quite distinct groups of physicians; these show a very marked parallelism.

The most obvious fact that emerges from this study is the strikingly constant and high incidence of rheumatic heart disease among hospital patients. It thus serves to show, if any further evidence is needed, the urgent necessity for further study into the aetiology of acute rheumatism and into methods for its prevention and relief. In view of the variations in the incidence of other types of heart disease, which are evident in this investigation, it would appear very desirable that such inquiries should be continued at different centres throughout Great Britain along similar lines for a longer period of time, so that it may be ascertained whether such variations are constant, and what local features are responsible for them.

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B. PYOCYANEUS MENINGITIS WITH RECOVERY

BY

J. F. D. SHREWSBURY, M.D., D.P.H.

The following case of *B. pyocyaneus* infection appears to be of sufficient general interest to warrant its publication, partly because it points a moral, and partly because the precise pathogenic status of *B. pyocyaneus* for the human adult is still somewhat doubtful. *B. pyocyaneus* has long been recognized as a secondary invading microbe in wounds and sinuses in man, but many authorities consider that it can only fill the role of a primary invader in infections of children and debilitated adults. Wilson¹ states, however, that the bacillus can produce in adults a generalized infection resembling typhoid fever, and that in the course of such an infection the bacillus may attack the meninges. He mentions that cases have been recorded of *B. pyocyaneus* meningitis resulting from the injection of contaminated cocaine solutions for anaesthetic purposes.

CASE REPORT

The patient, a married woman aged 34, was originally admitted to the surgical wards of the Queen's Hospital, Birmingham, under observation for presumptive attacks of gall-stone colic. This condition, however, bears no relation,

and she vomited several times. Her temperature, which was normal on admission, rose precipitately to 100° F., and her pulse rate increased from 65 to 80.

There is a hiatus in the clinical record for the next fifteen days, but apparently she returned home, where she was confined to her bed and was attended by her own doctor. She was admitted to the medical wards of the Queen's Hospital on September 6th, 1933, and on the following day the examination of a sample of her cerebro-spinal fluid established the bacteriological diagnosis. The fluid was frankly purulent, and contained large numbers of a small, extracellular, actively motile Gram-negative bacillus, which proved to be *B. pyocyaneus* on cultural investigation. Between September 7th and October 10th seven samples of cerebro-spinal fluid were examined bacteriologically and biochemically, and the laboratory findings on these fluids are tabulated below.

On admission the patient presented the picture of a subacute meningitis. She was febrile (102° F.), with a slow pulse (60), and was vomiting at frequent intervals; she had a severe left-sided headache, with a tendency to localization in the occipital region, a coarse nystagmus to the right, and a considerable degree of neck rigidity. Kernig's sign, however, was negative, and her fundi were clear. The clinical condition fluctuated considerably during the succeeding four weeks. On some days she had little or no headache, and the meningeal symptoms were inconspicuous; at other times she was prostrated by an intolerable headache, and the meningeal symptoms were obvious. For example, when she was examined by Dr. Neale on September 16th he was unable to detect

Date	Bacteriological			Biochemical				
	Cytology	Coagulum Formation	Presence of <i>B. pyocyaneus</i>	Sugar mg. %	Chlorides mg. %	Total Protein mg. %	Globulin	Colloidal Gold Curve
			M = microscopical C = cultural					
7.9.33	Frank pus. Exclusive polymorphonuclear reaction	Massive	M. +++ C. +++	21	668	175	Excessive	Luetic
8.9.33	1,230 cells per c.mm. Exclusively polymorphonuclear	Heavy	M. ++ C. +++	11	653	300	"	Meningitic
9.9.33	4,670 cells per c.mm. Chiefly polymorphonuclear	Heavy	M. + C. ++	32	674	150	"	Luetic
12.9.33	Purulent. Blood also present ...	—	M. 0 C. 0	Specimen not examined				
18.9.33	Purulent.* Polymorphonuclear cells predominate	Heavy	M. 0 C. 0	16	670	250	Excessive	Luetic
4.10.33	1,600 cells per c.mm. Polymorphonuclears = 70 per cent.	Present	M. 0 C. 0	27	655	200	"	Meningitic
10.10.33	1,070 cells per c.mm. Polymorphonuclears = 71 per cent.	Present	M. 0 C. 0	33	676	220	"	Luetic

other than an accidental one, to the meningeal infection; she had no symptoms or signs of meningitis at this time. Shortly after her admission to hospital, as part of the general surgical examination of her complaint an injection of 10 c.cm. of percaïne was given intrathecally, prior to a pelvic examination being carried out per vaginam. On the following day the patient complained of a very severe, generalized headache,

any appreciable abnormality in her condition, but two days later she had a severe recrudescence of headache and vomiting, and exhibited the signs of an acute meningitis. This recrudescence persisted, with slight fluctuations, until October 4th, from which date a rapid improvement set in, which progressed to a complete recovery without any further interruptions. The fluctuations in the clinical condition could

not be correlated with any similar fluctuations in the chemistry or the cytology of the cerebro-spinal fluid.

The patient was discharged cured on October 17th, 1933, after a stay of practically six weeks in hospital. Since her discharge she has had no recurrence of meningeal involvement, and at the present time she is able to undertake her normal household duties, and seems to be enjoying good health. She has not, apparently, experienced any recurrence of the original attacks of presumptive gall-bladder trouble, which first brought her to the Queen's Hospital.

The significant treatment consisted in the complete drainage of the cerebro-spinal fluid by repeated lumbar puncture, and the rectal injection of four ounces of a 25 per cent. solution of magnesium sulphate, morning and evening, for the first eight days after admission.

DISCUSSION

It would appear to be certain that the meningeal infection was connected with the intrathecal injection of the spinal anaesthetic. The patient exhibited no signs or symptoms of any intestinal infection when she was first examined, and the complete absence of fever and her general good condition negative any likelihood of a pre-existing generalized infection with *B. pyocyaneus*. At no time, also, had she any signs of a middle-ear or nasal sinus infection.

The exact source of the infection has not been established, but contamination of the percaïne is a more likely event than contamination of the syringe or needle used in the intrathecal injection, especially in view of Wilson's observation, to which I have already referred. Unfortunately, the sample of percaïne was not submitted for laboratory examination, and, in the absence of bacteriological proof of the contamination of the percaïne with *B. pyocyaneus*, the exact source of the infection remains a matter for conjecture. This case, however, has several educational bearings—notably, the low virulence of a *B. pyocyaneus* infection of the meninges in a previously healthy adult, and the warning that it provides of the need for scrupulous asepsis and absolute sterility in the use of medicaments and apparatus for therapeutic purposes. Had the infecting agent been *Staphylococcus aureus* or *Streptococcus pyogenes* the final result would certainly not have been so favourable.

I wish to record my indebtedness to Dr. A. V. Neale, honorary assistant physician to the Queen's Hospital, under whose care the patient recovered in the medical wards, for his kind permission to publish the clinical notes of the case, and to Dr. H. I. Coombs, Ph.D., biochemist to the Queen's Hospital, for his kind permission to include the chemical findings on the cerebro-spinal fluid.

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H. W. Siemens and J. H. Broekema (*Nederl. Tijdschr. v. Geneesk.*, January 13th) state that Holland is one of the European countries in which favus is most frequent. In Germany the disease is almost unknown, as is shown by the fact that in Munich only four cases were seen in the course of a year, in Kiel ten cases in eight years, and in Hamburg four cases in six years. In the Leyden district, on the other hand, 250 fresh cases were seen in less than four years. The prevalence of favus in Holland is attributed to the fact that a large proportion of the patients refuse treatment owing to their ignorance of the risks connected with the disease. Moreover, many Dutch physicians are said to be ignorant of the principles of the modern treatment of favus. The authors maintain that the disease can only be eradicated by enlightenment of the public, which could be effected by the formation of a special association. In the meanwhile it is desirable that favus should be added to the list of diseases infection with which debar children from attending school.

A FURTHER INVESTIGATION ON EXCRETORY TUBERCLE BACILLURIA

BY

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Despite the progress of modern research in the elucidation of many aspects of renal function, authorities still differ on the apparently simple question as to whether or not micro-organisms can pass through the healthy kidney. This problem has a clinical as well as a scientific interest. It has from time to time engaged the attention of various workers, so that the lack of unanimity is not due to want of interest.

Wysokowitsch¹ (1836), using various micro-organisms, found renal lesions essential for transmission. Others who have agreed with this view, with the organisms on which they have based their conclusions, are: Boccardi² (1888) (anthrax bacilli); Pernice and Scagliosi³ (1892) (*Staphylococcus aureus*); Sherrington⁴ (1893) (various organisms); Cotton⁵ (1895) (*Staphylococcus aureus*); and Lepper⁶ (1921) (coliform organisms). On the other hand, Sittmann⁷ (1894) concluded that the staphylococcus could pass through a healthy kidney. Great disagreement exists also on this question in regard to the tubercle bacillus. Killeuthemer⁸ (1914) obtained negative biological results in guinea-pigs with the albumin-free urines of thirteen advanced tuberculous patients, whereas three of eleven specimens showing albumin, and taken from similar patients, were positive, although these three patients revealed no post-mortem evidence of genito-urinary tuberculosis. He therefore concluded that tubercle bacilli could not pass through a healthy kidney, but might do so through an impaired organ, although no actual renal tuberculosis was present. Medlar and Sasano⁹ (1924), after examining 30,000 serial sections of the kidneys of twelve tuberculous guinea-pigs and four tuberculous rabbits, formed the opinion that renal tuberculosis was present in every instance in which tubercle bacilli were found in the urine during life, and that there was no evidence to suggest the excretion of these organisms by a normal kidney. Bumpus and Thompson¹⁰ (1930) did not think it was possible for a normal kidney to filter tubercle bacilli from the blood stream into the urine. Rieder¹¹ (1931) found urogenital tuberculosis by operation, or post mortem, in all the eleven instances in which he had recovered tubercle bacilli from the urine. The present writer¹² (1932) found only one urine positive out of seventy-six single specimens from seventy-six patients with advanced pulmonary tuberculosis, and repeated examinations revealed persistent albuminuria in this instance. On the other hand, Foulerton and Hillier¹³ (1901) obtained six positive urines from six tuberculous patients without being able to find any post-mortem evidence of genito-urinary involvement. Churchman¹⁴ (1914), Brown¹⁵ (1915), Geisinger¹⁶ (1917), Caulk¹⁷ (1921), Hobbs¹⁸ (1923), Smith¹⁹ (1924), Ekehorn²⁰ (1923), and many other authorities, including Calmette, have expressed themselves in favour of the possible occurrence of excretory tubercle bacilluria. More recently, Ramel²¹ (1932) formed similar conclusions, believing that he had encountered six instances of transitory tubercle bacilluria; but this authority like some of the others expressing similar opinions, seems to have laid undue stress on normal renal function tests, and it is not clear if he cut serial sections to exclude active genito-urinary tuberculosis.

PRESENT INVESTIGATION

A healthy young adult rabbit excreting normal urine received 66.5 mg. of living human tubercle bacilli intravenously. Twenty-four-hour specimens of urine were tested chemically, microscopically, and biologically from the first to the sixth day inclusive. No abnormality and no evidence of the excretion of tubercle bacilli was found, despite the fact that the guinea-pigs inoculated with the urine were kept alive for several months. The rabbit, killed late on the sixth day, showed no macroscopic