Clinical and other Notes

To those inspired "to seek out the secrets of nature" the excellent description of the complicated mechanism of the rotation of the gut in the "Synopsis of Surgical Anatomy," by A. L. McGregor (John Wright and Sons, Ltd., Bristol), is recommended. Without the assistance of Mr. McGregor's book this case could not have been recorded.

My thanks are due to Colonel K. Comyn, Officer Commanding, British Military Hospital, Meerut, for permission to submit this record for publication.

URINARY GLUCOSE IN PREGNANCY.

By Major C. R. Christian,
Royal Army Medical Corps.

The renal threshold for glucose, or leak-point of the kidney, is that level of blood-sugar above which glucose appears in the urine. The normal threshold is about 180 mgm. glucose per 100 c.c. blood. The amount of blood-sugar in the normal individual does not rise above this level; hence the urine is sugar-free.

The threshold for glucose, however, may vary in different individuals in health and disease. Thus certain people who have a low threshold may exhibit glycosuria although the blood-sugar is normal and such people are apparently healthy. This is termed renal glycosuria, the cause of which is uncertain.

Although a temporary lowering of the renal threshold in pregnancy is not a fresh discovery, most textbooks say little or nothing of this matter. It is not of uncommon occurrence and its true nature is not always recognized by medical officers occasionally in charge of families. It is hoped, therefore, that the following notes of cases which were dealt with at the Military Hospital, Colchester, may be of interest.

Case 1.—Mrs. Fr., aged 24: Primigravida 7 months.

Previous health very good. The patient looks and feels well and is well nourished. On further questioning she complains of slightly increased thirst and micturition and a mild pruritus vulvae, but has not reported these symptoms which have only lasted for a few weeks. There are no signs or symptoms of thyroid, pituitary or adrenal disease. Glucose is present in considerable quantity in the urine, as shown by the fermentation of yeast. The history of the case is as follows:—

The urine had been examined during the fifth and sixth months of pregnancy and no sugar found. In the seventh month the urine contained considerable glucose; no ketone bodies, albumin or casts were found; specific gravity 1030. A few days later the glucose tolerance test was
carried out with 50 grammes of glucose by the mouth and gave the following results:—

<table>
<thead>
<tr>
<th>Time after glucose given</th>
<th>Glucose level (mgm. glucose per 100 c.c. blood)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting blood</td>
<td>68</td>
</tr>
<tr>
<td>1/2 hour after glucose given</td>
<td>90</td>
</tr>
<tr>
<td>1 hour after glucose given</td>
<td>137</td>
</tr>
<tr>
<td>14 hours after glucose given</td>
<td>106</td>
</tr>
<tr>
<td>2 hours after glucose given</td>
<td>90</td>
</tr>
</tbody>
</table>

Urine passed two hours after ingestion of glucose contained 5 per cent glucose.

As the patient was therefore not a true case of diabetes she was encouraged to take a full diet. Five days later a blood sugar estimation was twice again performed:—

<table>
<thead>
<tr>
<th>Time after meal</th>
<th>Glucose level (mgm. glucose per 100 c.c. blood)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 hours after full breakfast</td>
<td>100</td>
</tr>
<tr>
<td>1 hour after full dinner</td>
<td>125</td>
</tr>
</tbody>
</table>

The subsequent history may be briefly stated. Fourteen urine examinations were carried out during the last three months of pregnancy, including early-morning and 24-hour specimens. Sugar was always present (3·7 per cent during the eighth month and 3·8 per cent during the ninth month, on full diet). Yeast tests, with controls, were several times performed and were always definitely positive. Ketone bodies were frequently tested for (Rothera) and never present. Instrumental delivery was effected at full term under chloroform and ether, without complications. The mild pruritus, etc., rapidly disappeared after confinement.

Urine twenty-two days after confinement contained 2·5 per cent sugar, and thirty-six days after confinement 1·8 per cent sugar. Unfortunately, change of station prevented further examinations, but it was reported to me about two months later that Mrs. Fr. was quite well.

Case 2.—Mrs. W., aged 23. Primigravida 7 months.

Previous health good. Patient looks and feels well, but also complains of slight pruritus vulvae of recent origin. Glucose, confirmed by yeast test, found in routine examination of urine early during seventh month.

History of case:—

Urinary examinations during fourth, fifth and sixth months revealed no sugar. After its discovery a sugar tolerance test with 50 grammes of glucose was performed during the seventh month with the result:—

<table>
<thead>
<tr>
<th>Time after glucose given</th>
<th>Glucose level (mgm. glucose per 100 c.c. blood)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting blood</td>
<td>63</td>
</tr>
<tr>
<td>40 minutes after glucose given</td>
<td>136</td>
</tr>
<tr>
<td>75 minutes after glucose given</td>
<td>128</td>
</tr>
<tr>
<td>120 minutes after glucose given</td>
<td>110</td>
</tr>
</tbody>
</table>

Urine passed one hour forty minutes after ingestion of glucose contained 0·2 per cent sugar and fermented yeast.
The patient's diet was not restricted at any time except for the performance of the tolerance test. The urine was again examined for sugar as follows:

Middle of 7th month: before breakfast 0.1 per cent, after breakfast 0.4 per cent*
End of 7th month: before breakfast 0.1 per cent, after breakfast 0.3 per cent
Middle of 8th month: before breakfast 0.2 per cent, after breakfast 0.5 per cent
Middle of 9th month:
One week after parturition
Two months after parturition

* Four hours after breakfast, sugar was absent.

The urine was examined seven times for ketone bodies (before and after breakfast specimens) but was always negative. No albumin or casts were found and there was nothing to indicate renal disease. S.G. varied from 1006 to 1022. The specimen containing 0.4 per cent sugar was fermented by yeast for twenty-four hours, filtered, and the filtrate failed to reduce Benedict's solution, so that no lactose was present with the glucose. Parturition was uneventful.

**Case 3.**—Mrs. C. Multigravida (2).

No relevant previous history. Looks healthy, but states definitely she is eating and drinking more than before her pregnancy, and complains of some thirst and frequency of micturition, especially at night. There is a mild complicating cystitis dating from before the pregnancy.

The urine examined monthly from the fourth to the eighth month inclusive was negative for sugar. Early in the ninth month a small amount of glucose, confirmed by yeast, was discovered. A partial sugar tolerance test (50 grammes glucose) was then carried out with the following results:

<table>
<thead>
<tr>
<th>Time</th>
<th>Glucose in Blood (mgm. per 100 c.c.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 minutes after glucose given</td>
<td>140 mgm. glucose per 100 c.c. blood</td>
</tr>
<tr>
<td>1.5 hours after glucose given</td>
<td>134 mgm. glucose per 100 c.c. blood</td>
</tr>
<tr>
<td>2 hours after glucose given</td>
<td>100 mgm. glucose per 100 c.c. blood</td>
</tr>
</tbody>
</table>

Urine passed seventy-five minutes after ingestion of glucose contained no sugar.

The patient was allowed full diet. Thirteen further examinations of urine were carried out: one before parturition (negative) and the remainder from the day of parturition until fifteen days later. Sugar was only found on the following days after parturition:

<table>
<thead>
<tr>
<th>Day after parturition</th>
<th>Sugar in Urine</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd day after parturition</td>
<td>0.5 per cent sugar present in urine</td>
</tr>
<tr>
<td>4th day after parturition</td>
<td>(a) first specimen 0.3 per cent sugar (yeast fermentation +, no lactose present)</td>
</tr>
<tr>
<td></td>
<td>(b) second specimen 0.1 per cent sugar</td>
</tr>
</tbody>
</table>

Thereafter the urine contained no sugar. Pus cells were found in moderate numbers, usually a trace of albumin was present and one culture was sterile. Ketone bodies (four examinations) were not found. The patient's general health continued satisfactory.
Clinical and other Notes

Case 4.—Mrs. S., aged 23.

Only a few urine examinations were made during the pregnancy as the patient looked and felt well. One sample of urine contained 0.5 per cent. sugar and fermented yeast (positive and negative controls), but after twenty-four hours fermentation with yeast still reduced Benedict’s solution to less extent. Chemicals were not available to make lactosozone test but presumably lactose was also present. Later urine examinations were negative for sugar. No acetone or albumin present. Patient continued healthy without treatment.

Case 5.—Mrs. Fo.

A search of the laboratory records produced notes of another case, possibly of this type, but neither the dates of origin nor cessation of glycosuria were recorded. Thirty-four examinations of urine were made from three weeks before until one month after parturition, and in all sugar was present, ranging from 0.19 to 1.3 per cent. Lactose was stated to have been excluded. Ketone bodies were present from three weeks before until two days after parturition, and were thereafter absent. No albumin. Specific gravity 1013 to 1027.

Blood-sugar examinations:

- 19 days before parturition: 114 mgm. glucose per 100 c.c. blood
- 17 days before parturition: 104 mgm. glucose per 100 c.c. blood
- Date unspecified: 80 mgm. glucose per 100 c.c. blood
- 5 days after parturition: 50 mgm. glucose per 100 c.c. blood
- 9 days after parturition: 125 mgm. glucose per 100 c.c. blood*
- 1 month after parturition: 156 mgm. glucose per 100 c.c. blood
- 6 weeks after parturition: glucose tolerance test — “blood sugar returned to normal in 2 hours”

* "After 50 grammes glucose given."

While the above investigations were being carried out it was decided that Mrs. Fo. was not a true case of diabetes and therefore diet restrictions were removed, without ill effect. Insulin was given on several occasions but was discarded as it had no good effect, and it did not abolish the ketosis. The general health continued satisfactory without treatment.

CONCLUSIONS.

(1) Five cases of glycosuria occurring during pregnancy have been briefly described. None of these were cases of true diabetes, and in the four in which blood-sugar estimations were carried out no hyperglycaemia was found.

(2) In Cases 1 and 2 the onset of glycosuria was in the seventh month, in Case 3 in the ninth month. Cases 2 and 4 cleared up before parturition, Case 3 a few days after it, and Case 1 probably within two months or so of parturition.
(3) The concentration of sugar in the urine varied on a normal diet from 0.1 per cent to 3.8 per cent.

(4) The general health of the patients was good and continued so without treatment. Cases 1 and 2 complained of mild local symptoms presumably due to the glycosuria. Case 4 had no symptoms whatever.

(5) No ketosis was found except in Case 5. It cannot be stated definitely however that this last case was due simply to the pregnancy.

My thanks are due to Lieutenant-Colonel O. R. McEwen, M.D., M.R.C.P., R.A.M.C., Officer Commanding the Military Hospital, Colchester, for permission to send this article for publication.

MUSINGS ON URINARY pH VALUES.

By MAJOR I. H. LLOYD-WILLIAMS, M.C., M.B., Royal Army Medical Corps (T.A.).

The kidney has as its function the voidance of waste products, both solid and liquid. The urine thus secreted is an index of the metabolism of the body with or without changes superadded as a result of disease of the urinary tract.

It must be realized that the body is continually striving to keep the composition of its circulating fluids at a constant level. The optimum range of blood reaction is slightly alkaline, being 7.28 to 7.41. Apart from diseased conditions, biochemical variations occur in different parts of the circulation as a result of such physiological functions as digestion and exercise. Urinary analysis is one of the methods of assessing these changes in vital functions.

The kidney is a compact and very complex system of glomeruli and tubules. The part played by the various sections in the secretion of the finished urinary product must remain to a large extent a matter of speculation. Its anatomical structure and position do not lend themselves to direct experiment.

Its functions are: (1) The excretion of fluids; (2) the concentration and excretion of solids and in some cases bacteria. For any one substance in the blood there is a renal threshold; concentration above this level leads to its excretion in the urine. This threshold may vary from the normal as a result of renal or cardiovascular disease. In this article the normal kidney only is being considered.

Urinary reaction is normally tested with litmus paper. This method unfortunately gives no numerical index of acidity or alkalinity for comparison or estimation of the total acid passed per diem, the normal being estimated as equal to between 20 and 40 cubic centimetres of N/10 NaOH per 100 cubic centimetres of urine passed in twenty-four hours.