# THE USE OF URISTIX AS A RAPID SCREENING TEST FOR PROTEINURIA AND GLUCOSURIA IN OBSTETRICS AND GYNAECOLOGY

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Uristix reagent strips combine 2 quick, simple, standardized colour tests for the detection of proteinuria and glucosuria. The strip of stiff absorbent cellulose has 2 portions near one end impregnated with the reagents for the protein and glucose tests, separated from each other and from the remainder of the strip by water-impermeable barriers. At the extreme tip is the portion for the protein test (yellow), the mechanism of which is based on the phenomenon of the protein error of indicators, in which certain chemical indicators of the acid alkali type show one colour in the presence of protein and another colour in its absence at the same pH. This portion is impregnated with the indicator tetrabromophenol blue and buffered to about pH 3. At this pH tetrabromophenol blue is yellow in the absence of protein and changes to a shade of green when protein is present, depending on its type concentration.

The second portion nearer the middle of the stick (red) is for glucose detection. This is impregnated with a buffered mixture of glucose oxidase, peroxidase, orthotolidine and red dye. The reaction takes place in 2 stages. The glucose is oxidized by atmospheric oxygen in the presence of glucose oxidase to gluconic acid and hydrogen peroxide. The hydrogen peroxide in the presence of peroxidase oxidizes orthotolidine to a blue compound, which with the red dye gives a shade of purple.

The test provides a simple, rapid and clean method of detecting protein and glucose in the routine examination of patients attending the antenatal clinic, and also on admission to a gynaecological ward before operations. No apparatus is required and the tests can be conducted in a minimum of space.[1-10]

The directions are simple:

1. Dip test end of strip in urine and remove immediately.
2. Compare colour of protein portion (at tip) closely with the protein colour chart at once.
3. Observe colour of glucose portion 10 seconds after dipping. Any shade of purple indicates the presence of glucose. Positive blocks on glucose colour guide show typical reactions.

Ignore any change of colour appearing after 10 seconds. This is a qualitative test for glucose, and is not quantitative.[1]

## USE IN ANTENATAL CLINIC

A sample of 50 consecutive patients' urine specimens were tested first with Uristix, and then with Benedict's test for reducing sugars and the salicyl-sulphonic acid routine 'cold' test for protein substances. The results are expressed in Table I. This was done at the Queen Victoria Maternity Hospital, Johannesburg.

*Comment*

The tests for glucose agreed in all 50 patients, when the urine was tested by Uristix and then Benedict's test at the same time (100% concurrence).

The tests for proteinuria agreed in 39 of the 50 urines tested at the same time (78% concurrence). In 9 (18%) of the remaining 11 patients, traces of albuminuria were found on testing with Uristix, but were not found with the salicyl-sulphonic acid test; in 2 patients (4%) the proteinuria was undetected on testing with Uristix. One of

TABLE I. RESULTS OF TESTING 50 CONSECUTIVE PATIENTS' URINE FOR PROTEIN AND SUGAR

| | | *Uristix* | | *Salicyl-sulphonic acid* | *Benedict's test* | |
|---|---|---|---|---|---|---|
| | *No.* | *Protein* | *Sugar* | *Protein* | *Sugar* | |
| | 1. | Nil | Nil | Nil | Nil | |
| | 2. | Nil | + | Nil | + | |
| | 3. | Nil | Nil | Nil | Nil | |
| | 4. | Nil | Nil | Nil | Nil | |
| | 5. | Nil | Nil | Nil | Nil | |
| | 6. | Nil | Nil | Nil | Nil | |
| | 7. | Nil | Nil | Nil | Nil | |
| | 8. | Trace | Nil | + | Nil | * |
| | 9. | Nil | Nil | Nil | Nil | |
| | 10. | Nil | Nil | Nil | Nil | |
| | 11. | Nil | Nil | Nil | Nil | |
| | 12. | ++ | Nil | ++ | Nil | |
| | 13. | Nil | Nil | Nil | Nil | |
| | 14. | Nil | Nil | Nil | Nil | |
| | 15. | Nil | Nil | Nil | Nil | |
| * | 16. | Trace | Nil | Nil | Nil | |
| * | 17. | Trace | Nil | Nil | Nil | |
| | 18. | Nil | Nil | Nil | Nil | |
| | 19. | Trace | Nil | Trace | Nil | |
| * | 20. | Trace | Nil | Nil | Nil | |
| | 21. | Nil | Nil | Nil | Nil | |
| * | 22. | Trace | Nil | Nil | Nil | |
| | 23. | Nil | Nil | Nil | Nil | |
| | 24. | Nil | Nil | Nil | Nil | |
| | 25. | Nil | Nil | Nil | Nil | |
| * | 26. | Trace | Nil | Nil | Nil | |
| * | 27. | Trace | Nil | Nil | Nil | |
| | 28. | Nil | Nil | Nil | Nil | |
| | 29. | Nil | Nil | Trace | Nil | * |
| | 30. | Nil | Nil | Nil | Nil | |
| * | 31. | Trace | Nil | Nil | Nil | |
| * | 32. | Trace | Nil | Nil | Nil | |
| | 33. | Nil | ++ | Nil | ++ | |
| * | 34. | Trace | Nil | Nil | Nil | |
| | 35. | Nil | Nil | Nil | Nil | |
| | 36. | Nil | Nil | Nil | Nil | |
| | 37. | Nil | Nil | Nil | Nil | |
| | 38. | Nil | Nil | Nil | Nil | |
| | 39. | Nil | Nil | Nil | Nil | |
| | 40. | Nil | Nil | Nil | Nil | |
| | 41. | Nil | Nil | Nil | Nil | |
| | 42. | Nil | Nil | Nil | Nil | |
| | 43. | Nil | Nil | Nil | Nil | |
| | 44. | Nil | Nil | Nil | Nil | |
| | 45. | Nil | Nil | Nil | Nil | |
| | 46. | Nil | Nil | Nil | Nil | |
| | 47. | Nil | Nil | Nil | Nil | |
| | 48. | Nil | Nil | Nil | Nil | |
| | 49. | Nil | Nil | Nil | Nil | |
| | 50. | Nil | Nil | Nil | Nil | |

Asterisk marks a disagreement in result between different methods of testing.

these 2 patients showed the presence of a trace of protein in the urine, missed by Uristix, the other showed + of proteinuria, a trace having been detected using Uristix.

### USE IN A GYNAECOLOGICAL WARD

The experiment was now repeated using the catheter specimens of urine obtained from 50 patients admitted for gynaecological surgery to the Florence Nightingale Gynaecological Unit of the Department of Obstetrics and Gynaecology.

These specimens of urine were subsequently submitted to the laboratory for microscopic examination and bacteriological culture.

The results are expressed in Table II.

*Comment*

The tests for proteinuria agreed in 41 of the above patients (82%). In 5 (10%) of the remaining 9 patients Uristix-testing showed traces of protein which were undetected on control testing with salicyl-sulphonic acid. In

TABLE II. RESULTS OF TESTING CATHETER SPECIMENS OF 50 CONSECUTIVE PATIENTS' URINE

| | *No.* | *Uristix* | | *Cold test* | *Benedict's test* | *Cells/high-power field* | *Bacterial culture* | |
|---|---|---|---|---|---|---|---|---|
| | | *Protein* | *Glucose* | (*Protein*) | (*Sugar*) | | | |
| | 1. | Nil | Nil | Nil | Nil | Nil | Nil | |
| | 2. | Nil | Nil | Nil | Nil | Nil | *Aerobacter* (+) | |
| | 3. | Trace | Nil | Trace | Nil | Nil | *Aerobacter* (scanty)<br>*Ps. pyocyanea* (+) | |
| | 4. | Nil | Nil | Nil | Nil | Nil | Nil | |
| | 5. | Nil | Nil | Nil | Nil | Nil | *E. freundii* (scanty) | |
| | 6. | Nil | Nil | Nil | Nil | Nil | *Klebsiella* (+) | |
| | 7. | Nil | Nil | Nil | Nil | Nil | Nil | |
| | 8. | + | Nil | + | Nil | 4 Polys | *E. coli* (scanty)<br>*Achromobacter* (+) | |
| * | 9. | Trace | Nil | Nil | Nil | Nil | Nil | |
| | 10. | Nil | Nil | Nil | Nil | Nil | Nil | |
| | 11. | Nil | Nil | Nil | Nil | Nil | Nil | |
| | 12. | Nil | Nil | Nil | Nil | Nil | Nil | |
| | 13. | Nil | Nil | Nil | Nil | Nil | Nil | |
| | 14. | Nil | Nil | Nil | Nil | Nil | Nil | |
| | 15. | Nil | Nil | Nil | Nil | Nil | Nil | |
| | 16. | Nil | Nil | Nil | Nil | Nil | Nil | |
| | 17. | Trace | Nil | Trace | Nil | 6 Polys, epith. cells | Nil | |
| | 18. | Trace | Nil | Trace | Nil | 1 Poly, epith. cells | *B. anitratum* (+)<br>*Aerobacter* (scanty) | |
| | 19. | Nil | Nil | Nil | Nil | Epith. cells | *Achromobacter* (scanty) | |
| | 20. | Nil | Nil | Nil | Nil | Nil | Nil | |
| | 21. | Trace | Nil | Trace | Nil | Epith. cells | *Achromobacter*,<br>*Aerobacter aerog.* | |
| | 22. | Trace | Nil | + | Nil | 3 Polys, epith. cells | *E. coli* (+) | * |
| | 23. | Trace | + | Trace | + | Epith. cells | *Proteus mirabilis* (+) | |
| * | 24. | Trace | Nil | Nil | Nil | 2 Polys, epith. cells | Nil | |
| | 25. | Nil | Nil | Nil | Nil | Epith. cells | Nil | |
| | 26. | Nil | Nil | Trace | Nil | 3 Polys, epith. cells | *E. coli* (+) | * |
| | 27. | Trace | Nil | Trace | Nil | Epith. cells | *Achromobacter* (+) | |
| | 28. | Nil | Nil | Nil | Nil | 1–2 Polys, epith. cells | *E. freundii* (+) | |
| | 29. | Trace | Nil | Trace | Nil | 8 RBCs, epith. cells | *B. anitratum* (+) | |
| * | 30. | Trace | Nil | Nil | Nil | 1–2 Polys, epith. cells | *E. coli* (scanty) | |
| | 31. | Trace | Nil | Trace | Nil | Epith. cells | *Achromobacter* (+) | |
| | 32. | Nil | Nil | Nil | Nil | Epith. cells | *Aerobacter aerog.* (+) | |
| * | 33. | Trace | Nil | Nil | Nil | Nil | Nil | |
| * | 34. | Trace | Nil | Nil | Nil | Epith. cells | *E. freundii* (scanty) | |
| | 35. | Trace | Nil | + | Nil | Numerous polys | *E. coli* (++) | * |
| | 36. | Trace | Nil | Trace | Nil | 1–2 Polys, 1–2 RBCs | *Achromobacter* (+) | |
| | 37. | Trace | Nil | Trace | Nil | Numerous RBCs | *E. coli* (scanty) | |
| | 38. | Trace | Nil | + | Nil | Numerous RBCs<br>Epith. cells | *E. freundii* (+)<br>*Strep. faecalis* (scanty) | * |
| | 39. | Nil | Nil | Nil | Nil | Epith. cells | *E. coli* (scanty) | |
| | 40. | Nil | Nil | Nil | Nil | 1–2 Polys, epith. cells | *E. coli* (scanty) | |
| | 41. | Nil | Nil | Nil | Nil | Epith. cells | Nil | |
| | 42. | Nil | + | Nil | + | Epith. cells | Nil | |
| | 43. | Nil | Nil | Nil | Nil | 3 Polys, epith. cells | *E. freundii* (scanty) | |
| | 44. | Nil | Nil | Nil | Nil | 4 Polys, epith. cells | *Aerobacter aerog.* (scanty) | |
| | 45. | Nil | Trace | Nil | + | 3 Polys, 2 RBCs | *Achromobacter* (+) | |
| | 46. | Trace | Nil | Trace | Nil | 3 Polys, epith. cells | *E. coli* (scanty) | |
| | 47. | Trace | Nil | Trace | Nil | Epith. cells | *E. coli* (+)<br>*B. anitratum* (scanty) | |
| | 48. | Nil | Nil | Nil | Nil | Nil | Nil | |
| | 49. | Nil | + | Nil | + | Nil | Nil | |
| | 50. | Nil | Nil | Nil | Nil | Nil | *Aerobacter aerog.* (scanty) | |

Asterisk marks a disagreement in result between different methods of testing.

\+ Moderate growth
\+ + Profuse growth

4 patients (8%) Uristix either failed to record proteinuria where it was present on control testing (in 1 patient), or showed traces of protein where + was recorded in the control test (3 patients).

The tests for sugar agreed in all 50 patients (100% concurrence). Proteinuria was present whenever numerous cells were seen on microscopic examination, but was not specifically related to the results of bacteriological culture.

## DISCUSSION

The results of testing for protein and glucose in the urine, using Uristix, compare very favourably with the control-test results.

Uristix can be usefully employed as a rapid screening test for proteinuria or glucosuria in routine antenatal care and in patients admitted for gynaecological surgery. If the Uristix show a positive result, further methods of testing can be used to confirm the result, and to give a quantitative assessment of the glucose in the urine. The advantages of Uristix as a routine method for the detection of proteinuria and glucosuria are summarized in Tables III and IV respectively.

The protein detection test in Uristix is unaffected by urine turbidity or the ingestion of drugs such as tolbutamide, para-aminosalicylic acid, sulphafurazole and penicillin, all of which may cause false +ve results on testing by the other 3 methods considered in Table III.

*False Positives*

False positive Uristix results for protein can be caused by 3 factors.

1. Fermented, very alkaline, or highly buffered urine may overcome the buffer system in the Uristix. This would alter the pH, causing the indicator to change colour due to alkalinity, not protein (e.g. urine from a patient receiving heavy alkali medication, or stale and fermented urine).
2. Urine contamination by quaternary ammonium compounds used to clean the urine container and not subsequently thoroughly rinsed (e.g. Cetavlon or Hibitane).
3. Faulty technique in doing this simple test—leaving the reagent strip in the urine too long, or waiting too long before reading the result.

The glucose portion of the Uristix strip is specific for glucose and does not react with the other reducing sugars (e.g. lactose, galactose and fructose) or with reducing metabolites of drugs (e.g. salicylates, para-aminosalicylic acid, penicillin in massive doses, chloral hydrate, streptomycin, isoniazid, antipyrin and ascorbic acid) as occurs in the copper reduction methods (Benedict's and Fehling's) and bismuth reducing methods (Nylander).[1,7,8]

*Precautions and Storage*

Uristix strips must be kept in their container and protected from exposure to heat, light and especially moisture. They should be stored in a dry place (not a refrigerator). The bottle must be tightly recapped immediately after use. The container for the urine sample must be clean, and free from contaminants.

The test end of the strip must not be touched; both impregnated portions must be wet, and the result read at the correct time (i.e. protein immediately, glucose after 10 seconds).

Compare colour obtained with colour charts on the bottle directly. This must be done in a bright white light;

TABLE III. URISTIX TESTING FOR PROTEIN COMPARED WITH OTHER TESTS

| | *Uristix (protein portion)* | *Boiling test (heat + acetic acid)* | *Salicyl-sulphonic acid test (qualitative)* | *Heller's test (nitric acid ring test)* |
|---|---|---|---|---|
| Reagents required? .. | Uristix strip | Acetic acid 5%, 10% or 33% soln. | Salicyl-sulphonic acid 25% soln. | Nitric acid conc. |
| Reagent dangerous? .. | No | Only at highest cones | Yes | Yes very |
| Heat required? .. .. | No | Yes | No | No |
| Apparatus required? .. | None | Boiling tube, dropper, pH paper | 2 test tubes, dropper | Test tube |
| Time of result? .. .. | 5 seconds | 3 minutes | 1 minute | 1 minute |
| Sensitivity (approx.) mg./100 ml. | + shows 30, smaller quantities detectable | 10 | 5–10 | 10 |
| Interference by cloudy urine | Nil | Yes, if not filtered | Yes, if not filtered | Yes, if not filtered |

TABLE IV. URISTIX TESTING FOR SUGAR COMPARED WITH OTHER TESTS

| | *Uristix (glucose portion)* | *Benedict's test* | *Fehling's test* | *Tes-tape* | *Nylander's test (almen test)* |
|---|---|---|---|---|---|
| Reagents required? .. | Uristix strip | Copper sulphate, sodium citrate + 10% sod. carbonate in solution | $CuSO_4$, 25% KOH NaK tartrate solution | Tes-tape | Bismuth subnitrate NaK tartrate + 10% NaOH solution |
| Reagents dangerous? .. | No | No | Yes | No | Yes |
| Heat required? .. .. | No | Yes | Yes | No | Yes |
| Apparatus required? .. | None | Boiling tube, dropper | 2 boiling tubes | None | 2 boiling tubes, filter, funnel, paper, measure |
| Time for result? .. | 12 seconds | 2–7 minutes | 5 minutes | 1–2 mins. | 10 minutes |
| Sensitivity mg./100 ml. .. | 10–100 | 150 | 250 | 20–100 | 80 |
| Dangers .. .. .. | Nil | Spurts | Spurts | Nil | |
| Interference by non-glucose-reducing sugars | Nil | + | + | Nil | + |
| Protein .. .. .. | Nil | Interferes | Interferes | Nil | Interferes (first removed by boiling and filtering) |

coloured fluorescent lighting may interfere with the readings. The protein portion must be held very near to the protein colour chart to get accurate quantitative assessment of the degree of proteinuria present.[1]

*Conclusion*

Uristix have been found to be a reliable, clean, quick and excellent method of testing urine for the presence of glucose and protein substances, in the routine care of antenatal patients, and in those patients admitted to a gynaecological ward for surgery. It is rare for Uristix to miss protein or glucose when these are present in urine. When these are found, further investigation to assess the amount and its cause should obviously be undertaken. False positive results will then be eliminated. The test is sensitive, the protein portion more so to albumins, and the sugar portion is specific for glucose.

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