtained from the National Institute of Health, Bethesda, Maryland, U.S.A. The latter was diluted to 1:1,000. All the histoplasmin was kept in a refrigerator before use, and that of lot H 42 was all used within two weeks of dilution. The technique employed was exactly the same as that of a Mantoux test: 0.1 ml. of antigen was injected intradermally into the forearm, the result was read after 72 hours and was regarded as positive if the area of induration was 5 mm. or over at the site of injection. All areas of induration were carefully measured. The greatest care was taken to avoid using any syringes, needles, glass-ware, or sterilizers which had previously been used for tuberculin-testing. All the tests, both histoplasmin and tuberculin, were performed and read by me.

Tuberculin Test.—In the case of the miners both the tuberculin and the histoplasmin tests were performed at the same time, but in the case of the prisoners this was not so. All prisoners admitted to Nakuru gaol were normally tuberculin-tested on admission, and a large number of negative reactors retested routinely every three months. The same method of tuberculin-testing was used among both the miners and the prisoners. The Mantoux method was adopted, using 0.1 ml. of 1:1,000 (0.1 mg.) O.T.; it was read after 72 hours, and a positive reaction was recorded for an induration of 5 mm. or over and the presence of vesiculation was noted.

Histoplasmin Sensitivity.—Of the 768 adult African males tested with 1:100 histoplasmin, 65 (8.5%) showed a positive reaction. The average size of the reaction was 8.8 mm., the largest being 18 mm. and the smallest 5 mm. Of the 703 (91.5%) histoplasmin-negative reactors, 33 showed a minimal degree of induration after 72 hours, ranging from 2 to 4 mm., whilst the remaining 670 showed no induration whatever. Of the 65 miners tested with 1:1,000 histoplasmin, 7 (10.8%) showed a positive reaction after 72 hours; the average size of the induration in this case being 6.9 mm., the largest measuring 12 mm. and the smallest 5 mm. It will be noted that positive reactions were obtained from histoplasmin coming from two entirely separate sources.

Minimal Reactions to Histoplasmin.—An area of induration under 5 mm. after 72 hours is described here as a minimal reaction: 5.8% of the miners and 3.4% of the prisoners showed these reactions. In general a positive skin response of 5 mm. or over probably indicates specific sensitivity to *H. capsulatum*, but does not necessarily indicate the presence of active disease. Cross-reactions owing to sensitivity to other antigenically related fungi such as *C. immitis* may occur, and possibly this is particularly so among those showing small positive reactions, or negative reactors showing minimal indurations.

Histoplasmin Reactors by Tribe Groups

It was found that the reactor rate was much greater in the miners (14.6%) than in the prisoners (5.3%), although the same batch and dilution of histoplasmin was used in both groups. Almost all the miners tested were of the Jaluo or Bantu Kavirondo tribes living on or near the shores of Lake Victoria, whereas the prisoners constituted a mixed and varied number of tribes coming from widely scattered areas.

It might appear from this observation that the higher reactor rate among the miners was due to higher endemicity of histoplasmosis in the areas surrounding Lake Victoria, but an analysis of the results obtained from 110 Jaluo and Bantu Kavirondo who were tested in the prison shows that only 5 (4.5%) were positive to the histoplasmin test. It therefore seems that there is little to support the hypothesis of local endemicity, and it is possible that the higher rates in the miners may conceivably be associated with their occupation.

The vast majority of the prisoners tested came from areas in Kenya within the Rift Valley or to the west of it. It

was observed that no single tribe group in this area showed any marked tendency to higher histoplasmin-sensitivity rates than the others, but it must be pointed out that when the total numbers are divided into many groups the figures are of course small, and consequently give only a rough indication of the state of affairs.

Relationship between Histoplasmin and Tuberculin Sensitivity

In considering this relationship only the results obtained among the miners are dealt with in any detail. In many prisoners the interval between the tests varied, and to draw any conclusions from them would necessitate a difficult analysis which in the event might well prove misleading.

It was found that 91.2% of the miners were tuberculin-positive and 14.6% histoplasmin-positive. A more detailed analysis shows the following :

Tuberculin-positive, histoplasmin-negative	..	211 (77.0%)
" " positive	..	39 (14.2%)
" " negative	..	23 (8.4%)
" " positive	..	1 (0.4%)

It will be observed that whereas there were 39 (15.6%) histoplasmin reactors amongst the 250 tuberculin reactors, there was only 1 (4.2%) among the 24 non-reactors to tuberculin. As cross-reactions between histoplasmin and tuberculin are extremely rare, the large proportion of histoplasmin-positive subjects in the tuberculin-positive group might be explained by presupposing contamination of the histoplasmin with tuberculin, although the greatest care was taken to avoid this complication. If such contamination had occurred, it is most probable that, predominantly, those subjects highly sensitive to tuberculin would have shown false-positive histoplasmin tests, as it is assumed that only very small traces of tuberculin would actually be injected with the histoplasmin. A response by vesiculation to the tuberculin test is indicative of a high degree of tuberculin sensitivity, and if all the vesicular reactors amongst the miners are taken it is found that out of 39 histoplasmin- and tuberculin-positive subjects only one (2.6%) showed vesiculation, whereas of 211 histoplasmin-negative but tuberculin-positive miners 10 (4.1%) showed a vesicular reaction. From this analysis it seems unlikely that contamination of histoplasmin with tuberculin resulted in false-positive reactions. The explanation for this higher percentage of histoplasmin reactors among the tuberculin reactors may be that those who had travelled to any extent were more likely to have contracted both infections than those who had remained almost exclusively in their own reserves.

The hypothesis that the positive reactions after histoplasmin were due to contamination with tuberculin becomes more unlikely when the tests performed in the prison are considered. Here, in addition to the precautions taken to prevent contamination, tuberculin tests were purposely not performed simultaneously, and yet histoplasmin reactors were still found. Furthermore, these reactions occurred in some prisoners who, either immediately before or shortly after the test, showed negative reactions to tuberculin in a strength of as great as 1 mg. of O.T.

Radiological Evidence of Calcification

There were 130 histoplasmin-tested persons whose x-ray films were available for examination; 66 were miners and 64 prisoners. These x-ray pictures were inspected from the point of view of calcification in the lung fields or in the mediastinal glands. The interpretation and classification of calcification was based on that used by Goddard *et al.* (1949). The following standards were used :

Calcification Present.—Opacities whose size, sharpness, irregularity, and density were so characteristic that the diagnosis of calcium was indisputable. Or opacities similar to the above though somewhat less characteristic, but such that vascular structures and calcifying costal cartilages could be excluded.

Calcification Absent.—No evidence of calcification. Or opacities which possibly could be questioned as calcium but which the interpreter felt were more probably variations of the normal pattern of lung markings; particularly those shadows which might represent blood vessels on cross-section.

Each x-ray film was examined independently by two observers (Dr. W. S. Haynes and myself). All knowledge of the results of the histoplasmin or tuberculin tests was withheld from them. In just under 25% different results were obtained, and these films were therefore reviewed for a final assessment by both interpreters sitting together. On this occasion also the results of the histoplasmin and tuberculin sensitivity were not made available.

Selection of X-ray Films

There was to some extent a certain selection of persons whose x-ray pictures were examined. This was due to the fact that the films were available as a result of other entirely independent investigations which were being conducted among both the prisoners and the miners, and which necessitated taking films.

In the case of the miners a preliminary survey was being undertaken in the gold-mines of Kenya to assess the incidence of silicosis. Owing to the shortage of films it was found possible to x-ray only those miners who had worked for a period of five years or more underground.

The x-ray films of certain prisoners who were histoplasmin-tested were available because these prisoners were the subjects of a B.C.G. trial which was then in progress. For the purpose of this trial it was necessary for all prisoners who were tuberculin-negative on admission to prison, and who had a sentence of nine months or more, to have x-ray films taken and tuberculin tests performed every three months. Histoplasmin tests were performed on 47 of the latter subjects. Only one film from each prisoner was examined for calcification, the one selected being that taken at a date nearest to the performance of the histoplasmin test.

With regard to the relationship between radiological findings and tuberculin-testing amongst the prisoners it will be remembered that in this group the tuberculin tests were not performed at the same time as the histoplasmin tests. X-ray films of 47 histoplasmin-tested prisoners were available from the B.C.G. trial, and the results of the tuberculin tests performed nearest in time to the date of the histoplasmin test have been taken to indicate the tuberculin sensitivity of the individual prisoner at the time of histoplasmin-testing. In no case was the interval between the two tests more than six weeks. It should here be noted that all these 47 prisoners had at some time previously been negative to 0.1 mg. of O.T. on at least two consecutive occasions. The longest possible period between a negative tuberculin reaction and the date of histoplasmin-testing was 14 months, but a large number of prisoners had been negative reactors at a much shorter period before the histoplasmin test. All those who had converted to the Mantoux test during the interval had done so as the result either of a natural primary infection in that period or B.C.G. vaccination. It would hardly be expected, therefore, that the calcification observed in the x-ray films of any but those subjects longest in the trial could be due to a tuberculous infection.

Owing to an acute shortage of films it was impossible to x-ray all the histoplasmin reactors at the time of testing, but with the increase of supplies all the reactors who were still in prison were x-rayed. There were 17 such prisoners who had shown a positive or a minimal histoplasmin reaction. All of them had been found to be tuberculin-positive on admission, but had not been tuberculin-tested again, as it was presumed that they were still tuberculin-positive at the time of histoplasmin-testing. For purposes of interpretation these 17 x-ray films were mixed haphazardly with all the others, and could not be identified from them.

Type of Pulmonary Calcification Encountered.—Of the 130 films examined, 16 (12.3%) were deemed to show calcification. This figure should not be taken as an indication of the calcification rate existing amongst Africans as a whole, as it has already been pointed out that in the case of the prisoners there was a selection of cases. With regard to the

type and distribution of the calcification, there was evidence in 10 cases of only one area of undoubted calcification in the lung fields, and in four of an area of calcification in the lung fields with concomitant calcification at the hilum. In one case there was evidence of calcification at the hilum only; another case showed evidence of three foci in the lung fields with a calcified area at the hilum. In no case was generalized miliary calcification observed in the lung fields.

Correlation of Histoplasmin and Tuberculin Sensitivity with Radiological Findings

Correlation between calcification observed in the x-ray picture and the histoplasmin and tuberculin tests both of prisoners and of miners are shown in the Table. It also

Correlation of Histoplasmin and Tuberculin Sensitivity with Pulmonary Calcification (X-ray Film)

	No. X-rayed	With Calcification		Without Calcification	
		No.	%	No.	%
Miners					
T+ H-	50	5	10.0	45	90.0
T+ H+	11	4	(36.4)	7	(63.6)
T+ Hmin.	4	0	—	4	(100)
T- H-	1	0	—	1	(100)
Total	66	9	13.6	57	86.4
Prisoners					
T+ H-	24	1	4.2	23	95.8
T+ H+	9	3	(33.3)	6	(66.7)
T+ Hmin.	8	1	(12.5)	7	(87.5)
T- H-	18	0	—	18	100
T- H+	3	1	(33.3)	2	(66.7)
T- Hmin.	2	1	(50.0)	1	(50.0)
Total	64	7	10.9	57	(89.1)
Miners and Prisoners					
T+ H-	74	6	8.1	68	91.9
T+ H+	20	7	35.0	13	65.0
T+ Hmin.	12	1	(8.3)	11	(91.7)
T- H-	19	0	—	19	100
T- H+	3	1	(33.3)	2	(66.7)
T- Hmin.	2	1	(50.0)	1	(50.0)
Total	130	16	12.3	114	87.7

Hmin. = An induration of under 5 mm. occurring after 72 hours from the time of the histoplasmin test.

T+ = An induration of 5 mm. or over occurring after 72 hours from the time of the tuberculin test.

H+ = An induration of 5 mm. or over occurring after 72 hours from the time of the histoplasmin test.

shows the final analysis in respect of all persons whose x-ray films were examined. The incidence of calcification amongst the tuberculin-positive and histoplasmin-positive group of subjects was four times that of the tuberculin-positive but histoplasmin-negative group. The same trend can be seen in the case of both miners and prisoners. If the tuberculin-negative subjects are considered the same tendency is observed—that is, a greater percentage of the histoplasmin-positive reactors show radiological evidence of calcification. This is proved by the fact that none of the 19 tuberculin-negative and histoplasmin-negative subjects showed calcification, whereas one of the three tuberculin-negative but histoplasmin-positive subjects did.

It is of interest to note that of the 47 prisoners who were known to have been Mantoux-negative at some time within a period of 14 months of the histoplasmin test three showed calcification at the time of performance of the latter. One of these was completely negative to the histoplasmin test, and his serial x-ray films showed a calcification developing in a primary tuberculous lesion contracted a year before the histoplasmin test. One of the other two subjects showing calcification gave a positive histoplasmin reaction, and the other showed a minimal induration of 3 mm. to this test.

It is not possible to make a comparison of the incidence of calcification observed in prisoners and miners in view of the selection that took place among the miners.

Minimal Histoplasmin Reactions and Calcification.—The significance of a small reaction of under 5 mm. to the histoplasmin test is not known. It may indicate a past infection of histoplasmosis, or it may represent a weak cross-reaction to other fungal antigens. The Table shows that the number of persons having minimal reactions and whose x-ray films were available is very small, but it seems that the incidence of calcification among such people (14.2%) is not as high as among the histoplasmin-positive subjects (34.8%), and only slightly higher than that observed in those 51 unselected histoplasmin-negative miners (9.8%).

Discussion

During the past six to seven years much work has been performed with histoplasmin in various parts of the world, but there have been no recorded investigations on this subject in East Africa. The finding of an overall sensitivity rate of 8.5% among adult male Africans in Kenya suggests that histoplasmosis is endemic in at least parts of Kenya. A certain amount of caution in interpretation, however, is necessary, since it is known that weak reactions to the histoplasmin test may represent cross-reactions to other related fungi, particularly *C. immitis*. For instance, it is believed that such is the interpretation of the rather weak histoplasmin reactions observed in California, a known endemic centre of coccidioidomycosis. This explanation may be applicable to Kenya, particularly in the case of those showing small indurations, and it will be necessary to clear up this point by performing sensitivity tests with coccidioidin and histoplasmin at the same time. Induration to a greater extent than 5 mm. to the histoplasmin test may be caused after infection by other related fungi, but in the present series reactions up to 18 mm. were observed 72 hours after the histoplasmin test, and this should provide fairly sound evidence that the response obtained is specific to histoplasmin. It may, however, be that, apart from histoplasmosis, coccidioidomycosis, or indeed other similar fungal infections, is endemic in Kenya. No cases of histoplasmosis or coccidioidomycosis have yet been recorded in Kenya, but the knowledge that at any rate cases of histoplasmosis are to be expected should cause more interest in the subject and a greater search for cases.

It is difficult to explain the high sensitivity rate found among miners as compared with that of prisoners, and until further tests both with histoplasmin and with coccidioidin are performed speculation would be highly theoretical. The sensitivity rate of 14.6% found among miners is the highest rate so far recorded in Africa.

It is known that false-positive histoplasmin reactions have been caused by contamination of the histoplasmin solution or the syringes or needles with tuberculin, but it has been shown among the miners that it is very unlikely that such reactions due to tuberculin have presented as positive tests to histoplasmin. It is even more unlikely that false reactions due to tuberculin occurred when testing the prisoners, as in these subjects the chances of cross-contamination during testing were eliminated by omitting the simultaneous test with tuberculin.

The radiological appearances of healed lesions resulting from histoplasmosis usually mimic those due to healed tuberculosis (Riddell, 1951). Zwerling and Palmer (1946) stated that the appearance of massive bilateral calcification is in most instances due to histoplasmosis. In only one case in the present series was evidence of bilateral calcification found in the lung fields, and this case had a positive histoplasmin reaction. In all other cases the calcification observed was either a single focus or a dual focus similar to that seen in a healed primary complex. The picture of generalized miliary calcification which is described as occurring in histoplasmosis was not seen.

It was also found that approximately one-third of those persons reacting to histoplasmin had radiological evidence of calcification; this should be compared with about 13% of all tuberculin-positive cases that showed calcification. It

should again be emphasized in this connexion that in assessing evidence of calcification in the x-ray films the interpreters had no knowledge of the individual histoplasmin or tuberculin tests. These findings, although based on relatively small numbers, compare closely with those found by Goddard *et al.* among a large series of student nurses in the United States. In the latter investigation it was found that approximately one-third of the nurses reacting to histoplasmin, or to histoplasmin and tuberculin, had pulmonary calcification, whereas approximately 10% reacting only to tuberculin showed evidence of calcification.

Radiological evidence of pulmonary calcification amongst the natives of Kenya is not therefore necessarily indicative of healed tuberculosis; the evidence indicates that it may be due to a past infection of histoplasmosis. It may also be said that radiological evidence of persistent pulmonary infiltrations, as distinct from calcification, may be due to infection by *H. capsulatum*, as Furcolow *et al.* (1947) have indicated that such infiltrations in children are much more often associated with histoplasmin than with tuberculin sensitivity.

Summary

Intradermal sensitivity tests performed on 768 adult African males show an overall sensitivity rate of 8.5% to 1:100 histoplasmin. A further 4.3% of the subjects showed minimal indurations of under 5 mm. to the histoplasmin test.

It is highly unlikely that these reactions are due to contamination of the histoplasmin solution with tuberculin, but it is possible that some of the smaller reactions are due to cross-reactions with other antigenically related fungi.

X-ray films of 130 of the subjects were examined for calcification under controlled conditions. Calcification was observed in 12.3% of the films.

In the tuberculin-positive subjects the incidence of radiological evidence of calcification among histoplasmin reactors was four times the incidence observed amongst the histoplasmin non-reactors. The same tendency can be seen in the tuberculin-negative group of subjects.

Those with minimal reactions to the histoplasmin test did not show the incidence of calcification that was observed in the histoplasmin-positive group and showed only a slightly higher incidence than that of the histoplasmin-negative group.

The appearance of calcification in an x-ray film of a Kenya African does not necessarily indicate a past tuberculous infection, as it may be due to a past infection with *H. capsulatum*. The diagnosis of histoplasmosis should be considered in the face of a negative tuberculin test associated with a persistent pulmonary infiltration.

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REFERENCES

- Darling, S. T. (1906). *J. Amer. med. Ass.*, **46**, 1283.
 Da Rocha-Lima, H. (1912). *Arch. Schiffs- u. Tropenhyg.*, **16**, 79.
 De Monbreun, W. A. (1934). *Amer. J. trop. Med.*, **14**, 93.
 Furcolow, M. L., Mantz, H. L., and Lewis, I. (1947). *Publ. Hlth Rep. Wash.*, **62**, 1711.
 Goddard, J. C., Edwards, L. B., and Palmer, C. E. (1949). *Ibid.*, **64**, 827.
 Mochi, A., and Edwards, P. Q. (1952). *Bull. Wld Hlth Org.*, **5**, 259.
 Riddell, R. W. (1951). *British Encyclopaedia of Medical Practice*, **6**, 560. London.
 Zwierling, H. B., and Palmer, C. E. (1946). *Radiology*, **47**, 59.

A CASE OF PULMONARY HAMARTOMA

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The term "hamartoma"—from a Greek word meaning "to err"—was coined by Albrecht (1904), who defined it as "a tumour-like malformation in which in truth one can demonstrate only an abnormal mixture of the normal developmental components of the organ in which they occur, whether it be with regard to the quantity, to the arrangement, or to the degree of development, or in all three respects." He actually used this term for cavernous malformations of the spleen and liver, and also for the fibromata of the medullary substance of the kidney. Both Goldworthy (1934) and Jaeger (1934) used the word for a similar malformation occurring in relation to bronchi. More than 125 cases have been described up to date.

The tumour varies enormously in size. Usually a globular, solid, firm growth of the diameter of a two-shilling piece, it is of greyish-white colour and has a rough nodular surface. Commonly there is round it a capsule consisting of very loose areolar tissue. Microscopically it has a characteristic picture. The predominant tissue is cartilaginous, and may show calcification or even ossification at times. Such islets of cartilage are separated by varying amounts of mesodermal and epithelial tissues, which include fibrous and adipose tissues, epithelial clefts giving at times the appearance of a gland (the epithelium may be cuboidal, columnar, or transitional), smooth muscle fibres, and blood vessels. Essentially these tumours are benign, although very rarely they may undergo malignant transformation. The case reported by Simon and Ballon (1947) did show malignant changes.

Hamartomas can occur in any part of the lung, more commonly, it is said, in the lower lobes. Most of them are peripheral and subpleural, but a few are hilar in relation to the main bronchi. They are supposed to be more common in males than in females in the ratio of 3 to 1, and can occur at any age. Jones (1949) described one in a newborn baby. However, the majority of them are seen in the middle-age groups of 35 to 50 years, perhaps because of their asymptomatic course. Clinically most of the patients are symptomless and the lesion is usually detected on routine chest radiography. When subpleural there is often pleuritic pain. When the lesion is situated at the hilum symptoms of dyspnoea due to bronchial obstruction and of cough with sputum and fever due to infection behind this obstruction may occur.

Pre-operative diagnosis is rarely possible. A rounded shadow in a chest radiograph with well-defined margins, surrounded by normal-looking lung tissue and some scattered calcium in the shadow, when seen in an asymptomatic person strongly suggest the possibility of a hamartoma. No other investigation is helpful except rarely in the hilar variety, when a bronchoscopic biopsy may prove to be diagnostic. Diagnosis is usually arrived at by thoracotomy, when the tumour alone may be removed or, if necessary, with a part of the lung as well.

Case Report

A man aged 53 first had pains in the left lower chest and upper abdomen in 1949. These were sharp and stabbing in character, and very variable in duration. Thorough investi-