Dictionnaire des maladies éponymiques et des observations princeps : Darier - Roussy (sarcoide de)

DARLING, Samuel Taylor. - A protozoan general infection producing pseudotubercles in the lungs and focal necrosis in the liver, spleen and lymphnodes

In : Journal of the American Medical Association, 1906, Vol. 46, pp. 1283-5

Clinical Notes, New Instruments, Etc.

A PROTOZOÖN GENERAL INFECTION PRODUCING PSEUDOTUBERCLES IN THE LUNGS AND FOCAL NECROSES IN THE LIVER, SPLEEN AND LYMPHNODES.

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On Dec. 7, 1905, while examining smears from the lungs, spleen and bone marrow in a case that appeared to be miliary tuberculosis of the lungs, I found enormous numbers of small bodies generally oval or round. Most of them were intracellular in alveolar epithelial cells, while others appeared to be free in the plasma of the spleen and rib marrow. Tubercle bacilli were absent. The following is an account of the case:

Patient.—C. D., negro from Martinique, aged 27, occupation carpenter; address, Paraiso, a village in the Canal Zone.

History.—The patient had been a resident of the zone three months. While in Martinique he had suffered from some mental disturbance. His present illness dates from Sept. 15, 1905, when he complained of fever and vomiting.

Condition on Admission to Hospital.—On entering Ancon Hospital Dec. 5, 1905, he was mildly delirious and incoherent. Lungs were clear; abdomen was scaphoid; spleen was enlarged.

Blood: Negative for malarial parasites. leucocytosis, 2200.
Hemoglobin: 60 per cent. (Dare's).
Feces: Negative.
Temperature: On admission, Dec. 5, 12:30 p. m., 101, pulse 120; Dec. 6, 8 a. m., 95, pulse 96; 4 p. m., 98, pulse 100.
The patient died Dec. 6 at 11:30 p. m.

AUTOPSY.

December 7, 8:30 a. m.

Macroscopic and Microscopic Examination.—Body of negro, moderately emaciated; length, 5 feet 8¾ inches; inter nipple distance, 7 3/16 inches; rigor mortis was plus.

The odor on opening thorax was suggestive of pulmonary tuberculosis. The right and left pleuræ were free. There were numerous red blotches (ecchymoses) beneath the visceral pleura of both lungs 8 mm. in diameter. Many small nodules could be felt under the visceral pleura.

The lungs on section were found studded with pale gray hyaline miliary tubercles from 2 to 3 mm. in diameter. The lungs were heavier and more voluminous than normal. The tubercles were not as closely packed or so numerous as is often found in miliary tuberculosis, and the general color of the lungs was bright red.

The peribronchial lymphnodes contained a few small soft recently caseated tubercles. The nodes were enlarged and pigmented .

Heart: This organ was small and normal.

Liver: The liver was enlarged and pale, and there was slight atrophic cirrhosis.

Spleen: This was enlarged to three times the normal in size; the pulp was very firm. The malpighian bodies were distinct. Here and there were a number of small yellow nodules resembling tubercles.

Kidneys: There were a few depressions in a cortex diminished to 8 mm. in depth.

Pancreas: Normal.

Bladder: Normal.

Rib bone marrow: Normal and dry.

Brain: The pia-arachnoid was slightly edematous and more generally adherent to the cortex than normal. The calvarium was very thick.

Intestines: Several specimens of *Tricocephalus dispar* were found in the cecum. There were a few small superficial circular ulcers from 2 to 4 mm. in diameter in the cecum and ileum.

The mesenteric lymphnodes and those at the hilum of spleen were enlarged and pale.

Bacteriologic Examination.—Spleen smears were negative for malarial parasites or pigment. Oval and round bodies were free in the plasma.

In rib bone marrow smears there were traces of intracellular malarial pigment. A number of bodies similar to those in the spleen were seen.

In lung smears tubercle bacilli were absent.

There were myriads of intracellular and extracellular bodies similar to those found in the spleen and the marrow.

A moist coverslip preparation from intestinal ulcers showed motile amebæ.

Anatomic Diagnosis.—Acute miliary tuberculosis, pulmonary type. Tuberculous lymphadenitis, peribronchial. Chronic interstitial splenitis. Atrophic cirrhosis. Chronic interstitial nephritis, slight. Lymphadenitis, mesenteric. Chronic leptomeningitis. Edema of pia-arachnoid. Ulcerative enterocolitis. Amebiasis. General infection by protozoön.

APPEARANCE OF THE PARASITE IN SMEARS.

Lung: This specimen was stained by carbolfuchsin and Gabbet's methylen blue, overstained with polychrome methylen blue, and washed with eosin.

The polychrome blue was prepared as follows:

Methylen blue, pure, medic, Grüb.....	g. 1.
Sodium carbonate, pure.....	g. .5
Distilled water	g. 100.

This was placed in thermostat one week, and kept at room temperature for six months.

The excess of blue was removed by washing the smear alternately with alcoholic solution of eosin (.5 per cent in 60 per cent. ethyl alcohol) one second and distilled water a few seconds, until the internal structure of the parasite showed plainly.

The parasite is oviform or round, and is surrounded by a clear refractile non-staining rim, in thickness about 1/6 the diameter of the parasite. This refractile rim is present in all smears, whether previously treated with acid blue or not. The structure is not homogeneous, but consists of a faintly staining substance and a deeply staining one; a clear space or spaces; and chromatin granules. The chromatin granules are generally single, sometimes two or more are counted. One large parasite appeared to have six such dots of chromatin. The granules are often situated in a clear non-staining zone at one side of the darker staining substance; at other times they are situated on the margin or within this substance; and also frequently appearing in the clear refractile capsule. The chromatin granules are generally dot shaped, very rarely elongated. Occasionally two chromatin dots placed together simulated a rod form.

The clear space or spaces resemble vacuoles; at times they resemble the clear non-staining spaces seen in filaria embryos and trypanosomes. The staining substance almost entirely fills the capsule or refractile rim of the parasite. The circular contour of the staining substance is at times broken on one side or place by the clear non-staining zone.

This zone varies in shape, size, and in its relation to the staining substance; being circular, oval, or irregular in form; being three-fourths the size of the entire parasite, or at times barely perceptible on account of its minuteness; being centrally located or excentric; and being single or multiple—two or three.

In size the parasites are from 1 to 4 microns through their greatest diameter; commonly this diameter is 3 microns.

The parasite appears to divide by fission into two equal or unequal elements. One parasite appeared to be dividing into four equal elements. Several parasites with chromatin dots scattered through their substance appeared as pre-segmenting bodies—ready to divide into five or six elements. Occasionally a smaller parasite may be seen close beside a larger one, as though separating from it, the smaller one being about 1 micron in diameter.

Although oval or round in outline, the staining substance,

together with the clear non-staining zone and chromatin granules, give a varying picture, depending on the point of view. Forms suggesting the appearance of familiar objects, such as the eye, a shield, a conch shell, a bullet, or a shuttle are seen. The resemblance of certain parasites to a mammalian embryo in "fetal attitude" is very striking.

In the lung smears the parasite is apparently always intracellular, and the cells contain from 10 to 100 or more parasites. The appearance of free parasites is probably due to the squeezing and breaking up of infected epithelial cells by pressure in making the smear. One unbroken alveolar epithelial cell occupied one-third the diameter of the field, 1/12 oil im. No. 1 oc. B. & L. Parasites had invaded the cell nucleus as well as the cytoplasm, and it was estimated that this cell contained more than 300!

Spleen and rib marrow smears showed fewer parasites, two or three to a field, and they appeared to be extracellular. The

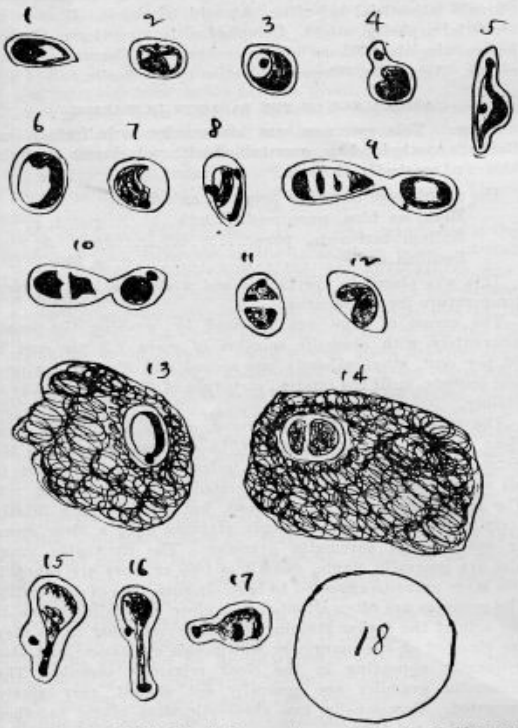

Fig. 1.—(× 2000), 1 to 8, forms of parasite; 9, 10, 11, 12 manner of subdivision; 13, 14, parasites within nuclei of spleen cells; 15, 16, 17, flagellate forms; 18, alveolar epithelial cell containing parasites.

nucleus of a spleen or marow cell appeared now and then to have been invaded. Each parasite had a definite refractile rim, as in the lung smears, and its internal structure could be well made out.

Red blood corpuscles were never invaded.

Three flagellated forms were seen in a lung smear. The distal extremity of one of the flagella contained a rod of chromatin placed at right angles to the flagellum, simulating the relation of centrosome to chromatin filament in *Trypanosoma Lewisi*. The flagella were single, short and thick, without chromatin filaments, and were enclosed by the refractile capsule, continuous with that of the body of the parasite.

EXAMINATION OF SECTIONS.

Sections were fixed in Zenker's solution and stained by eosin and hematoxylin, Van Giesen's method, and polychrome-methylen blue.

Lung: The alveolar capillaries are tortuous and engorged with red blood corpuscles. In places the walls are broken down, stretched, or greatly distended. No leucocytes were seen within the capillaries. The epithelial cells of the alveolar walls are desquamating or completely shed. In places there appears to be merely a single layer of endothelial cells separating the circulating blood from the alveolar contents. The alveoli are seen to be filled with red blood corpuscles, generally having a washed out appearance; red blood corpuscles and serum; or red blood corpuscles, serum, and large swollen alveolar epithelial cells containing many parasites.

Polymorphonuclear leucocytes are rarely observed in the alveolar contents; a few mononuclear elements are noted. There are no tubercles. The pseudo tubercular areas are made up of alveoli with broken, distorted, or collapsed walls, containing many alveolar epithelial cells distended by parasites. Small vessels or capillaries are seen to pass through the pseudotubercles, but there are no evidences of the hemorrhages seen in other alveoli. Within these areas there are enormous numbers of parasites generally contained within epithelial cells—rarely free. The nuclei of invaded cells stain well, though often more faintly than normal. The cytoplasm of badly infected cells is wanting, and there are numerous distended epithelial cells devoid of cytoplasm and parasites. The infected cells have a distinctly staining rim of cytoplasm, even when their nucleus and cytoplasm are gone.

Liver: There are numerous faintly staining areas ranging in size from that of a single glandular epithelial cell to those one-third the size of a lobule; in which the liver cells and endothelial cells of the portal capillaries are completely transformed by invading parasites. In the larger areas the cytoplasm and nuclei of the invaded cells have disappeared or do not stain. There is a mass of débris, imbedded in which are myriads of parasites. In places the liver cells are normal, in others they have suffered cloudy change. In these latter localities there appears to be a stasis of blood in the portal capillaries due to occlusion of capillaries by enormously distended endothelial cells filled with parasites. The red blood corpuscles are here "washed out."

There is a distinct primary invasion of liver cells in places, although oftener it would seem that many liver cells become invaded after they have had their nutrition cut off by infected overlying endothelial cells.

Around the portal spaces the connective tissue is increased in amount and there is a recent round cell infiltration. The bile capillaries and their epithelium are normal.

Spleen: The splenic spaces are greatly engorged with red blood corpuscles. The connective tissue is moderately increased, its cells are swollen, cloudy, and at times contain parasites. There is cloudy swelling of cells in small areas here and there, and many of these cells contain parasites. There are also numerous free parasites.

Lymphnode from hilum of spleen: The cortical follicles and medullary cords of the dense lymphoid tissue are, with the few exceptions noted, below normal. The capsule and reticulum throughout the node are the seat of degenerative changes. The reticulum of the loose lymphoid tissue encloses many large mononuclear cells possessed of distinctly staining nuclei, and containing many parasites.

There are two cortical follicles, and portions of a medullary cord which have undergone cloudy swelling and necrosis, amid the débris of which are cells containing parasites. The margins of these areas show beginning degenerative changes; many fragmented nuclei are seen, as well as mononuclear cells distended by parasites.

Peribronchial Lymphnode: This node contains several old fibro-caseous tubercles, and one giant cell. The reticulum and capsule of the node are greatly thickened in places. A lymph vessel beneath the capsule contains mononuclear cells infected by parasites.

There is seen to be a general infection by a parasite having a predilection for endothelial and epithelial cells.

The lesions are those of scattered focal necroses of liver, spleen and lymphnodes, with foci of catarrhal pneumonia and hemorrhages in the lungs, in which the lungs play a very passive part, there being absolutely no leucocytic infiltration of the miliary pneumonic nodules.

The infection was a fatal one, there being no other

lesions sufficiently grave to have caused death. The anatomic diagnosis of tuberculosis not being confirmed on examination of sections, save in peribronchial lymph-nodes.

The parasite, as studied from smears, presents certain resemblances to those found by Leishman, Donovan, Marchand, Ledingham and Wright, but the differences are so marked and the lesions so unusual that I feel the case is a unique one.[1]

For the parasite the name *Histoplasma capsulata* is proposed.

I wish to thank Acting Chief Sanitary Officer Dr. H. R. Carter for his kind permission to publish this report.

A MODIFICATION OF GOCHT'S COMPRESSION DIAPHRAGM.*

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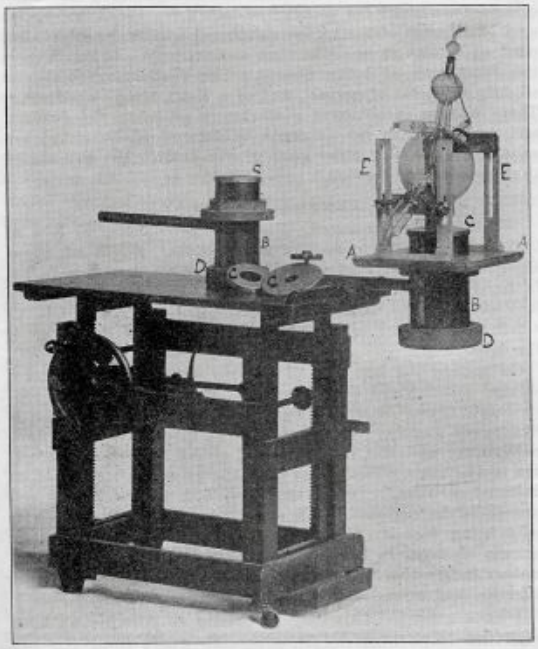
Shortly after he had presented his first paper on *x*-rays to the physiomedical society at Würzburg, Roentgen found that *x*-rays do not emanate from the platinum of the anti-cathode only, but also from the walls of the glass tube, from the air which the rays penetrate, in fact that they fill every space in the room in which the Roentgen tube is operating. These secondary rays, as they are called, or diffused rays, as they should be called, affect the sensitized plate, and the blurred and flat negatives which we so often see must be ascribed to these unwelcome secondary rays.



Modified compression diaphragm.

Roentgen himself recommended lead diaphragms to be put between tube and body to annihilate the effect of the secondary rays, and an American investigator, Charles Finley Easton, was the first (1896) to cover his tubes with a lead shell into which a changeable opening was made. Rumpel, in Hamburg, covers the body with thick lead plates, except the region which is to be Roentgenographed. Walter, in Hamburg, constructed a box made of lead, Levy in Berlin, Gocht in Halle, and many others have made original and valuable inventions in this field, but no one was so successful as Albers-Schönberg, in Hamburg, who constructed an apparatus which enabled him to exclude the secondary rays almost completely, and at the same time to reduce the thickness of the body as much as the patient could endure.

Unfortunately, this compression diaphragm of Albers-Schönberg is a very complicated mechanism, besides being so high in price that only a few operators are able to add it to their Roentgen instrumentarium.

Gocht has endeavored to simplify the apparatus, but his arrangement has added greatly to the weight of the instrument so that it is unhandy. I have taken up Gocht's idea and devised an apparatus (see illustration) as follows: A heavy board (A), covered on both sides with lead sheet, has in the center an opening in which two brass cylinders (B), lined inside with lead foil and of the same dimensions as the original Albers-Schönberg tubes, can be tightly inserted. The upper aperture of the cylinder is covered with lead diaphragms (C) of different sizes, while the rim of the lower aperture is covered with a heavy rubber ring (D). On the wooden board are two uprights (E), erected at such a distance from each other that a seven-inch tube can be supported so that the focus of the platinum target falls exactly in a vertical line drawn through the middle of the cylinder, and thus only the most effective rays are allowed to penetrate the body.

As I am working only with seven-inch tubes I had these uprights made steady. Of course, they can be made sliding so that a tube of any size can be used. If an operator is very anxious to avoid any evil effect on his own body these uprights can be connected with lead glass, but I think this is unnecessary.

The whole apparatus is firmly attached to an ordinary camera table, which, by a system of cog wheels, can be raised and lowered at will. As the table runs on castors, which can be arrested by a small lever-break, the whole apparatus can be easily transported to any part of the room. At the same time it can be made stable while in use. The apparatus combines cheapness with effectiveness.

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1. Since writing this article I have found the parasite in a second case.

* Presented at a meeting of the Chicago Surgical Society.

CASE OF CHRONIC SUPPURATIVE ETHMOIDITIS, SARCOMA OF RIGHT TEMPORO-SPHENOIDAL LOBE, WITH MISLEADING SYMPTOMS.*

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On account of the extensive and serious pathologic condition, involving vital structures and very confusing and misleading symptoms, the following case is considered of sufficient interest for discussion:

Patient.—On Dec. 7, 1905, J. J. H., aged 51, was brought to me by Dr. E. V. Seay, of Salvisa, Ky., with the following history: He had been troubled for many years with nasal catarrh; at times large quantities of pus would discharge from nose, and this would be followed by great relief for some days or weeks. Six months previously he had a prolonged attack of malarial fever. Two weeks ago he began suffering excruciating pains in frontal region between the eyes, pain being aggravated by jarring the bed or when in a stooping position. He suffered greatly from nausea, mental depression and insomnia.

Examination.—His gait was unsteady, inclining to the right as he walked across the room. Skin was of muddy, septic appearance; right eye protruding and moved sluggishly. Very slight pressure or tapping over frontal sinus or at inner canthus gave rise to acute pain. The right nares was filled with mass of bluish red granulations, through which pus exuded. There was no evidence of the middle turbinates. The left nares

* Read before the Eastern Section American Laryngological, Rhinological and Otological Society at Syracuse, N. Y.