- ¹⁶ Crow, H. E., Corpe, R. F., and Smith, C. E., *Diseases of the Chest*, 1961, **39**, 372.
- ¹⁷ Chapman, J. S., Dewlett, H. J., and Potts, W. E., *American Review of Respiratory Diseases*, 1962, **86**, 547.
- ¹⁸ Johnston, R. N., *Tubercle*, 1969, **50**, Suppl. 88.
- ¹⁹ Nassau, E., and Merrick, A. J., *Tubercle*, 1970, **51**, 430.
- ²⁰ Bennedsen, J., and Larsen, S. O., *Scandinavian Journal of Respiratory Diseases*, 1966, **47**, 114.
- ²¹ Mitchison, D. A., *Bulletin of the International Union against Tuberculosis*, 1968, **41**, 139.
- ²² Tuberculosis Chemotherapy Centre, Madras, *Bulletin of the World Health Organization*, 1970, **43**, 143.
- ²³ Marks, J., *Monthly Bulletin of the Ministry of Health and the Public Health Laboratory Service*, 1959, **18**, 81.
- ²⁴ Engback, H. C., Vergmann, B., and Bentzou, M. W., *Scandinavian Journal of Respiratory Diseases*, 1967, **48**, 268.
- ²⁵ Stonebrink, B., *Acta Tuberculosa et Pneumologica Scandinavica*, 1958, **35**, 67.
- ²⁶ Marks, J., *Monthly Bulletin of the Ministry of Health and the Public Health Laboratory Service*, 1963, **22**, 150.
- ²⁷ Hughes, M. H., *Journal of Clinical Pathology*, 1966, **19**, 73.
- ²⁸ Boissvert, H., *Revue Tuberculose et de Pneumologie*, 1970, **34**, 117.
- ²⁹ Runyon, E. H., Selin, M. J., and Harris, H. W., *American Review of Respiratory Diseases*, 1959, **79**, 663.
- ³⁰ Young, W. D., Maslansky, A., Lefar, M. S., and Kronish, D. P., *Applied Microbiology*, 1970, **20**, 939.
- ³¹ Tsukamura, M., and Tsukamura, S., *Tubercle*, 1964, **45**, 64.
- ³² Hobby, G. L., et al., *American Review of Respiratory Diseases*, 1967, **95**, 954.
- ³³ Jenkins, P. A., Marks, J., and Schaefer, W. B., *American Review of Respiratory Diseases*, 1971, **103**, 179.
- ³⁴ Lind, A., *Serological Studies of Mycobacteria by Means of Diffusion-in-gel Techniques*, Department of Bacteriology, University of Gothenburg, Sweden.
- ³⁵ Stanford, J. L., and Muser, R., *Tubercle*, 1969, **50**, Suppl. 80.
- ³⁶ Csillag, A., *Journal of General Microbiology*, 1961, **24**, 261.
- ³⁷ Wayne, L. G., Doubek, J. R., and Russell, R. L., *American Review of Respiratory Diseases*, 1964, **90**, 588.
- ³⁸ Canetti, G., et al., *Bulletin of the World Health Organisation*, 1969, **41**, 21.
- ³⁹ Tuberculosis Chemotherapy Centre, Madras, *Bulletin of the World Health Organization*, 1970, **43**, 143.
- ⁴⁰ Medical Research Council, *Tubercle*, 1962, **43**, 201.
- ⁴¹ East African/British Medical Research Council, *Tubercle*, 1969, **50**, 233.
- ⁴² Evans, C., et al., *Bulletin of the World Health Organization*, 1969, **41**, 1.
- ⁴³ Devadatta, S., et al., *Bulletin of the World Health Organization*, 1970, **42**, 337.
- ⁴⁴ Allan, G. L., *Proceedings of the 21st International Tuberculosis Conference*, Moscow, 1972, in press.
- ⁴⁵ Mitchison, D. A., *Proceedings of the 21st International Tuberculosis Conference*, Moscow, 1972, in press.
- ⁴⁶ Schaefer, W. B., *American Review of Respiratory Disease*, 1965, **92**, Suppl. 85.
- ⁴⁷ Marks, J., and Szulga, T., *Tubercle*, 1965, **46**, 400.
- ⁴⁸ East African/British Medical Research Council Fifth Thiactetazone Investigation, *Tubercle*, 1970, **51**, 123.
- ⁴⁹ East African/British Medical Research Council Third Thiactetazone Investigation, *Tubercle*, 1966, **47**, 1.
- ⁵⁰ Miller, A. B., Fox, W., Tall, R., *Tubercle*, 1966, **47**, 33.
- ⁵¹ Miller, A. B., et al., *Bulletin of the World Health Organization*, 1970, **43**, 107.
- ⁵² Singapore Tuberculosis Services/Brompton Hospital/British Medical Research Council Investigation, *Tubercle*, 1971, **52**, 88.
- ⁵³ Bobrowitz, I. D., and Robins, D. E., *American Review of Respiratory Diseases*, 1967, **96**, 428.
- ⁵⁴ Murray, J. F., *International Symposium on Chemotherapy*, 1967, **6**, 339.
- ⁵⁵ Citron, K. M., *Tubercle*, 1969, **50**, Suppl. 32.
- ⁵⁶ Nitti, V., et al., *American Review of Respiratory Diseases*, 1971, **103**, 329.
- ⁵⁷ Newman, R., Doster, B., Murray, F. J., and Ferebee, S., *American Review of Respiratory Diseases*, 1971, **103**, 461.
- ⁵⁸ Lesobre, R., et al., *Revue de la Tuberculose et de Pneumologie*, 1969, **33**, 393.
- ⁵⁹ Lees, A. W., Asgher, B., Hashem, M. A., and Sinha, B. N., *British Journal of Diseases of the Chest*, 1970, **64**, 90.
- ⁶⁰ Lees, A. W., et al., *Tubercle*, 1971, **52**, 182.
- ⁶¹ Schärer, L., and Smith, J. B., *Annals of Internal Medicine*, 1969, **71**, 1113.
- ⁶² Poole, G., Stradling, P., and Worledge, S., *British Medical Journal*, 1971, **3**, 343.
- ⁶³ Kent, P. W., et al., *Tubercle*, 1970, **51**, 24.
- ⁶⁴ Tuberculosis Chemotherapy Centre, Madras, *Bulletin of the World Health Organization*, 1964, **31**, 247.
- ⁶⁵ Tripathy, S. P., in *Proceedings of the 21st International Tuberculosis Conference*, Moscow, 1972, in press.
- ⁶⁶ Fox, W., *Postgraduate Medical Journal*, 1971, **47**, 732.
- ⁶⁷ Polansky, F., *Bulletin of the International Union against Tuberculosis*, 1970, **43**, 295.
- ⁶⁸ Bignall, J. R., *Bulletin of the International Union against Tuberculosis*, 1970, **43**, 253.

Second Opinion, Please

Recurrent Urinary Infections in a Girl

ANDREW SMITH, HUGH JACKSON

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Rose Villa, Whickham, Newcastle upon Tyne

Dear Hugh,

A.B., aged 2, has just had her third urinary infection. The first presented as vomiting with slight fever and minimal diarrhoea and was diagnosed as gastroenteritis. When she began vomiting and was feverish a second time I microscopied her urine, found pus cells, and gave her sulphadimidine.

She got better slowly and a midstream urine specimen ten days later showed neither pus cells nor organisms. The third time she got the same symptoms I sent an M.S.U. to the lab. and

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prescribed ampicillin. She responded quickly and was almost better when the laboratory report came back: *E. coli*—sensitive to everything except ampicillin!

Ought we to look for a congenital abnormality in her urinary tract?

Royal Victoria Infirmary, Newcastle upon Tyne

Dear Andy,

The information you gave me, plus the finding of 1,000 pus cells/mm³ in her urine, made it clear that A.B. had a urinary infection, so I admitted her with her mother for further investigation. Four M.S.U.s grew *E. coli* in significant numbers and also had significant numbers of pus cells, so the diagnosis was confirmed. Her I.V.P. was probably normal, though the demonstration was rather marred by overlying bowel shadows. Her urea was 50 mg%—a little raised—but electrolytes were normal.

In view of your culture results we discharged her on Septrin, 5 ml b.d., and will check her urine in six weeks.

Rose Villa, Whickham, Newcastle upon Tyne

Dear Hugh,

A.B. developed an extensive allergic rash to Septrin, so I stopped it. I checked her urine after a few days. The first specimen was sterile but the second produced *E. coli* resistant to sulphas and ampicillin. I have therefore started her on nalidixic acid.

Royal Victoria Infirmary, Newcastle upon Tyne

Dear Andy,

I was sorry to hear of A.B.'s sensitivity rash, presumably from the sulphonamide in the Septrin. The rash had cleared on Tuesday; there was no pyuria, and a culture is sterile. Could she stay on the nalidixic acid till I see her again in three months?

Rose Villa, Whickham, Newcastle upon Tyne

Dear Hugh,

In the last ten weeks she has had several further *E. coli* urinary infections all initially sensitive to nalidixic acid and quickly responding to it. The last one didn't and M.S.U. showed *E. coli* now resistant to it but sensitive to nitrofurantoin, which quickly killed them. It is reassuring to know that her urinary tract is normal but disconcerting to find her getting resistant *E. coli* even though she remains well and happy most of the time.

Royal Victoria Infirmary, Newcastle upon Tyne

Dear Andy,

In view of A.B.'s repeated relapses while on chemotherapy it was clear that further investigation was necessary. Her micturating cystogram showed quite marked bilateral ureteric reflux and early hydronephrosis, which accounts for our difficulties.

I discussed her with John Scott, who agreed that surgery was necessary. He has now carried out a bilateral reimplantation of her ureters which we hope will help. She has been discharged on nitrofurantoin, 25 mg t.d.s.

Rose Villa, Whickham, Newcastle upon Tyne

Dear Hugh,

A.B. is well and lively after her operation. She is taking nitrofurantoin and all urine specimens have been sterile. I see two points where we might have done better. One is my initial slowness in diagnosis. I might have microscoped her urine when her first illness, apparently atypical gastroenteritis, took so long to resolve, instead of realizing retrospectively that it was probably a misdiagnosis. Getting M.S.U.s from young children is so difficult that one tends not to ask for them unless the indications are much clearer than one expects from adults.

The other is the fallibility of the I.V.P.—the initial one reported normal gave us both a false sense of security. Is it

feasible or desirable to include micturating cystograms in all urinary tract investigations?

Royal Victoria Infirmary, Newcastle upon Tyne

Dear Andy,

I agree that this baby's illness high-lights the difficulties in the diagnosis and management of urinary infections in young children. In recurrent or chronic disease I like to get three positive urine cultures growing the same organism with the same antibiotic sensitivity, and if significant numbers of pus cells are present on microscopy then I am even happier.

Incidentally, we microscope the urine immediately after it is passed: often we find large numbers of cells on immediate examination when the laboratory reports "no pus cells seen" on examination later, because the pus cells have lysed.

Obtaining the specimen for culture is another problem. We use urine collecting bags in hospital, and they might be useful for family doctors also. The snag is to get the specimens examined soon enough, and the technique in your practice of sending the child to the hospital laboratory to pass urine there is excellent.

Three other measures are: (1) Dip-slide cultures; (2) bottles containing boric acid which reduce the growth rate of organisms; and (3) measurement of urinary glucose concentration: organisms use up urinary glucose and there is therefore a relationship between urinary glucose concentration and the numbers of bacteria. Current trials may decide which is the best method.

You mention the fallibility of the I.V.P. In retrospect I was wrong to accept a technically unsatisfactory I.V.P.: I should have repeated it and possibly done a micturating cystogram. Some centres arrange both an I.V.P. and a cystogram when a urinary infection is first diagnosed, others do one or the other, and yet others do neither.

I personally arrange an I.V.P. in all cases: the younger the child the more important it is, as the proportion of abnormal findings is greater. If the upper urinary tract is normal I treat the child with the appropriate antibiotic but arrange a micturating cystogram if he relapses.

The question of the length of treatment is a difficult one. My own custom is to treat the first attack for three to six weeks, and subsequent attacks for six months or a year. Some girls need to be on antibiotics indefinitely, even in the absence of detectable structural abnormality. When I stop treatment I check the urine after two weeks to detect an early relapse and then recheck at increasingly longer intervals till all is well.

I note that neither of us mentioned albuminuria in our correspondence. Some folk still equate albuminuria with infection, but of course the presence of albumin is not diagnostic of a urinary infection, and its absence by no means excludes it either.

I hope A.B. does well after her surgery. She has the inestimable advantage of having an excellent mother whom we can rely on to give her her treatment regularly.

Glossary

M.S.U.	Midstream specimen of urine.
E. coli	Escherichia coli.
I.V.P.	Intravenous pyelogram.
Septrin	Trimethoprin and sulphamethoxazole.