Dipstrips for urine screening

The letter by McGowan et al is a reminder that no wholly effective way of screening urines before culture exists. Because dipstrips give a very high rate of false positivity, if the criterion for choosing urine for culture is that of one or more of leucocyte esterase, nitrite, blood or protein tests being positive, the effect of modifying this interpretation and considering dipstrip testing to indicate the need for subsequent culture only if either one or both tests for leucocyte esterase or nitrite are positive was examined. The presence of a positive test for blood or protein, if not accompanied by a positive test for leucocyte esterase or nitrite, was ignored. Bacterial counts lower than those used by McGowan et al were accepted as positive—values—that is, \( \geq 10^4 \text{ cfu/ml} \) and \( \geq 10^5 \text{ cfu/ml} \) in women and men, respectively, along with \( > 10 \) leucocytes/\( \mu l \) of unspun urine. If pyuria was absent a count of \( > 10^3 \text{ cfu/ml} \) was used if the growth was pure. Mixed growth of \( 10^3 \text{ cfu/ml} \) was regarded as positive only in the presence of a history of urinary catheterisation.

Screening of urines with dipstrips: Could it replace microscopy?

McGowan and colleagues reported the results of an evaluation of Nephur plus labeling dipstrips and concluded that they were not cost effective in microbiology laboratories.\(^1\) I have recalculated the specificity and predictive values of a positive and negative result using their raw data and believe the correct values to be 22.3%, 26.6%, and 96.4%, respectively, and not the figures stated by them. The figures given in the table for the number of positive dipstrips is also at variance with the text. It is unlikely, however, that these differences affect their calculation relating to Welcan units and consumable costs in their laboratory.

It does not necessarily follow, however, that their conclusions apply to all units, because the additional costs are influenced by the number of false positive results (dipstrip positive but culture negative samples). The rate of false positivity in my own department among 1360 concurrent urine samples from children was only 27% compared with 60.3% in McGowan's study. In two other recent studies the rate was 34.8%\(^2\) and 50%\(^3\). I have applied estimated Welcan values and the Bristol costs for consumables to these other studies and my own to determine the effect of selective microscopy and culture combined with routine dipstrips. The increase in workload would be only 1.3% and 2.1% in the other units compared with a reduction of 20.7% in my own department. The increase in cost of consumables would be 13% and 16% in the other units, with a potential reduction of 13-8% in my own laboratory.

The Bristol group did not, however, consider the economics of dipstrips as a replacement for microscopy. The sensitivity of the Nephur plus leucocyte strip (if any test is positive) was 86.0% at Birmingham Children's Hospital and using a similar multistix manufactured by Ames was 94.8%\(^4\) and 97.0%.\(^5\) This compares with the sensitivity of microscopy of 80-5%, 75-9%, and 85-6%, respectively. If microscopy was replaced by dipstrip testing for leucocyte esterase, nitrite, protein and haemoglobin, but all samples were cultured, there would be no overall change in Welcan values. The increase in consumable costs would be partially offset by a reduction in consumables for microscopy. If, however, only samples with one or more positive tests were cultured, but not microscopic, there would be an overall reduction in Welcan values of 32-3% in my laboratory, 16-5% in the Liverpool study, 16-4% in Greenwich (table), and 7-1% at Southmead hospital. This would lead to a reduction in the total expenditure on consumables and labour in all four.

The introduction of Welcan has given us a tool to investigate complex laboratory estimates. Different clinical mixtures of patients, speed of transport and quality of sample will influence the relative costs of different techniques. My calculations suggest that the time has come to reappraise the overall usefulness and efficiency of routine urine microscopy.

CL GOLLEDGE
Central Microbiological Laboratories, Western General Hospital, Crewe Road, Edinburgh

Screening of urines with dipstrips

We were interested to read about the experience of McGowan and colleagues in the use of dipstrips for screening urine samples.\(^1\) Their conclusion, that the use of dipstrips in microbiology laboratories is not cost effective, seems to overlook the possibility of performing the screening test at ward or surgery level. We started screening urines by dipstrip testing in 1989. The dipstrips are ordered by the wards and clinics directly from the supplies department. Only samples producing a positive dipstrip result (one or more of the leucocyte esterase, nitrate, blood or protein tests as positive) are referred to the laboratory for conventional examination. We documented a reduction in the flow of urine specimens received in the laboratory to 71% of its former level.

This approach has relieved the laboratory of the task of the administration, processing, interpretation and report production for some 1000 specimens each month. Telephone enquiries have also decreased in proportion to the reduced workload. The clinicians are able to use the dipstrip test to begin specific treatment directed by the hospital's antibiotic policy, or consider an alternative diagnosis, depending on the urine screening results. Negative samples are not sent to the laboratory, eliminating the need to write out forms, label specimens, and use transport services. Our approach is subject to continuing audit but clearly illustrates the need to consider factors beyond the laboratory testing procedures when assessing the value of different microbiological methods.

Comparative workload of microscopy and culture on all specimens, dipstrip screening and selective microscopy and culture, and dipstrip screening and selective culture

<table>
<thead>
<tr>
<th></th>
<th>Liverpool (n = 1000)</th>
<th>Greenwich (n = 669)</th>
<th>Birmingham Children's Hospital (n = 1360)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of dipstrip positive urines</td>
<td>642</td>
<td>450</td>
<td>509</td>
</tr>
<tr>
<td>Estimated Welcan values:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(A) If all urines microscopied and cultured</td>
<td>7265</td>
<td>4875</td>
<td>8745</td>
</tr>
<tr>
<td>(B) Strip screening and culture + microscopy</td>
<td>7356</td>
<td>4975</td>
<td>6937</td>
</tr>
<tr>
<td>Potential change in workload using method B*</td>
<td>1-3%</td>
<td>+21%</td>
<td>-20-7%</td>
</tr>
<tr>
<td>(C) Dipstrip and selective culture</td>
<td>6072</td>
<td>4075</td>
<td>5919</td>
</tr>
<tr>
<td>Potential change in workload using method C*</td>
<td>16-5%</td>
<td>-16-4%</td>
<td>-32-3%</td>
</tr>
</tbody>
</table>

*Compared with method A.


Dr MacGowan et al comment:
Our recent study on the use of dipsticks was limited to laboratory use, as noted by Mr Chessum and Dr Holliman, because factors outside the laboratory are more difficult to quantify in terms of cost and time, while also being outside our direct control. The reduction in laboratory workload and costs alone suggested by both letters may be offset by increased workloads in other hospital departments and general practitioners' surgeries. For example, the cost, ordering, and invoicing of dipsticks, and nursing or medical time in performing and recording results should be taken into account. Routine transport costs are unlikely to be changed greatly as collections from clinical areas occur whether eight or 10 samples are taken to the laboratory. Whether dipsticks would decrease on-call costs is not known because the patient population may differ from the general one studied by us. Were the financial savings made on microbiology, clerical and portering services in Mr Chessum's and Dr Holliman's hospitals audited and transferred to the clinical departments now performing these extra procedures?

In our particular laboratory with computer generated reports, clinicians and general practitioners have access to results on-line as they become available. As urine microscopies are authorised on the day of receipt, a reduction in telephone enquiries would not be relevant to us. A factor not discussed by Chessum and Holliman is the possibility that universal routine use of dipsticks by doctors and nurses may increase the number of specimens sent to the laboratory due to uncertainty, resulting in a further number of dipsticks which as we know have relatively low predictive value for urinary tract infection. While this does not seem to have been the case in St George's Hospital, it may not be universally true.

The use of dipsticks to screen for urinary infection is more complex than may be initially apparent on superficial evaluation, each hospital having to reach its own conclusions on their potential value.

Bone marrow biopsy in non-Hodgkin's lymphoma

We read with interest the article by Juneja, Wolf, and Cooper.1 Our data on this subject were published last year2 and were based on a similar number of patients using the same classification for lymphoma, so avoiding nosological problems in comparing analyses of the value of bone marrow biopsy. Our own series consisted of 290 patients; 38 were "microscopic" or excluded, leaving a base of 252 patients with non-Hodgkin's lymphoma of all histological grades.

The results of our series and that of Juneja et al are compared in Table 1. Rates of positivity were almost directly comparable in low and intermediate grade lymphoma; differences in high grade lymphoma no doubt reflect the small number (n = 9) in the Juneja series. Overall positivity in our series was 35% compared with 38%. Almost certainly the difference reflects the larger number of low grade cases in that series. Our interpretation of the data from both series is that the use of bilateral iliac crest biopsy specimens in staging of non-Hodgkin's lymphoma is not justified.

To our own series, using single, long core iliac crest biopsy specimens we have the same positivity rate. For iliac crest biopsy specimens we use a Number 8 Island needle wherever possible and the section is examined histologically at three separate levels 0·5 mm apart. Average biopsy length is 25 mm and thus the average area of marrow examined is 150 mm2. This we also compares favourably with that reported by Brunning et al3 and Coller—both relatively small series—who are the only other groups to report on the use of bilateral iliac crest marrow biopsy in non-Hodgkin's lymphoma.

Biopsy specimen length is important especially when it comes to assessing patterns of disease distribution. In our series the mean biopsy specimen length was 25 mm. In 25 of 52 patients with focal deposition of lymphoma there was a mixed distribution in a pararetrabecular and nodular pattern (Table 2). Similarly, when diffuse disease was recorded it was sometimes present only in part of the biopsy specimen. The series of Juneja et al also recognises more than one pattern of infiltration. We find it difficult to comment at present on any particular type of infiltration is absolutely characteristic of any grade of lymphoma let alone subtype. We suggest that both nodular, non-pararetrabecular infiltration, and pararetrabecular infiltration are both variants of focal disease; they may well represent similar mechanisms of infiltration.

We agree with the comments made by the authors on bone marrow aspiration and peripheral blood and that when the appearances of marrow biopsy specimens are normal it is extremely rare to find positive peripheral blood or marrow aspirate samples.

The suggestion in the Juneja series that DLC is a special case which might benefit from bilateral biopsy requires further evaluation on large numbers of patients. We are currently undertaking such studies using single biopsy specimens in our own department and intend to publish these in due course. It would then be interesting to make further comparisons.

S ROATH
AG SMITH
D CHOUHDURI
Haematology Department,
Royal South Hants Hospital,
Southampton

Table 2 Type of infiltration and grade

<table>
<thead>
<tr>
<th>Grade</th>
<th>Pararabecular</th>
<th>Nodular</th>
<th>Mixed</th>
<th>All focal</th>
<th>Diffuse, differentiated, other</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>11</td>
<td>6</td>
<td>6</td>
<td>21</td>
<td>16</td>
<td>37</td>
</tr>
<tr>
<td>Intermediate</td>
<td>16</td>
<td>14</td>
<td>21</td>
<td>41</td>
<td>31</td>
<td>43</td>
</tr>
<tr>
<td>High</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
<td>27</td>
<td>58</td>
<td>96</td>
<td>87</td>
<td>98</td>
</tr>
</tbody>
</table>


Des Juneja, Wolf, and Cooper comment:
We thank Dr Roath and his colleagues for their interesting comments. We are pleased to note agreement on many points in the two series.

By examining bilateral biopsy specimens we have found the incidence of bone marrow disease in non-Hodgkin's lymphoma to be 38%. We estimate that this has resulted in an increase in positivity rate over unilateral biopsy specimens of 15% overall and 25% in cases of diffuse large cell lymphoma. This is comparable with an increase of 10-22% reported in the previous two major series.3,12 Roath et al have achieved a comparable incidence of 35% overall in their series using unilateral biopsy specimens. Possible reasons for this discrepancy could be the longer trephine in their series (25 mm compared with 19 mm in routine examination of three levels of the bone marrow biopsy specimen). Our practice is not to examine multiple levels except in cases with equivocal disease on the first level. It would be helpful if Roath et al would indicate how many cases would have been labelled negative by examining only one and not three levels.

Whether the number of cases of various histological subtypes differs in the two series and contributed to this discrepancy is difficult to ascertain because Roath et al have not mentioned these in their paper. On the basis of their data the use of bilateral biopsy specimens may not be justified if cores 2 mm or longer are obtained and these are examined at multiple levels. In fact, we make a similar point in our paper: "a question that remains unresolved is whether taking two biopsy specimens from the one side would achieve the same result with less discomfort for the patient." We are examining our own data to see if there is any correlation between marrow disease and the length of the biopsy specimen.

We agree with the findings of Roath et al regarding the occurrence of more than one pattern of marrow disease in many lymphomas and the fact that pararetrabecular disease may occur with a focal, non-pararetrabecular pattern. With regard to correlation with histology, our data seem to indicate that the pararetrabecular pattern is characteristic of follicular lymphoma. In our study the interstitial pattern of disease was also not seen in any case of follicular lymphoma. Of course the possibility of discordant histology has to be borne in mind. The latter was seen in six cases of diffuse large cell lymphoma (DLCL) in our series whereby
Screening of urines with dipstrips.

B S Chessum and R E Holliman

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