other cyst on the left side of the abdomen in the same way, but the third or omental cyst was removed entirely after tapping, by ligaturing off the portion of omentum in which it grew. I then found, on trying to draw out and fix the openings in the cysts directly to the skin, that a good deal of dragging on the abdominal contents occurred, so I simply closed the abdominal incision in the usual way, allowing two or three of the silk sutures to pass also through the cut edges of the cyst walls; between these two drainage tubes were inserted, one into the lower and one into the upper cyst; but, as there was very little discharge, these were removed in sixteen hours, and the abdominal incision allowed to close throughout. Union occurred at once, with the exception of a small spot at the umbilicus, which continued to discharge. The temperature remained normal throughout, and in a month's time he was out of doors. Unfortunately, at this date, owing to some strain or chill or other cause, an attack of abdominal pain and violent vomiting occurred, which was followed by some discharge of pus from the incision, and Dr. Serres removed several pieces of the laminated lining of the upper cyst. This ceased in a week's time, and the patient soon became again convalescent.

It will thus be seen that the healing of the wound and recovery were not interrupted, and I attribute the throwing off of some pieces of the cyst wall to some attempts made in the case of the upper cyst, or that first operated on, to detach some of the inflammatory outer cyst lining in addition to the elastic cyst proper, which alone should be removed; and further, from this result also it seems desirable that the emptied cyst, after suturing the incision in it, should be completely returned into the abdomen, as was done at the first operation, and not anchored to the site of the incision in the abdominal wall.

Judging from the experience of this case, it may, I think, be concluded that certain abdominal hydatid cysts, in which there is difficulty in bringing the cyst wall up to the surface of the body, can be well treated by incision and replacement of the cyst, provided that due care be taken to thoroughly evacuate the cavity of all its fluid and elastic solid contents, and to suture the inverted edges of the incision afterwards. The hæmorrhage and other accidents which have been described as following on detachment of the cyst wall must have been due to the teasing away, not the elastic membrane, but the outer wall or ectocyst itself. The addition of a few catgut sutures in the inverted edges of the opening is to prevent the subsequent entrance of a coil of intestine. Any serum secreted by the cyst wall would, I feel sure, be rapidly absorbed.

Further, I see no reason why we should not deal with cysts of the liver and other organs in the same way, provided, of course, that suppuration had not occurred, and that sufficient length of incision into the cyst ($1\frac{1}{2}$ to 2 inches or more) could be made to allow of complete exacuation. The elastic lining shrinks on first withdrawing the fluid, and can be removed by gentle traction with the aid of ordinary ring or pile forceps. The advantages of a method which completes the treatment at one operation, and without any subsequent open drainage wound with its attendant risks, are obvious. The operation is, in fact, a supplementing and finishing of the method of aspiration which only withdraws the fluid portion, by the withdrawal of the solid portion also of the cyst contents, and is, I believe, the safer method of the two. I have myself seen alarming symptoms appear in a patient in whom I had just aspirated a large hepatic hydatid cyst.

It is also highly important, even in suppurating cysts in which drainage is necessary, to remove the solid contents at the time of incision. With regard to the individual case mentioned, multiple cysts, either sub- or intraperitoneal, are not so very frequent; the recto-vesical space seems, however, to be a somewhat favourite locality, and from the experience of this and other cases of cysts in this position, and in such close proximity to the bowel, the risk of suppuration after simple aspiration appears to be a real one. In this case, also, all four methods of treatment were exemplified, namely: (1) aspiration; (2) incision and evacuation; (3) incision, evacuation, and drainage; (4) extirpation.

It is, perhaps, needless to add in conclusion that strict asepsis must be observed—not necessarily, however, the introduction of irritating lotions.

ON CERTAIN CONDITIONS THAT MODIFY THE VIRULENCE OF THE BACILLUS OF TUBERCLE.¹

By ARTHUR RANSOME, M.D., F.R.S.

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It is acknowledged by most pathologists that tuberculous sputum, dried up and broken into dust, is the most common vehicle by which the bacillus of tubercle is conveyed into the body. But its power for evil is obviously modified by a multitude of conditions, some of them inherent in the animal body exposed to infection, others due to external influences. Judging from the facts relating to the distribution of tuberculous disease, its incidence in certain localities, and especially its prevalence in badly drained, badly ventilated, and imperfectly lighted dwellings, it has been surmised that the three chief external conditions that mitigate the virulence of the bacillus are (1) a dry soil, (2) abundance of fresh air, and (3) light.

But hitherto few, if any, direct experiments have been made to determine the extent to which these several influences possess mitigating powers. It is true that Dr. Candler, in his work on the *Prevention of Consumption*, affirms that light is the chief agent in destroying the bacillary virus; and Professor Koch, in his address to the International Congress at Berlin last year, lends the weight of his great authority to the same opinion; but in neither case is any proof given of the truth of this view.

It was in order to test the influence of light, air, and dry soils upon the virulence of the bacillus of tubercle that the following series of experiments were devised. It was decided to expose tuberculous sputum:

(a) In a locality (Bowdon) where the soil was dry and sandy—about 100 feet in thickness—and where very few cases of phthisis were known to have originated. It was to be placed in full daylight or sunlight and exposed to abundant streams of fresh country air.

(b) A portion of the same sputum would be exposed under similar conditions in the same place, with the one exception that it would be put into a darkened chamber.

(c) A third portion would be taken to a small four-roomed tenement in Manchester, on a clay soil, without cellarage and badly ventilated, but it would be placed on the window-ledge with as much light as could there be obtained.

(d) A portion would be placed in the same cottage, but in a dark corner of a sleeping room in which it was known that three deaths from phthisis had occurred within the space of six or seven years.

(e) Finally, a portion would be exposed to used air coming from a ward in a consumption hospital in Bowdon, in darkness.

Two collections of sputum were obtained:

(A) From a woman dying of phthisis, collected on April 25th. This specimen contained comparatively few bacilli.

(B) Also from a woman in the third stage of phthisis. This sputum contained abundance of bacilli.

Sputum (A) was not considered to be very suitable for the purpose owing to the sparseness of bacilli, but it was decided to use it by way of control experiment. Owing to an accident the portions exposed under conditions (c) and (d) were lost. These collections of sputum were divided into portions and placed in watch glasses marked A 1, A 2, A 3; B 1 to B 10. Some of these watch glasses were exposed without further arrangement, but others, where there might be a possibility of infection, were enclosed in cages, so arranged that air could reach them through a thin layer of cotton-wool, one kind of cage being constructed of two squares of glass, supported at their edges by cork, and surrounded by cotton-wool, the other of small flasks, the bottoms of which had been cut off, and the lower edge resting in a small circular tray fitted with wool, the mouths of the flasks being also loosely stuffed with the wool.

These watch glasses were then exposed for five weeks under the conditions already noted, commencing on April 29th, 1890, with the exception of B 9 and 10, which were started on May 2nd. Most of the specimens were withdrawn on

¹ Read before the Royal Society.

June 3rd; but one, B 10, was divided on May 12th, and a portion, B 10 b, was introduced into a glass bulb and exposed for several minutes each day to a current of ozonised oxygen. All the specimens were then enclosed in a box and forwarded to the pathological laboratory, Owens College, where Dr. Dreschfeld, the Professor of Pathology, had kindly undertaken to carry out the necessary inoculations. Owing to various causes some of these operations were not commenced until June 27th, 1890, others until July 10th. The animals used were rabbits, kept under favourable hygienic conditions. The dried sputum was mixed with sterilised water to form a pasty mass, and this was inserted into the subcutaneous tissue of the back. All the instruments used were made thoroughly aseptic.

The following tables give (1) the conditions of exposure; (2) the date of death, by killing or otherwise; (3) Dr. Dreschfeld's report upon the results of the inoculation.

TABLE I.—*Influence of Dry Soil, Air, and Light.*

No. of Specimen.	Conditions of Exposure.	Date of		Dr. Dreschfeld's Reports.
		Inoculation.	Death.	
A 1	In outdoor studio, Bowdon; in light and free ventilation in flask arrangement	June 27	Killed Sept. 4	Rabbit in good condition; wound completely healed; cicatrix of wound scarcely visible. All inserted sputum completely disappeared. Only a few pigmented streaks left. No caseation; internal organs healthy.
A 2	Ditto in open watch glass	July 10	Killed Sept. 4	In good condition; wound healed; good cicatrix; no caseous mass. In liver a number of disseminated firm spots. Microscopically, these consisted of fibrous tissue. No tubercle bacilli found in them.
B 6	Ditto in cotton-wool cage	July 10	Killed Sept. 4	In good condition; cicatrix healed. No trace of sputum left. No caseation; where sputum had been inoculated only a few pigmented streaks.
B 7	Ditto in open cage until May 9th, then cotton-wool added.	July 10	Killed Sept. 4	Good condition; cicatrix perfect; some fibrous induration in subcutaneous tissue where sputum had been. No caseation; internal organs healthy.

TABLE II.—*Influence of Dry Soil, Air, and Darkness.*

No. of Specimen.	Conditions of Exposure.	Date of		Dr. Dreschfeld's Reports.
		Inoculation.	Death.	
A 3	In darkened photographic room, Bowdon, in watch glass	June 27	Killed Sept. 4	Rabbit in good condition; small caseous mass beneath healed wound. All internal organs healthy. Microscopic examination of caseous mass: granular detritus; no tubercle bacilli.
B 8	Ditto in cotton-wool cage	June 27	Died Aug. 26	Moderately emaciated; wound healed, but the edges separated on pulling the skin at the sides. In the subcutaneous tissue beneath the wound a few yellowish soft spots, about the size of pin heads, surrounded by a zone of hyperæmia; internally all organs healthy; no signs of tubercle; right heart full of blood; left heart empty. Microscopic examination of the yellow spots show them to consist of granular detritus and a few granule cells; no tubercle bacilli could be detected.
B 9	Underward of Consumption Hospital in full ventilation; in darkness; in cotton-wool cage	July 10	Died Aug. 14	Emaciated; wound healed under a scab; a thin mass of yellow caseous material just beneath the skin. Heart and lungs healthy; kidney contained a number of small cysts. In the caseous mass a few tubercle bacilli were found.

TABLE III.—*Influence of Clay Soil, Bad Air, and Light.*

No. of Specimen.	Conditions of Exposure.	Date of		Dr. Dreschfeld's Reports.
		Inoculation.	Death.	
B 3	On window sill of small cottage bedroom in Ancoats flask arrangement	June 27	Died Aug. 14	Large rabbit, emaciated. Inoculation wound completely healed. Slight scab; no caseous material or any signs of sputum. Internal organs healthy; one white spot found on surface of liver. Microscopic examination of this showed it to consist of round cells, some with one nucleus, and others which were polynuclear. At the periphery of the nodule fibrous tissue. Sections of the nodule showed no tubercle bacilli.
B 4	Ditto in open watch glass	July 10	Died Aug. 9	Emaciated; wound at back not healed, and appeared slightly sloughing at the borders. Lungs presented several small caseous nodules. Pleuræ, heart, peritoneum, liver healthy. Tubercle bacilli found in the caseous lung nodules.

TABLE IV.—*Influence of Clay Soil, Bad Air, and Darkness.*

No. of Specimen.	Conditions of Exposure.	Date of		Dr. Dreschfeld's Reports.
		Inoculation.	Death.	
B 1	On dark shelf by fire-place in small cottage bedroom, in Ancoats flask arrangement	June 27	Killed Sept. 4	Rabbit in good condition; wound completely healed; no caseation, and only a small pigmented spot where the sputum had been deposited. All the internal organs healthy.
B 5	Ditto in a dark corner near the bed, in watch glass	July 10	Killed Sept. 4	Rabbit in good condition; cicatrix where the wound was, and beneath it a caseous mass about the size of a bean. Examined microscopically, this mass contained tubercle bacilli. Nothing abnormal in any of the organs.

TABLE V.—*Influence of Dry Soil, Bad Air, and Darkness.*

No. of Specimen.	Conditions of Exposure.	Date of		Dr. Dreschfeld's Reports.
		Inoculation.	Death.	
B 10	Cotton wool cage, in ventilating shaft, from ward of Consumption Hospital, for ten days, then placed on top of bookcase in sitting room	July 10	Died Aug. 14	Emaciated; wound healed under a scab; a yellow caseous mass about the size of a small pea beneath the scab. The liver presented a few yellowish nodules. All the other organs sound. In the caseous mass a few tubercle bacilli were found; none in the liver.
B 10 b	A portion of the above was taken on the tenth day, and exposed to a current of ozonised oxygen for a few minutes daily for a fortnight	July 10	Killed Sept. 4	Rabbit fairly well nourished; cicatrix quite healed. No trace of inoculated matter and no trace of caseation. In the left lung one firm nodule; this was carefully examined microscopically, and showed no bacilli. It was apparently only thickened pleura.

It will be seen that none of the four specimens of sputum exposed to fresh air and light on a dry soil conveyed the disease, but one of the three portions exposed under similar conditions in darkness produced tubercle. Of the two exposed in the cottage in Ancoats in the light, one produced tubercle and the other was doubtful; and of the two specimens exposed in the same place in comparative darkness, one caused tubercle, the other did not. Lastly, the specimen placed in the ventilating shaft from a ward in the consumption hospital, Bowdon, on a dry soil, conveyed the disease; but the portion removed from it after ten days, and exposed to the action of ozonised oxygen, did not produce tubercle.

These experiments are too few in number to justify the statement of positive conclusions; but, so far as they extend, they go to prove that fresh air and light and a dry sandy soil have a distinct influence in arresting the virulence of the tubercle bacillus; that darkness somewhat interferes with this disinfectant action; but that the mere exposure to light in otherwise bad sanitary conditions does not destroy the virus. There are also some indications that the presence of a cotton-wool envelope may interfere somewhat with the action of both good and bad air respectively.

GASTRO-ENTEROSTOMY.

By T. KILNER CLARKE, F.R.C.S.ENG.,
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THE following case of gastro-enterostomy, though unsuccessful, is more illustrative of the difficulties of the operation and its after-dangers than the successful one I published in the BRITISH MEDICAL JOURNAL, November 16th, 1889, p. 1089, the subject of which is still, ten months after the operation, in the enjoyment of good health.

Mrs. S., aged 36, a spare, dark-eyed woman, had been suffering from gastric troubles for a year, when in consultation with Mr. Haigh, of Meltham, I first saw her on May 6th, 1890. She had suffered much from vomiting, and had had several attacks of hæmatemesis. For the few days previous to my visit everything she had taken was rejected. There was a tumour the size of an orange in the situation of the pylorus, that is, on the right edge of the mesial line, and extending down to the level of the navel. The stomach was small, all the other organs of the body appeared healthy. The case seemed to us to be a very suitable one for either pylorotomy or gastro-enterostomy.

On May 13th, 1890, an anæsthetic consisting of chloroform one part and ether two parts was administered by Dr. Scougal; and, assisted by Mr. Haigh and Mr. Marshall, I operated as follows.

Making a median incision, 3 inches long, reaching as far as the lower border of the navel, I exposed the lower border of the stomach and the great omentum. The tumour, which was found to be the enlarged and thickened pylorus, was firmly adherent to everything in its immediate neighbourhood. Its size and adhesions, and the contracted state of the stomach rendering pylorotomy impossible, I proceeded to the alternative operation of gastro-enterostomy. The jejunum not being visible I pushed aside the great omentum, and, turning up the lower border of the stomach, saw it lying beneath the transverse mesocolon, rising from the spine on a level with the navel. Making a rent in the mesocolon, I brought up the intestine, emptied some six inches of it, and isolated the emptied portion from the rest of the gut. Then, dropping the jejunum back into the abdomen, I made one incision into the anterior wall of the stomach, an inch in length, parallel to and about $1\frac{1}{2}$ inch above the greater curvature, and inserted the decalcified bone plate. The second plate was then fixed into the jejunum. On attempting to bring the two plates into apposition so as to tie the corresponding threads I found it could not be done, as the contracted size of the stomach and the pyloric adhesions prevented my bringing the stomach wall sufficiently outside the abdomen. I therefore took out the stomach plate, sewed up the incision with a double row of Lembert sutures of fine silk, made a new incision in the posterior wall of the stomach, introduced the plate afresh, and readily brought it into close apposition with the jejunum

plate. The corresponding threads were then tied and the abdominal wound closed. A towel folded to form a pad was bound firmly over the dressings, and removed after forty-eight hours.

For three weeks after the operation the pulse kept under 100, and 99.6° was the highest temperature, everything going on favourably. On the twelfth day slight vomiting occurred at 8 A.M., but afterwards she was very well until the afternoon, when the artificial opening between the stomach and intestine seemed to close suddenly. While being fed, the trickling sound of fluid passing through the opening was distinctly audible to anyone standing by the bedside whenever the patient took any fluid food, and the patient's sensations of it abruptly ceased. At 10 P.M. she vomited some 20 ounces of fluids, and from this time till her death on the thirtieth day after the operation, all food taken was rejected. No necropsy was permitted, and the cause of the sudden closure of the artificial opening must remain uncertain.

In two at least of the failures of this operation closure of the opening has occurred. To prevent this it would be well to sew together by a continuous fine silk suture the cut edges of the serous and mucous coats of the incised viscera, and to make larger incisions into the viscera. Operators by the old method made incisions two inches in length.

ON THE DIAGNOSTIC VALUE OF VENOUS HUMMING MURMURS IN THE NECK.

Being an Abstract of a Paper read before the Royal Academy of Medicine in Ireland.

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VERY different opinions are at present entertained, even by the highest authorities, on the subject of the importance of a venous hum in the neck as a means of diagnosing anæmic conditions. Some believe it to be of considerable value. Thus Dr. Bristowe¹ writes of anæmia: "The development of abnormal sounds (among which he mentions various humming murmurs) in the heart and blood vessels is of common occurrence and highly characteristic." Gerhardt² considers that a venous hum is a sign of anæmia, if it can be heard when the head is held quite straight and not turned towards either side. On the other hand, Drs. Hilton Fagge, F. Taylor, and many others do not consider these murmurs to have any significance whatever from a diagnostic point of view. One of the most complete articles on this question is that by Dr. R. Apetz.³ He examined as to the presence or absence of a venous hum in over 600 persons, and came to the conclusion that, while it is more frequently found in anæmic individuals than in others, it is not of the slightest importance in individual cases.

I have during the past two years investigated this question in a large number of young persons, between the ages of 16 and 26. They were all presumably healthy. I examined them either sitting or standing, and with the head directed straight forwards. I placed the stethoscope—an ordinary straight wooden one—as lightly as possible on the side of the neck.

I divided my cases into three classes, namely: (1) anæmic; (2) slightly anæmic; (3) not anæmic. By "slightly anæmic" I mean cases that show some of the symptoms, but none of the signs of anæmia, or *vice versa*, that is, cases about which one cannot at once say whether they are anæmic or not. I should say that in estimating anæmia I could only use the ordinary clinical tests; time did not permit of my counting the corpuscles, etc.

I examined in all 200 persons, 51 young men and 149 young women. Of these, 22 belonged to the anæmic class, 31 to the slightly anæmic, and 147 to the not anæmic.

In the 22 anæmic there were 19 murmurs =	86.4 per cent.
„ 31 slightly anæmic 27 „	= 87.1 „
„ 147 not anæmic 85 „	= 57.9 „

¹ *Practice of Medicine.*

² *Lehrbuch d. Auscultation u. Percussion*, 1890.

³ *Virchow's Archiv*, vol. 107.