meeting of the Clinical Society. In this paper the author demonstrates by instances how portions of the prostate might be removed by scissors through a suprapubic incision. I am disposed to think that this, on still further trial, will be found the best way to deal with such cases, for it places the operator in view of those projecting masses of degenerated prostate tissue which invariably protrude towards the cavity of the bladder, and which really are the cause of the distressing symptoms of irritation which accompany them. Care, however, will be necessary, as I have just urged, in the selection of cases for operations of this kind, it being distinctly understood that they are undertaken, not because the prostate is large, but because it has induced symptoms which cannot be alleviated in any other way. You may remove the prostate entirely, but this necessarily renders the individual incontinent for life. Lobulated masses proceeding from an hypertrophied prostate and isolated fibromas in the part, may thus be dealt with with permanent advantage; but this is a very different thing to extirpating the prostate in its entirety, or seriously mutilating the muscular ring, which under all circumstances is essential to the integrity of the bladder as a urine holder.

The following instance, which I will briefly relate, substantiates the proposition with which I opened this lecture; and, as it similarly bears upon the operative point now under consideration, I may consistently close my remarks with it.

In August, 1882, a patient, aged 64, came under my care with symptoms of primary carcinoma of the prostate, which caused bleeding, continuous pain, and irritability of the bladder. As no treatment afforded relief, I did a free median cystotomy, and proceeded with my finger and a blunt gouge to enucleate the prostate and the growth connected with it. In this I succeeded, with the exception of a small portion in front, which I could not get away. There was very little bleeding, and the patient made a good recovery, though he lost power of retaining his urine. Some degree of retentive power eventually returned, but it became necessary to provide him with an apparatus for controlling the incontinent escape of urine from the bladder. He lived for fourteen months after the operation, and was able to return to his work as a stevedore. He eventually died from a recurrence of the disease in the glands of the groin. I showed the specimen of what was removed at a meeting of the Royal Medical and Chirurgical Society, in connection with a discussion bearing upon the subject.

A FURTHER INVESTIGATION

INTO

THE SO-CALLED HENDON COW DISEASE,

AND ITS

RELATION TO SCARLET FEVER IN MAN.

Abstracted from a Report to the Agricultural Department of the Privy Council, read before the Pathological Society, January 17th, 1888.

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Description of the Streptococcus isolated from the Ulcers of the Teats.—Determination of the Species: Streptococcus Pyogenes.—Acute Abscesses; Distribution of Streptococcus Pyogenes.—Nature of Contagium undetermined in the Exanthemata.—Post-mortem Appearances in the Hendon Cows.—Post-mortem Appearances of Cows from Wiltshire.—Post-mortem Appearances of Inoculated Calves.—Summary.

At a special meeting of this Society I laid before you the results of an investigation which, though admittedly incomplete in some details, enabled me to bring forward evidence to show that the theory that a certain eruptive disease of the teats of cows at Hendon was the very disease which we call scarlet fever in man could not be maintained. That was the object of my communication, while as a side issue—which I, nevertheless, regarded as of greater interest than the overthrow of the above-mentioned theory—I brought forward evidence to show that this disease was in reality cow-pox. I was anxious that these conclusions should be made known without delay, partly to allay the public anxiety, and partly because I wanted to give every opportunity for my statements to be examined. Thus I wished to afford anyone interested in the matter an opportunity for visiting the farms while the details were fresh in the memory of the milkers, and before the disease had totally disappeared from among the cows.

I pointed out that the study of the streptococcus which I had isolated was not yet completed. I had yet to study the effects of inoculation, and I was therefore only in a position to say that this streptococcus corresponded morphologically and on cultivation with the so-called scarlatina streptococcus. I inclined to the belief that these organisms were identical, not only with each other, but with certain other organisms which had been regarded originally as distinct species.

I promised further investigation on these points, and I also stated that I thought I should find in a calf at the Royal Veterinary College the *post-mortem* appearances which had been described by Dr. Klein. This animal showed symptoms of septicæmia, and has now been killed and carefully examined. I will therefore proceed to lay before you the details of these and of further inquiries in connection with this subject.

I desire to lay this further evidence before you, so that you may be concerned to-night in discussing the identity of the disease I have investigated with the disease which has been fully described clinically and pathologically by Dr. Cameron and Dr. Klein, and the micro-pathology of which has been so fully illustrated by Dr. Klein in a very extensive series of lithographed plates.

DESCRIPTION OF THE STREPTOCOCCUS ISOLATED FROM THE ULCERS OF THE TEATS.—I will first describe more in detail the chain-forming micrococcus which I found in the discharge from the ulcers.

The individual cocci are small spherical cells with a special tendency after fission, for the resulting elements to remain attached to each other, forming chains or rosaries. There may be a few, three or four, elements linked together, or a number of individuals forming straight or serpentine chains. The size of the individual elements is not always equal, here and there in a chain a larger element appearing.

In plate cultivations the appearances of the colonies are not very striking. They appear to the naked eye, after three or four days, as extremely minute, greyish-white, translucent dots, which, under the microscope, have a slightly yellowish-brown colour. They are finely granular and well-defined. They do not liquefy the gelatine, and after weeks do not exceed the size of a pin's head.

If the surface of nutrient gelatine solidified obliquely is traced over once or twice with a platinum needle, bent at the extremity into a little hook charged with the micrococci, a ribbon-shaped film develops in two or three days at 18° C. This film is composed of minute greyish-white translucent dots or droplets, which can be more easily recognised with the aid of a pocket lens.

According to the number of organisms seen on the jelly, the dots or colonies may be completely isolated or form a more or less continuous film. This film by reflected light has an iridescent appearance like mother-of-pearl, but has a bluish or bluish-grey tint by transmitted light, and with a pocket lens appears distinctly brownish.

The gelatine is not liquefied, and even after several weeks the cultivation is limited to the inoculated area and the individual colonies are not larger than pins' heads. Cultivated on the oblique surface of nutrient agar-agar at 37° C. the growth is very similar, forming a film composed of minute dot-like colonies like grains of sand. But the film appears less transparent, is whiter, and the colonies have a greater tendency to get irregular in form. If inoculated with one tracing of the needle the growth is scanty, but tends to get thicker in the centre than towards the margins, which may have a terraced appearance.

Inoculated in the depth of the gelatine there appears after a day or two, at 18° C., a thread-like growth along the track of the inoculating needle. This delicate thread is found on examination with a pocket lens to consist of a linear series of extremely minute granules. In a few days more the beads or granules become more marked, but even after weeks the cultivation only appears like a string of minute white compact globular masses or grains. In broth at 37° C. the cocci in twenty-four hours create a turbidity, and gradually develop chains varying in length according to the age of the cultivations. Even in forty-eight hours there may be chains of 8, 10 or 20 elements. After a few days the growth settles down at the bottom of the tube in the form of a white deposit, while the supernatant liquid becomes clear again.

Cultivated in milk at 37° C., they convert it in two or three days into a solid mass, while uninoculated control tubes remained liquid. Inoculated subcutaneously in the ear of rabbits, they produce in two days an inflammatory thickening, with erysipelatous redness, and without suppuration.

DETERMINATION OF THE SPECIES: STREPTOCOCCUS PYOGENES.—From its microscopical appearances, its characters on cultivation, and its effect on animals, it is obvious that this organism is identical with the *Streptococcus pyogenes* of other authors.

tical in every respect with the streptococcus found in acute abscesses by Ogston, and studied more minutely and named *streptococcus pyogenes* by Rosenbach. For some time my attention has been drawn to the probable identity of the organisms described in puerperal fever, measles, scarlatina, diphtheria, with the chain-forming micrococcus in pus, and I find that, independently, bacteriologists on the Continent have not only considerably extended that idea, but have come to definite conclusions. Formerly, certain differences in the result of inoculation of animals were regarded as establishing a distinction of species; but further researches have shown that often these differences are not constant, and moreover, in the history of the well-known pathogenic organisms we meet with different effects produced by one and the same species. Indeed, we find that the pathogenic effect depends upon several conditions, such as the source of the micro-organism, the dose, the mode and place of infection, and the nature of the inoculated soil. The principal method of attenuation of virus depends upon the fact that by passing organisms through different animals, they assume different properties. Thus, anthrax bacilli from sheep are fatal to sheep, but if passed through mice produce a transitory illness. The microbe of swine-erysipelas passed through pigeons is increased in pathogenic power, but by passing through rabbits is progressively diminished, producing only a mild disease. But not only is the pathogenic effect different, but the organism itself may be altered. Thus, according to Huber, anthrax bacilli from the guinea-pig are thicker than when they are derived from the mouse or sheep, and the latter are thicker than in the rabbit.

Even the *streptococcus erysipelatis* of Fehleisen, which at first was regarded as quite a distinct species, has been identified by many German authorities with the *streptococcus pyogenes*. Similar in their microscopical features and their characters on cultivation, Baumgarten does not consider it beyond the limits of possibility that they might differ in their effects on inoculation, according to the condition with which they had been associated. Thus, when derived from suppuration, there might be a tendency towards the development of an inflammation accompanied with the formation of pus; and when derived from erysipelas, there might be a tendency towards the formation of an erysipelatos inflammation without suppuration; while under other conditions the organisms might lose their pathogenic properties altogether. But apparently there is no longer even this distinction, for these differences after inoculation have been minimised by recent researches. I will give further details of these investigations directly, and I will now proceed to enumerate the various diseases and conditions in which the Continental authorities principally have arrived at the conclusion that we have to do with one and the same micro-organism.

DISTRIBUTION OF STREPTOCOCCUS PYOGENES.—*Acute Abscesses.*—I have already mentioned that a chain-forming micrococcus was first described by Ogston in acute suppuration. It was later studied by the methods of cultivation introduced by Koch, and named by Rosenbach *streptococcus pyogenes*. According to Flugge, after subcutaneous inoculation of mice with a small quantity of a cultivation, there is no result in 80 per cent. of the animals experimented on. Sometimes there is limited pus-formation at the seat of inoculation, sometimes the animals die without any very striking pathological appearances.

Erysipelas.—In erysipelas Fehleisen isolated a streptococcus and described the appearances on cultivation. Fehleisen regarded the organism as quite distinctive, with special characters on cultivation; but Rosenbach pointed out the extremely close resemblance in every respect to the *streptococcus pyogenes*, though he described an apparent difference on cultivation on nutrient agar-agar. Further investigations, however, by other observers showed that these organisms could not be distinguished with certainty, either by their morphological appearances or by their characters on cultivation. Moreover, the marked differences which have been described after inoculation were not obtained by those who repeated the experiments. Passet found that the result of inoculating *streptococcus pyogenes* in the rabbit's ears induced a very similar condition to the result of inoculation of *streptococcus erysipelatis*, and both organisms, by subcutaneous inoculation and by inoculation in the cornea of rabbits and other animals, induced results without any constant difference. Passet showed that the inoculation of the cornea produced the same form of keratitis. Hoffa and Hajek described minute differences at the seat of inoculation, but Biondi and Eiselsberg repeated the experiments, and failed to establish the alleged differences. Baumgarten also investigated this subject, and failed to prove any essential difference, and indeed found much more often than might have been expected from the publications of previous

authors that no marked result at all was obtained on inoculation; and he concluded that *streptococcus pyogenes* and *streptococcus erysipelatis* in their form, cultivation, and their effects on animals were identical. Thus Passet, Biondi, Eiselsberg, Baumgarten, and Fränkel have definitely accepted the identity of the streptococcus associated with suppuration, and the streptococcus associated with erysipelas.

Spreading Gangrene.—From a case of spreading gangrene, which was identical with Ogston's erysipelatosid wound gangrene, and regarded by him as the most intense and dangerous form of erysipelas, Rosenbach obtained pure cultivations of *streptococcus pyogenes* by incising the skin of the limb, and inoculating tubes from the turbid reddish fluid which escaped. That the streptococcus was identical with *streptococcus pyogenes* was ascertained by comparison of the mode of growth, and of the effect on animals with a cultivation derived from pus.

Surgical Fever.—Eiselsberg proved the presence of *streptococcus pyogenes* in the blood of several cases of surgical fever in Billroth's clinic. The organism was identified by cultivation.

Puerperal Fever.—Fränkel isolated from puerperal septicæmia a streptococcus, which he called *streptococcus puerperalis*; he identified it with *streptococcus pyogenes*. Winkel obtained a pure cultivation of a streptococcus from the blood of the heart in a case of puerperal peritonitis. It produced erysipelatosid redness when inoculated in the rabbit's ear, and in form and in cultivation was similar to *streptococcus erysipelatis*. Cushing found that *streptococcus pyogenes* was associated with puerperal infection. The cocci were found in endometritis diphtheritica as well as in secondary puerperal inflammation. These observations were confirmed by Baumgarten, and there can be little doubt, from the description, that the streptococcus isolated from puerperal fever by Dr. W. R. Smith, which is regarded by Dr. Klein as a distinct species of streptococcus, is the same organism as the one previously found by the observers just named, and, if so, it is only another manifestation of *streptococcus pyogenes*.

Puerperal Mastitis.—In puerperal mastitis Bumm isolated the *streptococcus pyogenes*.

Diphtheria.—In three cases of typical diphtheria Löffler found a streptococcus. He isolated it by cultivation, found that it was similar in form, characters on cultivation, and effects after inoculation, with Fehleisen's streptococcus of erysipelas. Löffler was not inclined to regard them as identical, because Fehleisen never found his cocci in the blood vessels. Flugge named the organism *streptococcus articularum*, and states that, after subcutaneous inoculation or injection of a cultivation in mice, a large proportion of the animals die, and in the sections of the spleen and other organs the streptococci are again seen. Baumgarten investigated the same subject, and decided that the streptococcus was *streptococcus pyogenes*.

Scarlet Fever.—Cooke, in cases of scarlet fever with severely affected throat, found bacilli, cocci, and streptococci in the organs of the throat, and cocci in the internal organs. Cooke left it an open question whether these cocci were the specific organisms of scarlet fever, or to be regarded as diphtheritic or septic associates. He inclined on clinical grounds to the latter view. In cases of scarlatinal diphtheria Löffler found the same chain-forming micrococcus which he had found in typical diphtheria. Babès was able constantly to prove in inflammatory products secondary to scarlatina the presence of a streptococcus greatly resembling that in pus. Heubner and Bahrdt, in a fatal case of scarlet fever in a boy, complicated with suppuration of the finger and knee joints and with pericarditis, found a streptococcus identical in form, from the description, with *streptococcus pyogenes*. Cultivations were not made. The secondary affection started from the diphtheritically affected tonsils, which were followed by retropharyngeal abscess. Fränkel and Freudenberg examined for micro-organisms three cases of scarlatina with well-marked affection of the throat. In all three cases they obtained cultivations of cocci from the submaxillary lymphatic glands, spleen, liver, and kidney. These cocci could in no way be distinguished from *streptococcus pyogenes* derived from pus; nor from the undoubtedly identical streptococcus which one of them (A. Fränkel) had already repeatedly cultivated in large numbers from puerperal affections. In two of the cases *streptococcus pyogenes* was the only organism present, and in all three cases it was far in excess of other colonies which developed. The organisms were also found in sections of the organs by microscopical examination.

The identity of this streptococcus with *streptococcus pyogenes* and *streptococcus puerperalis* was established by comparison of their macroscopical and microscopical appearances in cultivations on nutrient agar-agar, nutrient gelatine, and in broth, both at the ordinary and at higher temperatures, and also by experiments on animals. They concluded that it could be stated with certainty that the organ-

isms in question did not stand in causal relation to scarlet fever.

They consider that special methods of microscopical and biological research were apparently needed for demonstrating the true scarlet fever contagium, which probably was especially present in the skin.

They consider that the presence of the streptococcus was due to a secondary infection to which the door was opened by the lesions of the throat, a view which was supported by the fact that the organisms were found in the submaxillary lymphatic glands.

They preferred to use the term "secondary" to "complicated" or "combined" infection, because this expresses the fact that by the effect of the scarlatinal virus the soil is rendered suitable for this ubiquitous microbe, when it has once gained an entrance.

From the blood and desquamation of scarlet fever, Dr. Edington cultivated a streptococcus, which he named provisionally *streptococcus rubiginosus*.

Dr. Klein examined eleven cases of scarlet fever. In ten of them the tonsils were ulcerated, and in many severely. From five cases, from four during life, and from one after death, with ulcerated throat, a streptococcus was isolated—in one case in company with staphylococcus aureus. Dr. Klein regarded this chain-forming micrococcus as the contagium of scarlet fever, and named it the *micrococcus scarlatinae*. The Edinburgh commission regarded Dr. Klein's streptococcus as identical morphologically with the streptococcus rubiginosus, and Dr. Woodhead suggested that it was identical with the *streptococcus pyogenes*. In a specimen of tinned milk which had been suspected of containing the contagium of scarlet fever, Dr. Klein isolated a streptococcus, which he regarded as identical with the streptococcus from the scarlet fever cases. If the organism is identical with the streptococcus of scarlatina, it is obvious that improperly preserved milk is another source of the *streptococcus pyogenes*. From the blood of a monkey, which Dr. Klein received two days after death, a streptococcus was isolated, which corresponded with the streptococcus from the Hendon cow disease, from the scarlet fever cases, and from the tinned milk. This monkey died in a house where scarlet fever had occurred.

From the presence of this streptococcus and from the anatomical condition of the viscera, Dr. Klein regarded as without doubt the unity of this disease with acute scarlatina. The *post mortem* appearances, however, were from description the *post-mortem* appearances of septicæmia, which are common to many diseases besides scarlet fever, and the streptococcus, which can only be regarded as the *streptococcus pyogenes*, may have been either the result of septic infection secondary to some undetermined disease, or it may possibly be accounted for by the animal not being examined earlier than two days after death.

So-called Hendon Cow Disease.—In the disease which Dr. Klein calls the Hendon cow disease a streptococcus was isolated which is identical with the streptococcus from scarlet fever. The Hendon cow disease was regarded as scarlatina in the cow, and the streptococcus as the *micrococcus scarlatinae*. From the ulcers of the Wiltshire disease I have isolated an organism identical with the description of Dr. Klein's streptococcus. I regard this disease as cow-pox, and the organism as identical with the *streptococcus pyogenes*.

Vaccinia.—In vaccine lymph, Cohn and others have recognised the presence of micro-organisms. Guttman and Pfeiffer have separated the different species by Koch's methods. Guttman found: (1) micrococcus pyogenes aureus; (2) staphylococcus viridis flavescens; (3) staphylococcus cereus albus. (Syn. micrococcus vaccinæ, Cohn, Voight, Garré). Dr. Klein has isolated a micrococcus which he calls streptococcus vaccinæ, and which he states is identical with one of Guttman's cocci. But the *streptococcus pyogenes* may occur in vaccine lymph, and Pfeiffer regards it as the result of contamination. Hence it is suggested that before calf lymph is employed for vaccination it should be tested on a rabbit's ear. If in two days no rash has been produced, the possibility of the presence in the lymph of *streptococcus pyogenes* or *erysipelas* is excluded. The nature of the contagium in vaccinæ as in scarlet fever is unknown.

Variola.—In the pustules of variola Hlava has established the presence of *streptococcus pyogenes*, and Garré found streptococci in the internal organs in a case of variola hæmorrhagica.

Variola and Pemphigus.—In a fatal case of variola complicated with pemphigus, Garré found a streptococcus in the pemphigus vesicles. Whether it was identical with *streptococcus erysipellatis* Garré left an open question.

Foot-and-Mouth Disease.—In 1868 Professor Brown figured a streptococcus in the milk of cows affected with foot-and-mouth disease. From the vesicles of this disease in sheep Dr. Klein isolated a streptococcus which he regarded as the contagium of the disease. From Dr.

Klein's description of its morphological features and characters on cultivation it closely corresponds with *streptococcus pyogenes*. Mr. Watson Cheyne investigated the same disease, and informs me that he also isolated a streptococcus, which he concluded was *streptococcus pyogenes*. Baumgarten also regards Dr. Klein's alleged contagium as most probably the *streptococcus pyogenes*. Against the fact of this organism being the virus of this disease, and in favour of its being *streptococcus pyogenes* we have the results of inoculation experiments. A great number of subcutaneous inoculations in sheep were without any result. One of several guinea-pigs fed with the organism had an abscess, another an ulcer. In sheep fed with the organism two out of nine, after a number of repeated administrations, developed a disease regarded by Dr. Klein as foot-and-mouth disease. There is the possibility of two fallacies: one that the disease, if really foot-and-mouth disease, may have occurred spontaneously; the other that the result which occurred may have been a spurious form of foot-and-mouth disease. The control experiment of exposing a number of sheep with these two sheep to see if the disease spread was wanting.

Cattle Plague.—Semmer cultivated streptococci from the blood and lymphatic glands of a sheep with this disease. A calf inoculated with a cultivation was stated to have died in seven days from cattle plague. The cocci were stated to lose their virulence by successive cultivation, and the weakened cultivations to protect against the virulent disease. I think it extremely likely this was another manifestation of *streptococcus pyogenes*, and that the animal died very probably of septic infection. Dr. Klein is also of opinion, in spite of Semmer's statements, that the specific nature of these micro-organisms cannot be considered to be established.

Swine Fever.—In a severe case of this disease with well-marked intestinal ulceration I have obtained from the blood of the spleen a mixed cultivation of streptococci and other organisms. Isolation and cultivation in the pure state are not yet completed. It was very probably mixed infection with *streptococcus pyogenes*.

Yellow Fever.—Babès observed the presence of streptococci in the vessels of the kidney and liver in yellow fever. Cultivation experiments are wanting. It was probably secondary infection with *streptococcus pyogenes*.

Fèvre Bilieuse Typhoïde.—Babès, in a case of this disease, found masses of streptococci filling the vessels of the liver, kidney, and spleen; probably another instance of secondary infection with *streptococcus pyogenes*.

Measles.—From the blood and from inflammatory post-products in measles Babès isolated a streptococcus, which he describes as closely resembling the *streptococcus pyogenes*.

Endocarditis.—Wyssokowitsch found cocci in the internal organs in ulcerative endocarditis, and produced the disease in animals by injection of *streptococcus pyogenes* and other organisms after injury to the valves. Weichselbaum, by microscopical research and by cultivation experiments, proved the presence of *streptococcus pyogenes* in acute verrucous endocarditis. Baumgarten confirmed this. He found *streptococcus pyogenes* alone in one case, and accompanied by *staphylococcus aureus* in another.

Typhoid Fever.—Senger found a streptococcus in a case of typhoid with secondary infection. This was probably *streptococcus pyogenes*, for Dunin found in post-typhoid suppuration the well-known pyogenic organisms, mostly as staphylococci, but sometimes streptococci.

Pneumonia.—Weichselbaum found the *streptococcus pneumoniae*, which resembled *streptococcus pyogenes* and *erysipellatis* morphologically and on cultivation. It was found in twenty-one cases by microscopical research, and cultivated in nineteen. It had no effects on the rabbit's ear. Baumgarten nevertheless regards this as *streptococcus pyogenes*, and is of opinion that it is only a matter of further research to establish that view. In pneumonia after typhoid, Neumann found streptococci by microscopical research in the lungs, and by cultivation isolated a streptococcus. It corresponds with Weichselbaum's streptococcus in not affecting the rabbit's ear.

Empyema.—Rosenbach obtained a pure cultivation of *streptococcus pyogenes* in a case of empyema. Weichselbaum in two cases also established its presence.

Broncho-pneumonia.—Thaon found chain cocci in the lungs of children in fatal cases of broncho-pneumonia, complicating measles, diphtheria, and whooping-cough. They were regarded as identical with the streptococcus isolated by Löffler from diphtheria. Fränkel discovered a streptococcus in the lungs of a case of true croup complicated with broncho-pneumonia, and by cultivation established its identity with *streptococcus pyogenes*.

Progressive Tissue Necrosis in Mice.—Koch produced a disease in mice by subcutaneous injection of putrid blood. In tissue sections a chain coccus was found, and Baumgarten is of opinion that it is very pro-

bably identical with the *streptococcus pyogenes*, but cultivations are still wanting.

Septicæmia Consecutive to Anthrax.—Charrin found cocci in rabbits, examined some hours after death from anthrax. These when isolated produced death in rabbits from septicæmia without suppuration. Chains composed of fifteen to twenty elements were found in all the organs. This was probably another instance of *streptococcus pyogenes*.

Pyæmia and Septicæmia.—Rosenbach examined six cases of pyæmia. From Case No. 1 cultivations of *streptococcus pyogenes* were obtained from the blood of the patient during life. The blood was streaked over the surface of the culture medium, and in two tubes the *staphylococcus pyogenes aureus* was also present. In Case 2, with suppurative pleuritis, the pleura was tapped during life, and cultivations of *streptococcus pyogenes* were obtained. In Case 3, streptococci were found in the metastases in the kidneys, and in the other suppurations that were examined.

In Case 4 the pleura was opened during life, and *streptococcus pyogenes*, associated with *staphylococcus pyogenes aureus*, was cultivated from the fluid which escaped. In Case 5 pure cultivations of *streptococcus pyogenes* were obtained from pus from the knee, which was punctured during life. This case was one of erysipelas and pyæmia after removal of carcinoma of the breast. In Case 6, a case of whitlow, with metastatic abscesses, the patient recovered, and no streptococci were found. Thus in six cases of metastatic pyæmia *streptococcus pyogenes* was found five times, partly in the blood and partly in the metastatic deposits, and twice in company with *staphylococcus pyogenes aureus*. Baumgarten also found the *streptococcus pyogenes* in the internal organs in pyæmic cases, and Eiselsberg found *streptococcus pyogenes* in company with *staphylococcus pyogenes aureus* in the blood of cases of septicæmia.

Congenital Syphilis.—Kassowitz and Hochsinger found the presence of a streptococcus in the tissues and internal organs, and especially in the blood vessels, in fatal cases of congenital syphilis. These observers regarded their discovery as having an important bearing on the etiology of syphilis, but Kolisko pointed out that it was only the result of septic infection with presence of *streptococcus pyogenes*, as had already been established in scarlet fever.

Idiopathic Cerebro-Meningitis.—From the meningeal exudation of a case of apparently idiopathic cerebro-meningitis Banti found by Koch's methods the presence of *streptococcus pyogenes*, *staphylococcus aureus*, and *albus*. The cocci probably entered through an abscess of the jejunum.

Blepharadenitis and Phlegmonous Dacryocystitis.—Widmark isolated by cultivation, *streptococcus pyogenes*, and other organisms from these diseases. In phlegmonous dacryocystitis Widmark found *streptococcus pyogenes* almost exclusively.

Fatal Case of Leukæmia.—Flügge cultivated a streptococcus from necrotic patches in the spleen of a fatal case of leukæmia. Cultures corresponded very closely with *streptococcus pyogenes*. Inoculation in two rabbits' ears produced similar results to *streptococcus pyogenes*, or *erysipelatis*. Flügge called it *streptococcus pyogenes malignus*, but concludes that it is probably identical with the streptococcus from pus.

Earth.—Nicolai, and later Guarneri, isolated a streptococcus from soil. Microscopically it could not be distinguished from other streptococci. Baumgarten is of opinion that it is neither in form nor in cultivation to be distinguished with certainty from *streptococcus pyogenes*.

Air.—Emmerich succeeded in proving the presence of chain cocci in the air of a hospital where erysipelas had broken out. These cocci in their form, their characters on cultivation, and in inoculation results, were identified with the *streptococcus erysipelatis*.

Various Rotting Substances.—Baumgarten states that in the most various substances undergoing putrefaction streptococci are always found, which morphologically are exactly similar to the *streptococcus erysipelatis*. Baumgarten, therefore, regards it as quite possible that the *streptococcus erysipelatis*, or *pyogenes*, is essentially a saprophytic organism, that is to say, an organism which may be found wherever there is decaying organic matter, and that its parasitism is only incidental.

NATURE OF CONTAGIUM UNDETERMINED IN THE EXANTHEMATA.—I think, therefore, that the results of these numerous investigations constitute a mass of evidence in support of my opinion that in a disease which is accompanied with a lesion of the skin or mucous membrane, and in which the blood and tissues are profoundly affected by the virus of that disease, micro-organisms may gain an entrance into the circulation and escape destruction.

The occurrence, therefore, of *streptococcus pyogenes* in diphtheria, scarlet fever, vaccinia, variola, measles, typhoid, etc., must be re-

garded as a secondary result, and associated with septic or pyæmic complication—and I am forced to the conclusion that, excepting negative evidence, bacteriology has not assisted us in the least in the determination of the real nature of the morbid agent or actual contagium of the exanthemata.

That there are certain diseases which are due to micro-organisms is, I am sure, accepted by all modern pathologists, but we are far from having solved the nature of the contagium of all communicable diseases. In many cases, as in hydrophobia, where bacteria have been brought forward as the specific agents, they have been gradually substituted by the less definable term *virus*. Misapplied bacteriology will be both misleading and mischievous, and this criticism is applicable if a micro-organism is maintained to be the actual contagium of a disease, such as scarlatina, in the face of obvious fallacies and without affording the evidence which is usually regarded as necessary for admitting a causal connection.

POST-MORTEM APPEARANCES IN THE HENDON COWS.—A great deal of importance appears to have been attached to the *post-mortem* appearances which were found by Dr. Klein in the original Hendon disease. This is all the more surprising inasmuch as it was presumably not only a non-fatal form of scarlatina, but of such a very mild type that, according to Dr. Klein, neither feeding capacity nor milking power was affected, nor was the body temperature abnormal. Putting aside the danger of coming to conclusions from two *post-mortem* examinations, I will pass on to quote fully what the *post-mortem* examination of these two cows revealed.

In cow 4, killed January 9th, we read as follows:—

Naked Eye Appearances of Cow 4.—"On opening the chest, it was found that both lungs exhibited on the upper posterior lobes numerous petechiæ under the pulmonary pleura, the peripheral lobules of these parts being much congested. There were numerous adhesions by recent soft lymph between the lower lobes of the lung and the costal pleura, particularly laterally. In the liver there were several reddish streaks and patches reaching from the surface of the organ to a depth of about a quarter of an inch. In these patches the liver tissue was much softened. The spleen and kidneys, with exception of slight congestion, appeared normal. In the placenta there were numerous petechiæ."

Microscopical Examination of Internal Organs of Cow 4.—"Lung.—Sections made through the portions above mentioned as containing much congested lobules show not only great congestion of the blood vessels, large and small, but a large amount of hæmorrhage; blood in substance being present in the air vesicles and infundibula, in the lymph spaces of the interlobular septa, and in the tissue and lymphatics of the pleura.

"Liver.—Under the capsule, as well as in the substance of the liver, there occur in connection with the interlobular branches of the portal vein, larger and smaller foci of inflammation, consisting in the presence of numerous round cells. Some of these foci are several millimetres in diameter, others are very small. From the interlobular tissue the inflammation extends into the lobules between the liver cells. The liver cells of these lobules involved in the inflammatory process are swollen up, and many of them are undergoing disintegration. In some of these foci, particularly those situated in the vicinity of the capsule, the round cells are so much crowded that given foci look almost like miliary abscesses. The blood vessels are much distended and filled with blood.

"Kidney.—Sections showed well-marked glomerulo-nephritis, infiltration of the sheath of the cortical arterioles, with numerous round cells; the epithelium of the convoluted tubules swollen, opaque, and, in many places, disintegrating."

Naked-Eye Appearances of Cow 3.—"In the lungs there were numerous lobules, especially in the peripheral parts, which showed great congestion; there were, in addition, pleural adhesions; the cortex of the kidney was congested, but its medulla was pale."

Microscopical Appearances.—"The lungs and kidneys showed, on microscopic examination, the same appearances as in Cow 3; in addition, there was a good deal of round cell infiltration in the wall of the infundibula and bronchi in the lung and around the arterioles in the kidney."

Such *post-mortem* appearances can hardly be regarded as of primary importance. At most they are suggestive of some coincident affection. In both the description of the naked-eye appearances suggests pleurisy, or possibly some pleuro-pneumonia. The microscopical appearances in both are suggestive of septic poisoning.

POST-MORTEM APPEARANCES OF COWS FROM WILTSHIRE.—I have already mentioned that a cow from the outbreak which I investigated in Wiltshire was sent to the Brown Institution. Having duly received

notice of the *post mortem* examination, I accompanied Professor Brown; and inasmuch as there was no suspicion of any disease complicating the eruptive disease of the teats, it was not surprising to find that naked-eye appearances at the *post-mortem* examination were practically negative. All that could be noted of the viscera was as follows: petechiæ on the spleen; liver, a few whitish irregular spots; fatty patches on surface of the cortex of the kidney.

I have already mentioned that there was an unusual condition of ulceration in this cow, and milking had become a matter of great difficulty to inexperienced hands. The result was that after the cow had been at the Royal Veterinary College, the udder became enlarged, and the teats red and swollen. At the *post-mortem* examination an incision into the udder revealed an enormous abscess.

At the *post-mortem* of Cow 2, which was also sent to Dr. Klein, there was a somewhat similar condition, and the visceral changes were negative.

I shall refer to the examination of the ulcers of these two cows later, but it is interesting to observe that microscopical sections of the kidney of the Wiltshire cow No. 1 revealed a similar condition to that found in the kidney of Dr. Klein's Hendon cow.

Microscopical Examination of Kidney of Wiltshire Cow 1.—Sections showed glomerulo-nephritis; infiltrations round Bowman's capsule with round cells; infiltration of the sheaths of the vessels with round cells, especially of the cortex; blood-vessels in the boundary zone of the medulla engorged; arterioles of the glomeruli engorged, and slight hæmorrhages into the capsule; epithelium of the convoluted tubules granular, opaque, and in some parts breaking down.

Inasmuch as sections of the kidney of cow No. 1 (Wiltshire) show similar appearance to those in sections of Dr. Klein's Hendon cow No. 4, the appearances in the latter can hardly be regarded as a necessary indication of the disease being scarlatina in the cow.

Microscopical Appearances of the Ulcers of (Wiltshire) Cows 1 and 2.—Cow 1: Sections of a portion of the spreading ulceration of the teat, showed only a superficial ulceration, not extending far into the depth of the tissue. There were marked hæmorrhages in the corium. These appearances were somewhat different from the appearances in sections of a circumscribed ulcer from a teat of Wiltshire cow 2.

Sections of this ulcer also show infiltration of the corium with round cells, but the ulceration extends deeply into the tissue. There are spaces or cavities in the stratum Malpighii, especially in the superficial layers. These spaces are empty or filled with granular matter and round cells, and are separated from one other by trabeculae. In short, it may be said that the appearances under the microscope compared side by side with Dr. Klein's illustration of an ulcer from a Hendon cow (Plate x, fig. 12) are so strikingly similar, that Dr. Klein's illustration looks as if it might have been drawn from a section from (Wiltshire) cow 2.

It is interesting also to note that Dr. Klein states that appearances of microscopical sections of ulcers of the Hendon cows "recalled vividly the condition observed in the vesicles of cow-pox."

POST-MORTEM APPEARANCES OF INOCULATED CALVES.—Though the *post-mortem* appearances in the Hendon cows cannot be regarded as throwing much light upon the question, this is not the case when we come to examine the *post-mortem* appearances of calves inoculated with the scraping of an ulcer or with cultivation of the streptococcus from cases of scarlatina. These *post-mortem* appearances are very striking, but they cannot be regarded as characteristic of scarlatina; they are in reality the *post-mortem* appearances of septic infection, and common, therefore, to many diseases. For example, let us take the case of Calf No. 1, which was inoculated in the skin of the groin and the belly with a subculture of streptococci from the blood of a scarlatinal patient. This calf was killed, and the *post-mortem* appearances were as follows:—

The lymphatic glands of the groin much congested and swollen, some of them dark red, almost black. Similar appearances were found in some lymph glands in the subcutaneous tissues of the throat, and in the pelvis; in some, also, of those along the aorta and vena cava, in the bronchi, and in the anterior mediastinum, along the trachea, and along the stomach and mesentery. Many of these glands were either partially or wholly of a dark red colour, when cut into bloody fluid easily oozed out. Those that were not dark red were soft and juicy, and clear fluid oozed from them when cut into. Some of the dark red, almost black glands—for example, some in the bronchi, the glands along the aorta and vena cava, and in the pelvis—were not larger than a pea, others as large as a bean, and up to the size of a walnut. Sections examined under the microscope showed a large amount of blood effused *en masse* into the cortical and medullary

lymph sources, and into the tissue of the lymph follicles of the cortex, by which the adenoid tissue of these latter had become to a great extent destroyed.

"Both lungs were congested in the upper and middle portions, groups of lobules in the latter being dark red and hepatised and not floating in water. The pericardial cavity was filled with several ounces of clear liquid; patches of soft pseudo-membranes were found on the root of the aorta and pulmonary artery, on the wall of both auricles, and particularly along the free margin of the latter. The liver was congested, and showed dark red patches of softened liver tissue. The spleen was enlarged, dark in its substance, with numerous petechiæ in and underneath the capsule. Both kidneys showed much congestion."

The result of microscopical examination of the organs of this and other calves Dr. Klein sums up by saying that the appearances "closely resembled those found in the viscera of cases of fatal human scarlatina."

I will now give for comparison with this account the *post-mortem* appearances of the calf, which was killed at the Royal Veterinary College. This calf had been inoculated in the groin with a scraping from an ulcer of (Wiltshire) cow 1. During the second week after inoculation it was very dull, and did not feed well. It had diarrhœa for several days, and passed bloody urine. It was noticed that it had a slight cough, which got worse. The place of inoculation was suppurating freely, and there was considerable inflammatory thickening around the seat of inoculation. The animal was killed thirty-six days after inoculation.

The *post-mortem* examination of the viscera was made under the supervision of Professor Brown and Professor Axe. I have submitted the microscopical specimens to Professor Brown. I will now give a detailed account.

Naked Eye Appearances: Lungs.—Upper and middle lobes of each lung adherent to the walls of the chest; patchy congestion, especially of middle lobe, and patches of recent adherent lymph. Posterior parts of the upper lobes of both lungs were completely consolidated, and on section varied in colour from brick-red to greyish-white. The interlobular tissue was infiltrated with inflammatory products, which mapped out the tissue of the lung in small indurated areas, in which the tissue was granular looking and friable. These appearances in the upper lobes were due to pleuro-pneumonia. Scattered through the other lobes of both lungs were white, mostly firm, nodules raised above the level of the surface of the lung. They were surrounded by a zone of congestion, and in some cases sections were composed of indurated, in others of friable, lung tissue. In the posterior part of the right upper lobe there was a recent infarct. *Bronchial Glands.*—The bronchial glands at the roots of each lung were enlarged to two or three times their natural size, and were hard and firm in section. *Pericardium.*—The parietal surface of the pericardium was covered with recent adherent lymph. The visceral surface of the pericardium was normal. *Aorta.*—Along the external surface of the aorta were chains of enlarged lymphatic glands connected by dilated lymphatic vessels. These glands were dark red or purplish in colour, from hæmorrhage into their substance. *Heart.*—The heart was normal and the endocardium not stained. *Œsophagus.*—There were chains of red glands on the œsophagus similar to those along the aorta. *Mesenteric Glands.*—The appearance of the mesenteric glands was very striking. The mesentery was dotted along the lymphatic vessels with glands, varying in size from a large shot to a pea, which were deep red or prune coloured. In addition there were here and there enlarged glands, without hæmorrhage into their substance, and greyish in colour. *Spleen.*—There were scattered petechiæ on the spleen. *Kidneys.*—The kidneys were firm on section, and there was marked congestion in both, while it was more pronounced in one kidney than the other. *Liver.*—The liver was congested, the congestion being more marked in patches.

Microscopical Examination.—*Lung.*—Sections from the consolidated upper lobes showed thickening of the pleura and infiltration with round cells. The exudation filled the alveoli, and was breaking down in some cases in the centre. The vessels were injected, and there were hæmorrhages into the alveoli. The periphery of the lobules was infiltrated with round cells. *Kidney.*—Slight infiltration around glomeruli and arterioles; epithelium of convoluted tubes, granular and disintegrating, hæmorrhage in straight tubes, and engorgement of vessels. *Liver.*—Inter- and intra-lobular vessels engorged; intratubular collections of round cells displacing the liver cells; interlobular connective tissue infiltrated with round cells; liver cells granular and cloudy.

There can be no doubt from the symptoms and *post-mortem* appearances that this calf suffered from septicæmia, as the result of introducing septic matter subcutaneously in the groin; and the *post-mortem*

Severely ulcerating Lupus.

HUTCHINSON ON LUPUS.

Lupus mutilans.

Multiple Lupus of children.

Kaposi's Disease

appearances, excluding the consolidation of the apices due to the coincident pleuro-pneumonia, almost reproduce the *post-mortem* appearances observed by Dr. Klein. That the micrococcus from scarlet fever cases should fail to produce in calves fever, ulceration of the tonsils, or scarlatina rash, or any condition resembling clinically the disease in man, and yet that the result should be regarded as scarlatina in the calf, is quite untenable; but I am quite ready to agree with Dr. Klein that similar lesions may be produced in calves, whether inoculated with scrapings from ulcers, or with the streptococcus from the Hendon cows, or with the streptococcus from cases of scarlet fever. The micro-organism is a septic organism (*streptococcus pyogenes*); and its inoculation or the inoculation of septic lymph may produce septicæmia.

SUMMARY.—From the evidence I have adduced, and from the facts that I have described, I am led to the belief that:

1. The nature of the contagium of scarlet fever is unknown.
2. The micro-organism regarded by Dr. Klein as the contagium is the *streptococcus pyogenes*.
3. *Streptococcus pyogenes* is found, sometimes in company with *staphylococcus pyogenes aureus*, as a secondary result in scarlet fever and many other diseases.
4. A streptococcus was first observed in scarlet fever by Crooke, later by Löffler, Heubner, and Bahrdt; but its exact relation to scarlatina, and its undoubted identity with the streptococcus from pus and puerperal fever, was definitely established in 1885 by Fränkel and Freudenberg.

To these I would add the following statements:

5. Both the Wiltshire and Hendon cow diseases were called cow-pox by people on the farms.
6. Both diseases correspond in their clinical history.
7. The ulcers on the teats correspond in naked eye and in microscopical appearances, and the latter "vividly recall the appearances of cowpox."
8. Calves inoculated from the discharges of the ulcers are similarly affected.
9. *Post-mortem* examination of such calves, or of calves inoculated with streptococci isolated from scarlet fever cases, show similar appearances.

10. The *post-mortem* appearances in such inoculated calves are the result of septicæmia.

11. There are no specific visceral changes in cow-pox apart from complications or coincident affections.

I propose to publish shortly the history of the lad shown at the Society, the full details of the calves inoculated from the boy, and of calves inoculated from those calves, the results of revaccination of those calves, and further details from Wiltshire and Gloucestershire.

RUPTURE OF THE SAC IN THE EARLIER STAGES OF TUBAL PREGNANCY, WITH NOTES OF TWO CASES.

By WILLIAM JAPP SINCLAIR, M.A., M.D.,

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CASE 1. Tubal Pregnancy: Sudden Death: Necropsy.—During the greater part of 1880 a patient, nullipara, was under treatment for an enlargement of the uterus, with retroversion. In November she did not menstruate, and in December she had symptoms which suggested pregnancy, but they were very slight, and from the history and circumstances it seemed an improbable event. On January 1st, 1881, she was taken suddenly ill, with faintness and pain in the bowels. The medical man who was sent for in the emergency found the chief symptom diarrhoea with tenesmus. The patient sank rapidly, and when I arrived in the evening, in response to a telegram, she was dead.

From my previous knowledge of the case, on learning the details of the fatal illness, I concluded that the patient had died of hæmorrhage from the bursting of the sac of a tubal pregnancy. We were permitted to make an examination of the abdomen, and we found it full of blood. There was a tubal pregnancy apparently of about six weeks' duration; the sac was near the middle of the left Fallopian tube, and the orifice, from which blood oozed on disturbing the parts, was on the posterior surface, so that there was a free opening into the pelvis. The uterus contained several fibroid tumours projecting on the serous surface, the largest of them about the size of a walnut. In cutting through the abdominal walls, which was done carefully as if in the performance of an operation on the living, we were struck with the

appearance of the blood through the peritoneum before it was cut. As soon as the peritoneum was reached we knew there was blood in the abdomen, because of the black colour apparently given to the peritoneum by the blood behind it.

It will be noted in the history of this case that the pregnancy was not capable of definite diagnosis. It was too early for certainty in almost any case; but in this case there were the previous symptoms of diseased uterus and disturbed menstruation, the uterus was always enlarged to the touch, owing, as was found after death, to the presence of small fibroids. The sound was not used after the menstrual period had been missed, and there was no sort of examination to excite unusual movements of the uterus or tubes for nearly a month before the rupture of the sac.

When the rupture took place, it will be observed that the disturbance set up in the bowels became the most prominent feature in the case, and so obscured the diagnosis that the experienced practitioner who was called in on the emergency concluded that some unusual bowel complication had occurred.

This case made a deep impression on my mind, and I resolved that if ever the opportunity occurred to me, I would operate at once, and endeavour to stop the hæmorrhage by surgical means. It seemed a simple operation, and the only question was how far the bathing of the whole abdominal cavity in blood, which could not possibly be completely removed, might militate against a successful result. Very few cases of operation in the early stage had been published at that time, and the proceeding did not seem so common-place then as it may appear now.

CASE II. Tubal Pregnancy: Rupture of Sac: Laparotomy: Recovery.—The next case is that of a patient of Mr. Priestley, of Fallowfield, at whose suggestion I had the opportunity of helping in the treatment. She was residing at a distance from home at the time of the rupture of the sac. Mr. Priestley's notes of the case prior to operation are as follows:

"The patient, Mrs. —, between 30 and 35 years of age, vii-para, after menstruating regularly for more than twelve months from the birth of the last child, missed two menstrual periods, and was, when the present symptoms commenced, a week past the second. A week after the first missed period there was a slight brownish discharge, which subsided after a two days' rest on the couch.

"On February 13th, 1887, the patient 'believes she caught cold.' On February 15th, after a hasty tea, she hurried to catch a train. Hardly was she seated in the carriage when she was seized with a 'sudden terrible pain, paleness, vomiting, and faintness.' She was carried out of the train on its next stoppage, in a few minutes, and conveyed home, when her abdomen was found to be 'distended like a drum.' The temperature was normal. On February 16th the pain and faintness continued, and the temperature was found to be 101°. She also complained of muscular pain in the limbs. The pain diminished towards evening, under the influence of sedative medicine. On February 17th the intense abdominal pain returned quite suddenly at 3 A.M., and at 5 A.M. a clot of blood passed by the vagina. More morphine was administered, and the pain abated towards evening. On February 19th, at 3 A.M., four days after the first attack of pain in the abdomen, the patient was once more seized with intense abdominal pain, and immediately became collapsed and pulseless. During the day she was seen by Mr. Priestley, and subsequently by Dr. Sinclair. She had then rallied. The abdomen was much distended and tympanitic; it was very tender all over, but extremely so beneath the ribs on both sides; there was dulness in both flanks, and in a zone one inch above the pubes (horizontal position of the body). The uterus was high up, and its movements were slightly impeded; the left broad ligament was somewhat full and stiff. The cervix was soft, the os externum patulous, and a trickling discharge of blood still continued. The pulse was over 120, and very soft; the temperature was somewhat above the normal. Diagnosis: rupture of a tubal pregnancy.

"It was determined to open the abdomen at once, and, if the diagnosis proved correct, to proceed to check hæmorrhage by surgical means, and remove the ovary and tube, and, if possible, the ovum."

The operation was performed with as much attention to antiseptic precautions as the circumstances of the emergency would permit. It seemed tolerably certain that hæmorrhage had repeatedly occurred when, in the process of rallying, the blood-pressure had reached a certain point, and there was every reason to fear a recurrence, which might be fatal, if we delayed till morning. The operation was, therefore, proceeded with immediately after our consultation, which was held late on the night of February 19th. The incision was carried as quickly as possible down to the peritoneum, and when this was reached any possible shade of doubt as to the nature of the case which might