

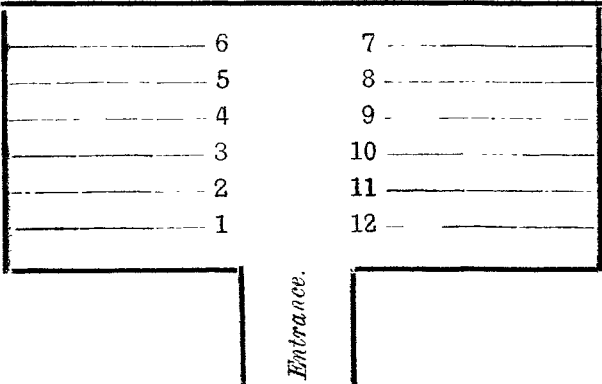
THE AERIAL CONVEYANCE OF INFECTION,
WITH A NOTE ON THE CONTACT INFECTION OF CHICKEN-POX.

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IN an article published in THE LANCET of June 13th, 1914 (p. 1669), Mr. Clifford Price and I recorded two years' work on the aerial conveyance of infection in certain fevers. This work has been continued with increasing difficulty since the outbreak of war until Sept. 29th, 1915, when it had to be stopped owing to shortage in the type of nursing staff, capable of the high standard necessitated, who could be spared for the work. Shortly after the outbreak of war Mr. Price was required for more important duties elsewhere, and I wish to record how deeply I am indebted to him for undertaking this work and sharing the heavy responsibilities with me.

Since a continuation of the investigation has of necessity to be postponed, it seems a fitting opportunity to record the whole of the statistics from the commencement, while avoiding unnecessary repetition of the original article. Once more I wish to express my great appreciation of the work of the nurses, and particularly of Sister Helen Turner, who continued in charge of the ward until it was closed.

For a clear understanding of the position of the patients in the ward the following plan showing the disposition of the beds is necessary:—



The space allotted to each patient is 195 square feet floor space and 15 lineal feet wall space. Commencing Feb. 12th, 1912, 497 patients were treated during a period of three years and somewhat over seven months. As a number of these patients suffered from more than one disease, the number of individual diseases is necessarily more, and amounted to 657.

TABLE I.—Showing the Number of Patients Treated, and the Diseases from which they Suffered.

Scarlet fever (with 9 septic cases)	137	Scarlet fever and whooping-cough	18
Scarlet fever and diphtheria (1 septic scarlet fever case) ...	8	Scarlet fever and varicella (1 septic scarlet fever case) ...	38
Scarlet fever and diphtheria and varicella	3	Scarlet fever and mumps	8
Scarlet fever and diphtheria and vaginal discharge	1	Scarlet fever and incipient measles	1
Scarlet fever and diphtheria and whooping cough	1	Scarlet fever and varicella and tinea tonsurans	2
Scarlet fever and diphtheria and mumps	2	Scarlet fever and vaginal discharge	6
Scarlet fever and whooping-cough and varicella	3	Scarlet fever and rubella	26
Scarlet fever and rubella and tinea tonsurans	1	Scarlet fever and rubella and Vincent's angina	1
		Diphtheria	71

TABLE I. (Continued).

Diphtheria and whooping-cough	5	Tonsillitis and varicella	1
Diphtheria and mumps	6	Scabies	2
Diphtheria and varicella	4	Pneumonia	2
Diphtheria and rubella	1	Erysipelas	1
Diphtheria and Vincent's angina	1	Tonsillitis	19
Diphtheria and vaginal discharge	1	Mastoiditis	1
Whooping-cough	41	Faucitis	7
Whooping-cough and varicella	2	Pyrexia	2
Whooping-cough and rubella	1	Erythema simplex	7
Whooping-cough and mumps	4	Conjunctivitis	1
Varicella	9	Laryngitis (non-diphtheritic)	1
Varicella and mumps	1	Urticaria	1
Mumps	2	Burns	2
Rubella	11	Vaginal discharge	1
Incipient measles	1	No obvious disease	32
		Total	49

TABLE II.—Showing (separating out the Combined Diseases) the Number of Cases of each Individual Disease.

Scarlet fever... ..	256	Pneumonia	2
Diphtheria	104	Erysipelas	1
Varicella (including 9 secondary cases left in ward)	63	Tonsillitis	20
Whooping-cough (including 2 secondary cases left in ward)	75	Mastoiditis	1
Mumps	23	Faucitis	7
Incipient measles	2	Pyrexia	2
Rubella	41	Erythema simplex	7
Vincent's angina	2	Conjunctivitis	1
Scabies	2	Urticaria	1
Vaginal discharge	9	Burns	2
Tinea tonsurans	3	No obvious disease	32
Laryngitis (non-diphtheritic)	1	Total	657

TABLE III.—Days' Stay in Ward.

Number of patients	497
Aggregate number of days spent in ward	13,146
Average number of days spent in the ward by each patient ...	26.31

TABLE IV.—Age-periods.

	Males.	Females.
Under 1 year	6	6
1-2 years	19	24
2-3 „	37	33
3-4 „	28	35
4-5 „	34	37
5-10 „	90	134
10-15 „	3	10
15-20 „	1	—
Total	218	279

TABLE V.—Showing the Day of Disease on which Cases were Admitted to the Ward.

Disease.	First day.	Second day.	Third day.	Fourth day.	Fifth day.	Sixth day.	Seventh day.	Second week.	Third week.	Fourth week.	Over 4 weeks.	Total.
Scarlet fever ...	8 [*]	21 [†]	53 [‡]	41	10	8	5	14	19	13	64	256
Diphtheria ...	—	4	7	18	6	4	12	19	10	3	21	104
Whooping-cough ...	4 [§]	4	4	9	7	—	6	19	9	1	12	75
Varicella ...	12 [¶]	4	31	7	2	3	1	3	—	—	—	63
Rubella ...	32	6	—	2	—	—	—	1	—	—	—	41
Mumps ...	16	3	2	1	1	—	—	—	—	—	—	23
Measles ...	2	—	—	—	—	—	—	—	—	—	—	2
Total ...	74	42	97	78	26	15	24	56	38	17	97	564

* 1 septic. † 3 septic. ‡ 4 septic. § 3 septic. ¶ 2 infected in ward, ¶ 9 infected in ward.

Secondary Infections.

All secondary infections that arose in the ward are called attention to below.

1. Scarlet fever.—256 cases of scarlet fever, including 11 septic cases, were treated in the ward, and, in addition, 2 cases which were infected in the ward. Of these 256 cases, 146 were admitted during the first week of the disease, and 110 at a later period. One case of secondary infection occurred on Dec. 24th, 1913, the other on the

following day, and both were left in the ward. As suggested in the former article, the more likely mode of infection was the inadvertent admission of a nurse to duty in the ward who was suffering from a septic finger, and who consequently was unable to wash her hands thoroughly. It is well, however, to record one doubtful secondary infection in January, 1915. This was a case of diphtheria and whooping-cough which developed a rash resembling scarlet fever, but I regarded the rash as being the result of the serum treatment for diphtheria. I admit the case may have been one of scarlet fever, and that I erred in my diagnosis, but the balance of the evidence was in accord with my conclusion.

2. *Diphtheria*.—104 cases were treated. Of these, 51 were admitted during the first week of the disease and 53 at a later period. No secondary cases occurred.

3. *Rubella*.—41 cases of rubella were treated. Of these, 32 were admitted on the first day of the disease, 6 on the second day, 2 on the fourth day, and 1 on or about the eighth day. No secondary cases occurred.

Several scarlet fever convalescents who had been exposed to rubella in other wards were admitted on the chance that they might develop the disease and so help to show if aerial conveyance would take place before the advent of the eruption. None of these developed rubella. Two of the nursing staff of the ward contracted the disease. The first had the rash on April 10th, 1915, and she was on duty in the ward on April 8th. The second developed the rash on April 13th, 1915, and she was on duty up to 8 A.M. on the 12th and not afterwards. No infection arose from these contact exposures.

On one occasion an opportunity arose of placing two first-day cases of rubella into the ward at the same time and advantage was taken of it. On another occasion a first-day case and a second-day case were placed in the ward at the same time.

4. *Mumps*.—23 cases of mumps were treated. Of these, 16 were admitted on the first day of the disease, 3 on the second day, 2 on the third day, 1 on the fourth day, and 1 on the fifth day. On two separate occasions two first-day cases were admitted at the same time, but no infection resulted from these double introductions. One infection of mumps arose and the infected patient occupied Bed 7. There were two possible sources of infection. One patient admitted on the first day of the disease occupied Bed 2, and another admitted on the third day occupied Bed 9. Counting from the first day of exposure the incubation period in the former case would have been 35 days and the latter 15 days. If infection was aurally conveyed I favour the former source. I am doubtful, however, whether this infection may not have been due to some fault in the nursing technique.

5. *Whooping-cough*.—75 cases were treated, including 2 infected in the ward. Of these, 34 were admitted during the first week of the disease, including the two infected in the ward; 19 were admitted in the second week and the remainder at a later period of the disease. Five cases of infection occurred, all of which are described in the original article. Since July 15th, 1913, there has been no whooping-cough infection, although 48 cases have been treated since that date.

6. *Measles*.—No case of measles was knowingly admitted to the ward, but 2 cases admitted with other diseases were incubating measles. Both were productive of secondary cases, as described in the original article.

7. *Chicken-pox*.—63 cases were treated, including 9 infected in the ward. Of the 54 cases introduced, 3 were admitted on the first day of the disease; 4 on the second day; 31 on the third day; 7 on the fourth day; 2 on the fifth day; 3 on the sixth day; 1 on the seventh day; 2 on the eighth day; and 1 on the tenth day. The 3 cases admitted on the first day of the disease all had fresh crops of lesions afterwards and 1 was an infecting case. This case had fresh crops of lesions until the fourth day and infected two patients. The 4 cases admitted on the second day had fresh crops of lesions in two instances, one a copious crop. Three of these infected one patient each; the 2 with fresh crops after admission and one of the others. Of the 31 cases admitted on the third day 4 had a fresh crop of lesions next day, 2 of which were copious crops; 1 of the cases with a copious crop was in Bed 6 and infected the occupant of Bed 8. The other three cases did not cause infection. Of the remaining 27, 2 proved to be infecting cases, and will be described below.

A few of the earlier cases of chicken-pox received "special nursing," which meant that the senior nurse on day or night duty was detailed off to look after the chicken-pox case, and was not allowed to touch any other patient except protected ones, and no other nurse was allowed to touch the chicken-pox patient or anything connected with him.

The 12th case was the last to receive "special nursing," therefore none of the undermentioned cases were so nursed.

19th case.—Bed 1: Third day; fresh vesicles on day of admission, but no fresh lesions in ward. Eleven other cases in ward; 4 protected, 7 unprotected. No infection.

20th case.—Bed 1: Tenth day; scabs only. Six other cases in ward; 3 protected, 3 unprotected. No infection.

21st case.—Bed 1: Third day; fresh vesicles on day of admission, but no fresh lesions in ward. Eleven other cases in ward; 5 protected, 5 unprotected, 1 doubtful. No infection.

22nd case.—Bed 1: Third day; fresh vesicles on day of admission, but no fresh lesions in ward. Eleven other cases in ward; 6 protected, 5 unprotected. No infection.

23rd case.—Bed 1: Third day; pustules but no fresh lesions in ward. Nine other cases in ward; 3 protected, 6 unprotected. No infection.

24th case.—Bed 1: Third day; fresh vesicles on day of admission and fresh crop day after admission. Nine other cases in ward; 5 protected, 4 unprotected. No infection.

25th case.—Bed 1: Second day; vesicles few in number on admission and a fresh and copious crop day after admission. Ten other cases in ward; 6 protected, 4 unprotected. Infected the occupant of Bed 11, who had been removed to another ward.

26th case.—Bed 1: Second day; vesicles but no fresh lesions in ward. Nine other cases in ward; 4 protected, 5 unprotected. Infected the occupant of Bed 6, who had been transferred to another ward.

27th case.—Bed 1: Third day; vesicles but no fresh lesions in ward. Eleven other cases in ward; 3 protected, 7 unprotected, 1 doubtful. No infection.

28th case.—Bed 1: Fourth day; scabs only, no fresh lesions in ward. Eight other cases in ward; 4 protected, 3 unprotected, 1 doubtful. No infection.

29th case.—Bed 1: Third day; vesicles but no fresh lesions in ward. Eight other cases in ward; 4 protected, 4 unprotected. No infection.

30th case.—Bed 1: Third day; vesicles but no fresh lesions in ward. Nine other cases in ward; 5 protected, 4 unprotected. No infection.

31st case.—Bed 1: Third day; vesicles but no fresh lesions in ward. Nine other cases in ward; 5 protected, 4 unprotected. No infection.

32nd case.—Bed 1: Third day; vesicles but no fresh lesions in ward. Eleven other cases in ward; 7 protected, 4 unprotected. No infection.

33rd case.—Bed 2: Third day; vesicles but no fresh lesions in ward. Eleven other cases in ward; 7 protected, 4 unprotected. No infection.

34th case.—Bed 1: Third day; pustules but no fresh lesions in ward. Eleven other cases in ward; 5 protected, 6 unprotected. No infection.

35th case.—Bed 1: Third day; vesicles but no fresh lesions in ward. Eight other cases in ward; 4 protected, 4 unprotected. No infection.

36th case.—Bed 2: Third day; fresh vesicles on day of admission and a fresh and copious crop after admission. Eight other cases in ward; 4 protected, 4 unprotected. No infection.

37th case.—Bed 3: Third day; vesicles but no fresh lesions in ward. Nine other cases in ward; 4 protected, 5 unprotected. No infection.

38th case.—Bed 1: Third day; vesicles but no fresh lesions in ward. Ten other cases in ward; 2 protected, 8 unprotected. No infection.

39th case.—Bed 3: Third day; vesicles but no fresh lesions in ward. Eleven other cases in ward; 5 protected, 6 unprotected. No infection.

40th case.—Bed 8: Third day; vesicles but no fresh lesions in ward. Eleven other cases in ward; 5 protected, 6 unprotected. Infected the occupant of Bed 7, who had been transferred out of ward.

41st case.—Bed 3: Third day; vesicles but no fresh lesions in ward. Eleven other cases in ward; 3 protected, 8 unprotected. No infection.

42nd case.—Bed 10: Third day; vesicles but no fresh lesions in ward. Eleven other patients in ward; 2 protected, 9 unprotected. No infection.

43rd case.—Bed 6: Sixth day; scabs but no fresh lesions in ward. Nine other cases in ward; 2 protected, 7 unprotected. No infection.

44th case.—Bed 8: Eighth day; scabs but no fresh lesions in ward. Nine other cases in ward; 2 protected, 7 unprotected. No infection.

45th case.—Bed 5: Third day; vesicles but no fresh lesions in ward. Eleven other cases in ward; 2 protected, 9 unprotected. Infected the occupant of Bed 8 who was left in ward, and in turn infected the occupants of Beds 6 and 9. No further infections.

46th case.—Bed 7: Third day; vesicles, fresh crop on day of admission but not in ward. Eleven other cases in ward; 4 protected, 7 unprotected. No infection.

47th case.—Bed 10: Third day; vesicles, fresh crop on day of admission but not in ward. Eleven other cases in ward; 4 protected, 7 unprotected. No infection.

48th case.—Bed 4: Third day; vesicles but no fresh lesions in ward. Ten other cases in ward; 5 protected, 5 unprotected. No infection.

49th case.—Bed 4: Eighth day; scabs but no fresh lesions in ward. Eight other cases in ward; 5 protected, 3 unprotected. No infection.

50th case.—Bed 9: Fourth day; vesicles but no fresh lesions in ward. Six other cases in ward; 2 protected, 4 unprotected. No infection.

51st case.—Bed 1: Third day; vesicles, fresh crop on day of admission but not in ward. Eight other cases in ward; 4 protected, 4 unprotected. No infection.

52nd case.—Bed 6: Third day; vesicles, copious crop the day after admission to ward. Eleven other cases in ward; 3 protected, 7 unprotected, 1 doubtful. Infected occupant of Bed 8, who had been transferred to another ward.

53rd case.—Bed 1: Third day; vesicles, fresh crop on day of admission but not in ward. Nine other cases in ward; 2 protected, 4 unprotected, 3 doubtful. No infection.

54th case.—Bed 1: Third day; vesicles, fresh crop on day of admission but not in ward. Nine other cases in ward; 2 protected, 4 unprotected, 3 doubtful. No infection.

As stated above, 3 out of the 31 third-day cases each caused one infection. The first (Case 40) was in Bed 8 and infected the occupant of Bed 7. The second (Case 45) was in Bed 5 and infected the occupant of Bed 8. The third (Case 52) was in Bed 6 and infected the occupant of Bed 8.

Case 40 was the twenty-first case of the series introduced on the third day of the eruption, and the first 19 of the series were each placed next to a protected case or between two protected cases. Case 39 was placed between a protected and an unprotected case, and Case 40 between two unprotected cases, and although 39 failed to infect, 40 did. The bringing nearer to infection of the unprotected cases may reasonably be considered to add to the danger. This course was persisted in until the ward closed, with the result that 6 cases of chicken-pox had each been placed between unprotected cases; 5 next unprotected cases on one side only, and 1 between an unprotected and a doubtfully protected case. The only infection was the one recorded above.

The next third-day infecting case (Case 45) I cannot satisfactorily account for. This patient, who occupied Bed 5, was placed between two unprotected cases and did not infect either of them, but did infect the occupant of Bed 8, directly on the opposite side of the ward. It is to be noted that the occupant of Bed 6 escaped infection from Case 45; he was left in the ward as well as the occupant of Bed 8, from whom he contracted chicken-pox. Case 45 was not a patient from whom to expect infection, for the total number of lesions was quite moderate and there were no fresh lesions on the day of admission or later, the

second crop having occurred on the day prior to admission to the ward. It may be that the occupant of Bed 8 was a peculiarly susceptible child, and that the occupant of Bed 6 could withstand infection to some extent, but responded to a more powerful infection. On the whole, however, I think that the occupant of Bed 8 was probably infected by indirect contact due to some error in the nursing technique. I am the more disposed to take this view, knowing the difficulty of maintaining the nursing at the highest level at that time.

The last third-day infecting case (Case 52) might also be attributed to faulty technique, but I do not feel satisfied that such an explanation is justifiable, though the possibility must be admitted. This patient was in Bed 6 and infected the occupant of Bed 8, not quite directly opposite, but failed to infect an unprotected child in the bed next to him. Case 52 had a large crop of fresh lesions on the day following admission to the ward, which may very well account for the infection. On the other hand, it must be remembered that three other third-day cases had fresh crops of lesions on the day following admission (one of them a large crop), without causing infection. Up to, and including, Case 31, only one third-day case of chicken-pox was introduced into the ward at the same time. It was then thought desirable to introduce two third-day cases at the same time if they could be procured. This was done with Cases 32 and 33, and they were placed in Beds 1 and 2; and the same course was adopted with Cases 35 and 36, also in Beds 1 and 2. Finally it was done with Cases 46 and 47, who were put into Beds 7 and 10. In this instance two unprotected cases lay between 46 and 47, and another unprotected patient next to 47 on his other side. No infection arose from these three double exposures.

Comparatively early in the investigation, having introduced a number of third-day cases without infection having arisen, I thought that the second-day case, early in the series, which had produced infection, might have been exceptional, or possibly due to some error in technique. Therefore, I introduced Cases 25 and 26 on the second day of the eruption. However, both of these caused infection. I subsequently commenced introducing cases early on the third day of the eruption, and a number of these passed through the ward. Until Case 40 (the twenty-first third-day case) caused infection the apparent abrupt stoppage of the conveyance of infection by air was a matter of wonder to me, and could hardly be expected to be constant. Yet it appears to hold good that it is unusual under the conditions in this ward for infection to be airborne, even from cases introduced early on the third day. It is interesting to note the distances in the ward that the infection of chicken-pox was aerielly conveyed. In all, 15 infections arose. On two occasions the infection was conveyed the whole length of the ward, on three occasions about half the length of the ward, and in the remaining ten the distance was short. The long- and medium-distance infections originated from four first-day cases and a second-day case, and the latter accounted for one of the long-distance infections.

It must be understood that deductions as to the aerial conveyance of infection do not apply to any other conditions than those obtaining in this special ward, for the results might be different were the beds closer to each other, the ventilation less good, &c. I have come to the conclusion that scarlet fever infection is not conveyed by air. It has been

held for many years that the infection of diphtheria is not air-borne, and the evidence in this ward only makes it clearer that this opinion is correct.

I am disposed to regard the evidence as strong against the conveyance of rubella infection by air. A considerable number of the cases of rubella introduced into the ward during the winter of 1914-1915 came from two scarlet fever wards into which the infection had come from outside the hospital, and in these two wards the infection persisted for many weeks although new patients were not admitted. Such persistence of infection in this disease is uncommon, and therefore indicated unusual activity.

I was surprised when an infection arose from mumps (if the infection was aerially conveyed), and I still incline to the view that this disease is probably not air-borne.

The last infection of whooping-cough occurred on July 15th, 1913, although since that time 48 cases have been treated in the ward. Nevertheless I confess I am still in doubt as to whether this disease may be occasionally air-borne or not. Taking into consideration the propelling power of the cough, I feel that longer experience is necessary before a reliable conclusion can be reached.

I am quite satisfied that chicken-pox infection is air-borne early in the disease, but it is difficult to determine the exact time it ceases to be so. It may uncommonly be conveyed by air on the third day, but apparently not afterwards.

A Note on Contact Infection in Chicken-pox.

Although it is safe to treat chicken-pox at certain stages of the disease in this special ward with all its precautions against direct and indirect contact infection, it does not follow that it would be safe to treat it in a similar, or even scabbing, stage in an ordinary ward where no such precautions were taken. It is commonly held that chicken-pox remains infectious until the last scab has separated from the patient's skin. For many years I have been unable to accept that view, and I have often placed patients who were approaching the completion of the scabbing stage into wards amongst children who were not suffering from chicken-pox. With the intention of working this subject out systematically I decided towards the end of 1914 to introduce cases of scarlet fever and chicken-pox into a small boys' scarlet fever ward, but not to guard against contact infection in any way. I purposely chose a ward in which the patients were young, and the ages of the unprotected exposed to the cases of chicken-pox were—one year, 1; two years, 5; three years, 8; four years, 13; five years, 12; six years, 15; seven years, 2; and eight years, 5. As it was necessary that the patient introduced should be a male suffering from both scarlet fever and chicken-pox, and that no other patients should be admitted to the ward while each test was in progress, &c., the work was necessarily slow. In all, 7 patients suffering from both diseases passed through the ward; 1 being introduced on the sixteenth day of chicken-pox; 1 on the twelfth day; 1 on the eleventh day; 1 on the tenth day; 2 on the ninth day; and 1 on the eighth day. Only one case was introduced at a time, and was kept in the ward until all the scabs had separated, or longer; while no patient was discharged until more than 22 days had elapsed after the first exposure, many being kept much longer. No infection arose from any of these cases. The ward in which this work was done accommodated 20 patients.

1st case.—Sixteenth day of chicken-pox; numerous scabs. Nineteen other patients in ward: 12 protected, 5 unprotected, 2 doubtful. No infection.

2nd case.—Eleventh day; a few scabs. Eighteen other cases in ward: 12 protected, 5 unprotected, 1 doubtful. No infection.

3rd case.—Tenth day; moderate number of scabs. Nineteen other cases in ward: 5 protected, 12 unprotected, 2 doubtful. No infection.

4th case.—Ninth day; scabs fairly numerous. Eighteen other cases in ward: 9 protected, 7 unprotected, 2 doubtful. No infection.

5th case.—Twelfth day; scabs fairly numerous. Nineteen other cases in ward: 10 protected, 9 unprotected. No infection.

6th case.—Ninth day; scabs very numerous. Eighteen other cases in ward: 9 protected, 8 unprotected, 1 doubtful. No infection.

7th case.—Eighth day; moderate number of scabs. Nineteen other cases in ward: 4 protected, 15 unprotected. No infection.

Although only seven cases of chicken-pox in the scabbing stage have passed through the ward as yet, it is sufficient to show that I was justified in my disbelief of the generally accepted view. While it is interesting that the last case was introduced as early as the eighth day, yet it will probably take a considerable time to discover the exact day of the disease on which the chicken-pox patient ceases to be a danger to those with whom he comes in contact. Nevertheless, enough has been done to lead to economy in the provision of isolation accommodation for this disease in hospitals, and to show that it is needless to keep the chicken-pox patient separate from others for so long as is generally supposed necessary.

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THE UREA CONTENT OF THE CEREBRO-SPINAL FLUID:

WITH SPECIAL REFERENCE TO THE DIAGNOSIS OF URÆMIA.

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In recent years a considerable amount of work has been carried out, chiefly by French observers, on the urea content of the cerebro-spinal fluid. Mestrezat, who has collected the data of Javal, Dirksen, Widai, Froin, Froment, and many others, and who has made many additional observations, has come to the following conclusions: 1. The normal physiological urea content of the cerebro-spinal fluid is 0.006 per cent. 2. Cases of renal impermeability to urea without uræmia may show up to 0.1 per cent. of urea, and occasionally individuals may have a larger quantity without showing clinical signs. 3. Cases of clinical uræmia in which no other disease is present (i.e., "pure uræmia") have been found to have 0.098 to 0.634 per cent., and of these cases those with readings below 0.3 per cent. are curable and those with readings above 0.3 per cent. are fatal. (Mollard and Froment, to whom the terms "pure" and "associated" are attributable, choose 0.4 per cent. as the dividing line.) 4. Cases of clinical uræmia in which some other disease is present (i.e., "associated uræmia") have been found to show 0.1 to 0.764 per cent. of urea. 5. The content of urea present in the cerebro-spinal fluid, whether it be normal or raised, is approximately the same as in the blood.