chief is done. The presence of a staff prevents such an accident. I believe in removing the projecting prostate with forceps and twisting it off in one piece if small, piecemeal if large. By twisting or torsion hæmorrhage is lessened. The intravesical growth should alone be attacked; no good will come of trying to remove the lateral lobes even in part. In clearing the vesical urethral orifice of all surrounding projecting prostate tissue much assistance will be obtained by the presence of a metal sound in the urethra. Hæmorrhage is usually very free, and will be all the more so if the prostate has been attacked with knife or scissors, the use of both of which instruments I deprecate. Dr. Keyes, of New York, has had much experience of prostatectomy, and has suggested a lint tampon drawn into the prostatic urethra by a thread through the urethra, but I have found the bleeding sufficiently controlled by hot water irrigation, and all plugs must add to the patient's pain. My space is limited, and I make no special reference to perineal prostatectomy as compared with suprapubic, because the former operation is performed, practically and metaphorically, in the dark. The parts concerned are almost always beyond the reach of the finger, hæmorrhage is usually severe, and the risk of that most distressing condition, a perineal urinary fistula, resulting is very appreciable. I am also obliged to omit noticing the results obtained by the suprapubic route by Belfield, McGill, Mayo Robson, Jessop, Atkinson, Keyes, Southam, and Moullin; their works, however, speak for themselves.

In conclusion, I would express my present opinions as follows:

1. Suprapubic prostatectomy should never be undertaken at the outset of catheter life unless regular catheterism is impossible.

2. The operation should never be undertaken as long as the ordinary catheter life is a tolerable one.

3. If, from any of the causes I have detailed, catheter life becomes intolerable, suprapubic cystotomy should be resorted to. By means of this proceeding the bladder can be thoroughly explored, and any stone removed, which in these cases may easily have escaped detection by the more usual methods of examination. The intravesical growth, if it is found to exist, and of this existence we can never be sure until the finger is in the bladder, can be fully examined, and removed if the operator thinks right to do so. If he deems removal inadvisable, or if there is nothing which can be removed, he can leave the patient with a suprapubic tube, for permanent after-wear, with the certainty that he will have materially improved the condition of the patient.

4. Should the operator decide to remove the prostatic obstruction, there is a very good prospect, but not a certainty, of the power of natural micturition being restored to the patient.

CHEMICAL VACCINE AGAINST RABIES.¹

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AND

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In a previous publication we described the results of the researches we had made concerning the extraction from the central nervous system of rabid animals of a principle for vaccination against rabies. By means of this principle we succeeded in every case in securing for rabbits immunity even from subdural infection.

Later on we propose to communicate the methods for the extraction and preparation of this substance, and a series of experiments to determine its nature and properties, which have already been begun in this laboratory, will be published. We desire now, in view of their great importance both scientifically and practically, to make known the results of the antirabic vaccination obtained in rabbits by means of this substance.

The vaccine is extracted from the central nervous system of a rabbit which has died from *virus fixe*, though even that

taken from a rabbit of the first generation after direct inoculation has given us absolutely positive results. We confine ourselves, however, to the use of the first named in order to have a material to deal with the strength of which is definitely determined. We employ this vaccine in solution made always under exactly the same conditions, and the same designation, thus enabling us to obtain results both constant in themselves and comparable with each other. The proportions we have selected as most convenient for our purposes are so regulated that every 10 c.c. of the liquid contains dissolved the active principle of about 1 gramme of the rabic nervous system. This solution has a limpid appearance, is colourless like water, or very slightly tinted of a straw colour, without odour, with neutral reaction, and aseptic in the most restricted sense of the word.

By a series of preliminary experiments, we have several times satisfied ourselves that the vaccinating substance we employ is deprived of all virulent properties. Whether injected under the dura mater or introduced in fairly large quantity (5 c.c.) under the peritoneal cavity in the rabbit, it never gives rise to any of the phenomena of rabies.

Further, we have been able to demonstrate that it is without hurtful action of any kind, whether local or general. In fact with inoculation under the skin of large quantities of the solution (20 c.c.) in a single dose, or of still larger quantities (50 c.c.) during several days, no local irritation or general disturbance of any kind has ever been observable in the animals thus treated, no alteration of the temperature beyond the normal limits, no diminution of the ordinary liveliness of the animal nor of its weight, which even in the case of young animals follows its usual course of gradually increasing.

Further, this antirabic vaccine not being in the form of an emulsion, but in that of complete solution, spreads rapidly and becomes completely absorbed in a few seconds when injected even in large quantities or several times in the subcutaneous connective tissue. With this vaccinating substance we have, since the month of January, been carrying on numerous experiments. The animal we selected was invariably the rabbit; the virus used for infecting them was taken from three different dogs, and its virulence was previously conclusively established by numerous control experiments. Our researches may be divided into two series, those in which the vaccination was performed before infection, and those in which it was performed afterwards.

PREVENTIVE VACCINATION.

The animals belonging to this series received by subcutaneous inoculation varying quantities of the vaccinating solution repeated during a varying number of days. The day after the final inoculation the animal was infected (always under the dura mater) with the virus of "street" rabies. After which all further injections were discontinued, and the development of the experiment carefully followed.

In 3 animals the vaccination treatment was prolonged during two weeks, each animal being inoculated with 40, 30, 25 c.c. of the vaccinating solution on several occasions. In 8 other animals the time of the treatment was shortened to eight days, and they were respectively inoculated with 30, 30, 20, 20, 15, 15, 10, 7 c.c. of the vaccinating solution distributed over daily doses. In another animal the treatment lasted five days with 20 c.c. of the solution administered in five equal doses each day. One more animal also received 20 c.c. of the vaccinating solution, but in two doses on the two days preceding the infection. Finally, 1 animal received the dose of 20 c.c. at one single time on the day preceding the infection.

To sum up, therefore, we see that the treatment before infection was carried out in 14 cases; that the quantity of the vaccinal solution employed has ranged from 40 to 7 c.c., and that the time elapsing between the commencement of the vaccination to the moment of infection has varied from two weeks to one day. The whole number of control animals all inoculated under the dura mater was 6, and they died between the fifteenth and twenty-first day after infection. Twelve of the animals treated are alive and in excellent health, and a considerable time (five months already for the first ones) having elapsed since their infection, we may regard their recovery as definitive. Of the 2 remaining animals, 1 died of rabies the fifteenth day after inoculation, that one

¹ Read in the Section of Pathology at the Annual Meeting of the British Medical Association held at Nottingham, July, 1892.

having received 7 c.c. of the vaccinating solution in eight days, and the other died also of rabies on the twenty-second day of the experiment, having received 10 c.c. of the solution in the same time.

These results demonstrate, as far as regards the preventive vaccination series, that with the vaccine we have isolated from the nervous system of the rabic rabbit, we can always succeed in vaccinating the rabbit against subdural inoculation with rabic virus. That the minimum dose of our solution of vaccine to ensure this positive result in the rabbit is 15 c.c., being equivalent to $1\frac{1}{2}$ gramme of the nervous system. That a smaller dose than the above has no effect, or merely retards by a few days the death of the animal. That in order to obtain in the rabbit immunity with our vaccine, it is not necessary for a considerable time to elapse between the vaccination and the infection, but that on the contrary for the achievement of positive results, one inoculation of the necessary dose of the vaccine suffices, and the animal may then be inoculated even on the following day with "street" virus.

CURATIVE VACCINATION.

For experimenting as to the curative properties of our vaccine the animal was first infected with "street" virus in the sciatic nerve, and a series of injections of the vaccine were then begun, the time between the infection and the commencement of the treatment being varied, as well as the quantity of the material inoculated.

In the first animal the treatment was begun fourteen hours after the infection, and was continued for ten consecutive days, with a total dose of 38 c.c. With two animals the treatment was begun thirty hours after the infection and prolonged for ten days, as in the previous case, one animal receiving 38 c.c. of the vaccinating solution and the other 20. In a fourth animal the vaccination was performed sixty-four hours after the infection, 50 c.c. of the solution being inoculated in ten days. In a subsequent experiment the treatment was begun on the fourth day after the infection with 50 c.c. in ten days. Finally, in a last animal the treatment was started on the seventh day after infection, and 50 c.c. were administered in eight days. Six animals, therefore, have been treated after having been infected, the quantity of the material injected having varied from 20 to 50 c.c., and the time between the date of infection and the first application of the vaccine from fourteen hours to seven days.

The number of animals used in the control experiments for this series was five, and they were inoculated in the sciatic nerve, and died from the fifteenth to the twentieth day after infection. Of those animals which were treated two only developed rabies. The first was one of those two whose treatment was commenced thirty hours after infection, and who was the one to whom the smallest dose was given, that of 20 c.c. This one died on the fifteenth day. The second was one of the two whose treatment was begun upon the seventh day. This one died on the twentieth day after the infection.

The result of these experiments as to the curative vaccination demonstrate: That our vaccine clearly shows its potency against hydrophobia in the rabbit, even when first administered during the incubation period of the malady. That to obtain this positive result a larger dose is necessary than that which is sufficient to ensure it in the case of the merely preventive vaccination. Even with the treatment begun most carefully, the dose of 20 c.c., which is sufficient when used preventively against rabies, is not enough to cure it. That, so far as we have at present observed, independently of the amount of the dose employed, our vaccine can only effect its purpose if the treatment be begun not later than the fourth day after the infection has taken place. If this fact could be substantiated by further experiments, the difference between the vaccinating substance and the protection immunity conferring substance in the treatment of hydrophobia would be demonstrated. The one acts indirectly and requires a certain period of time, the other directly and after the malady has declared itself.

This demonstration is now irrefutable, for with our vaccine it is not possible, as with that of M. Pasteur, to attribute the insufficiency of its action to the slowness with which it becomes absorbed, or to the employment of a material of gradual attenuation. From our experiments conclusions may therefore be drawn of the greatest importance for science and

practical medicine. The scientific importance consists in the fact that this is the first time that it has been possible to isolate a vaccinating substance which, while not being in itself chemically pure, is yet entirely deprived of all toxic and virulent matter, and highly charged with vaccinating property—in fact, we may say that we have thus isolated the prototype of vaccine.

In this way we believe we establish the principle which, up till now, has not got beyond the stage of hypothesis, that vaccination is an entirely chemical fact or phenomenon due to the presence of a particular substance, which is developed from the infecting agent in the media of those cultures which are special to it.

For the practical question of the antirabic vaccination of individuals who have been bitten it will at once be obvious that an increased improvement our method is upon that discovery which will always remain an immortal glory for Pasteur. In fact, our method may be much more efficacious and much more easy of application. The efficacy is shown by the results obtained in the rabbit, an animal particularly susceptible to rabies, and one which, as all experimenters agree, can only with the greatest difficulty be rendered "proof" by the Pasteur method. We, on the other hand, can ensure immunity even under very dangerous conditions, such as subdural infection, the vaccination being performed all at one time, and the treatment begun at a very advanced period.

This all arises from the fact that our vaccine is not attenuated, is not virulent, and can be administered in the form of a solution—qualities which allow of rapid treatment in strong doses, and which are indispensable conditions for obtaining a favourable result. The greater convenience of the treatment consists, with our vaccine, in the possibility of performing it rapidly at very slight cost, without incurring the expense of a long journey, and also without the alarm of receiving a vaccine, which is still capable of giving rabies to a rabbit. By this means antirabic vaccination combines at one and the same time the maximum of power and the evident possibilities of practical extension.

Another advantage of our vaccine is to give us more easily the opportunity of obtaining rabbits which shall have been rendered to a very high degree "proof" and whose blood will contain, as we have already demonstrated, a principle capable of conferring immunity in the treatment of those cases when the disease is already developed. In those circumstances when the vaccine shows itself to have but little power, as in cases of bites on the face, and when the treatment has been begun late, we can add to the vaccine the last-mentioned product, which acts in a direct manner, even at the more advanced stages of the disease.

Finally, after our discovery, the idea of systematically vaccinating all dogs may be taken into serious consideration, as it would no longer be necessary to have special institutes for the purpose. One or a few injections would suffice. It is not toxic, and it would cost but little. In this manner, by attacking rabies at its original source, it would be possible to ensure an efficacious and radical preventive against the disease and to reduce its extension within extremely narrow limits.

THE INSTITUTE OF CHEMISTRY.—The report presented at the annual meeting of the Institute of Chemistry last week stated that, in consequence of the occurrence of "several cases of objectionable advertising and other practices," the Censors of the institute had drawn up a report, and had advised the adoption of a code establishing a better standard of professional custom and usage. The institute has acquired premises in Bloomsbury, and here laboratories will be erected in which the practical examination for admission will be conducted. The Council has joined with the Royal Horticultural Society in its representations to the London County Council, inviting it to take action to minimise, or to remove, the causes of the inimical influence of fogs on public health and vegetation. The institute was founded not quite fifteen years ago, with 225 Fellows; it now has 718 members. Dr. W. A. Tilden, F.R.S., in his presidential address, had therefore good grounds for congratulating the institute on the progress which has been made.