

# Erythrocyte sedimentation rate: the extinction of a dinosaur laboratory test?

The debate about erythrocyte sedimentation rate versus plasma viscosity has gone on for a considerable length of time. Here, Sabrina Chetcuti provides an update on current thinking.

Many laboratories have historically clung on to erythrocyte sedimentation rate (ESR) as a test to confirm that patients are unwell. Even though the science behind ESR is seen as dubious by laboratory scientists and many clinicians including consultant haematologists, why is the ESR still requested?

Is it just out of habit that we continue to use a test that has no quality control (QC), producing results that will vary without any change in the patient's condition? Aspirin and steroids are the backbone of many treatments for patients with inflammation, and yet they are the very drugs that will significantly

interfere with ESR results, suggesting an improvement which may not have occurred.

Plasma viscosity (PV) testing was seen as the 'cure' for this habit more than 30 years ago, and yet this easy-to-use, rapid and stable diagnostic tool has been overlooked by many laboratories as the high-volume alternative. Over the years, more and more laboratories have elected to use PV testing as a significant tool in their repertoire. Some noteworthy centres of excellence, including Leeds General Infirmary, the Royal United Hospital Bath, Nobles Hospital on the Isle of Man, and the

Royal Devon and Exeter, have made the ambitious commitment to eliminate ESR and replace it with PV.

## Breaking old habits

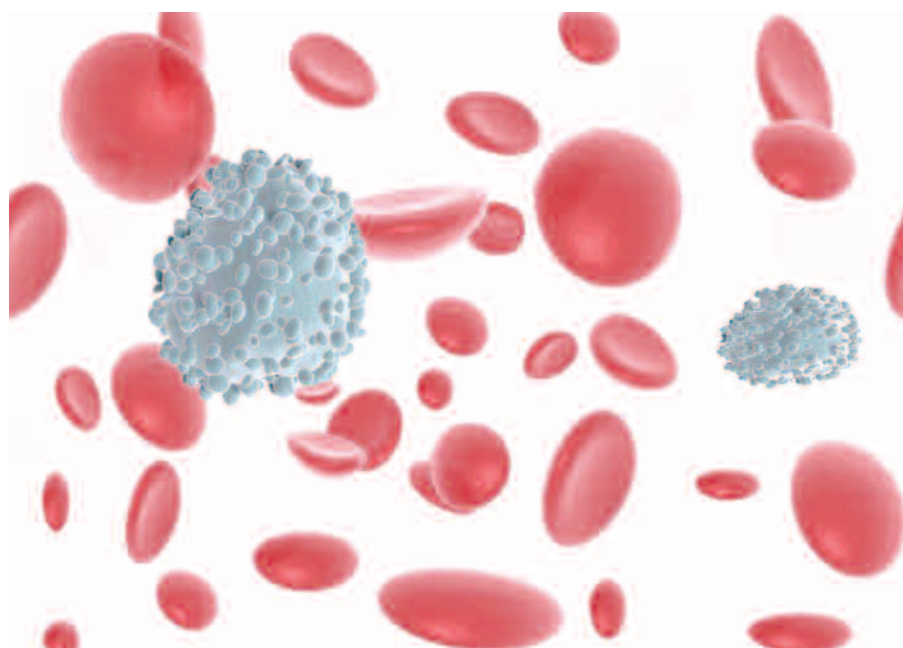
Recently, the momentum for change appears to have taken significant steps forward in the laboratory drive for increased efficiency and modernisation, as more sites across the UK signal a sea change in breaking old habits around the use of ESR testing.

NHS Highland and Hull Royal Infirmary (HEY NHS Trust) are the latest trusts to have abandoned their ESR testing and replaced it with PV by working with their clinical community to drive that change. The laboratories took advantage of a reorganisation in haematology to overhaul the service and move to a more efficient system.

"You need to be able to get consistent results in order to provide useful data for the clinical community, and with PV we have internal and external QC (CQAS). Due to the excellent data CQAS provides and the total number of Benson analysers, the consistency is easily observable. The manual ESR system did not have its own QC and no external quality control was available," said Mick Milner from NHS Highland.

These new sites have been able to provide some insight into how they achieved the change with the full support of their clinical colleagues. Together with the longer-term experiences of the Royal Devon and Exeter Hospital (RD&E), a process route map (Table 1) has been developed that can be followed by those laboratories that would also like to eliminate ESR testing, potentially reduce costs and provide the means to monitor acute-phase inflammatory disease progression.

A focus on four key areas – rheumatology, orthopaedics, clinical trials and GPs – was identified during the consultation to support the



Erythrocyte sedimentation rate will vary without any change in the patient's condition.

transition period. NHS Highland found that some basic clinical trial packages used ESR testing results due to clinical convention. Discussions revealed that the ESR results did not alter patient management, nor did the majority of trials really require its use.

The Royal Devon and Exeter hospital managed to eliminate all ESR testing four years ago. Steve Walton (RD&E haematology laboratory manager) explained that the only area of difficulty was for one clinical trial. A drug used as part of a hip replacement procedure was only available following an ESR test result. This drug authorisation protocol is not routinely seen in arthritic hip replacement surgery. The orthopaedic surgeons and the microbiologists continue to use C-reactive protein (CRP) testing to check for the acute-phase inflammatory response in a two-stage process whereby the patient's new hip is only inserted if there is no sign of infection. Once the critical phase is completed, PV testing is used for routine monitoring.

Similarly, NHS Highland rheumatologists used routine CRP testing to track patient progress with disease assessment scores and were able to eliminate ESR testing.

**Consultation and support**

The consultation and support processes were handled as critical steps in reviewing the potential for moving away from ESR testing. NHS Highland consultant haematologist Dr Peter Forsyth drove the decision to make the change only after preparing the evidence base,



The Benson BV2000 plasma viscometer.

where it was found that PV provided the laboratory with consistent, stable and reproducible data. This enables the requesting clinicians to plot disease progression with cumulative PV data.

The information was provided as part of a consultation involving the GPs and hospital consultants in order to discover what would happen if ESR testing was withdrawn. The overall view was that

PV would provide a suitable alternative. Dr Forsyth said: "Having put a good evidence base together we found that PV gave us consistent data, it was easier, a separate specimen tube was not required, and additional financial savings could be made."

Mick Milner goes on to explain that education is critical. The clinicians require clear information on what a PV result means because the range appears limited. Compared with a wide ESR range (<8 mm to 120 mm), the PV normal range is narrow (1.50–1.72 mPa-sec). The laboratory has been posting additional information on its reports to assist clinical interpretation.

**Time and transport**

Time and sample transportation can provide significant challenges for any integrated system involving several laboratories and GP point-of-care services. The NHS Highland and HEY NHS trusts found that switching to PV testing helped them overcome difficulties in managing the return of samples from outlying clinics. "The test became pointless when specimens arrived from outlying areas already 24 hours old. We made the decision to stop providing the ESR within our test repertoire. On the other hand, PV provided a stable, repeatable result, which is a major consideration given our unique geography," said Mick Milner.

**TABLE 1. PROCESS ROUTE TO INTRODUCE ROUTINE PLASMA VISCOSITY TESTING.**

<b>Assessment</b>
<ul style="list-style-type: none"> <li>Review of clinical picture and patient data repeatedly shows that PV provides a more consistent indicator of disease progression, and demonstrates the clinical significance of very small (0.05 mPa-sec) changes</li> <li>Duplicate test data for ESR and PV show there is no conversion table between the two systems.</li> </ul>
<b>Consultation with specialist clinicians and GPs to highlighted changes</b>
<ul style="list-style-type: none"> <li>Simplification of the test profile by the potential elimination of additional blood collection tubes (PV can use the full blood count sample)</li> <li>Improvements due to plasma sample stability and viscosity testing quality control</li> <li>Rheumatology/specialty patient monitoring changes to CRP in the acute phase</li> <li>Handling of clinical trial requirements.</li> </ul>
<b>Issue notice period for the switch to PV</b>
<ul style="list-style-type: none"> <li>Include summary evidence for the change</li> <li>Include table for results interpretation</li> <li>Plan for a short switchover period.</li> </ul>
<b>Support clinicians and specialties to make the final move</b>
<ul style="list-style-type: none"> <li>Provide laboratory staff with training to answer questions from clinicians.</li> </ul>
<b>Seek feedback</b>

TABLE 2.  
PATIENT SCREENING COMPARISON OF ESR AND PV

Patient situation	Screen potential	ESR	PV
Chronic arthritis	Prediction for patients with inflammation	No	Yes
Rheumatology Malignancy	Interference of test by anaemia	ESR rate is difficult to interpret with anaemia	PV correlates well with disease progression irrespective of anaemia <sup>2</sup>
Polycythaemia	Interference of test when Haematocrit $\geq 50\%$	ESR always normal irrespective of patient condition	PV measurements unaffected. Result dependent upon patient condition
Myeloma Macroglobulinaemia	Prediction for patients	ESR cannot distinguish between the conditions. Raised in both	Results are characteristic and can differentiate between conditions
Steroids treatment	Test Interference by anti-inflammatory drug	ESR readings give incorrect normal results <sup>3</sup>	PV results improve progressively with the arrest of the inflammatory process
Salicylate (Aspirin) therapy	Test Interference by anti-inflammatory drug	Drug effect incorrectly lowers ESR measurement even without disease relief	PV results improve progressively with the arrest of the inflammatory process
Glucocorticoids therapy	Test Interference by anti-inflammatory drug	Not diagnostic	PV monitoring predicts flare up <sup>4</sup>
Plasma hyperviscosity		Not diagnostic	The only diagnostic test available
Effect of age, gender, smoking and pregnancy on results		ESR has a different normal range for male and female and is variable in smoking and throughout pregnancy	PV is not affected by age (after three years) and gender. The rise of PV the third trimester is predictable
Comparable patient results between test		System variations and methods will not allow comparison	Universally accepted standard allows comparison

‘As an important vehicle for communication and process improvement, feedback on PV testing was very positive’

### Satisfying feedback


As one of the most important vehicles for communication and process improvement, the prospect of adverse feedback often causes some trepidation. Across all three trusts, the feedback received was very positive. “There were a lot of glowing comments from the feedback questionnaires. The only complaint we received was that the turnaround time was now too quick – glowing praise indeed,” said Elaine Boyle, haematology service manager at Hull Royal Infirmary (HEY NHS Trust).

### Test profile comparison

Since the early investigations into PV testing by Harkness<sup>1</sup> in 1971,

a number of research publications have compared ESR measurement and PV. The results are summarised by comparison of the potential for each technology to provide patient screening information (Table 2).

### Case for change

Both PV and ESR have been used to screen for the presence of infection or inflammation and to monitor disease activity. However, the significant differences between each test have led many haematology laboratories to make the case for change, both from a clinical and technical perspective. Over the past few years, significant evidence has emerged to show that more laboratories are increasing the momentum to make that change. 

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### References

- 1 Harkness J. The viscosity of human blood plasma: its measurement in health and disease. *Biorheology* 1971; **8** (3): 171–93.
- 2 Ng T. Erythrocyte sedimentation rate, plasma viscosity and C-reactive protein in clinical practice. *Br J Hosp Med* 1997; **58**: 521–3.
- 3 Brittain GPH, McIlwaine GG, Bell JA, Gibson JM. Plasma viscosity or erythrocyte sedimentation rate in the diagnosis of giant cell arteritis. *Br J Ophthalmol* 1991; **75**: 656–9.
- 4 Gudmundsson M, Nordborg E, Bengtsson B-A, Bjelle A. Plasma viscosity in giant cell arteritis as a predictor of disease activity. *Ann Rheum Dis* 1993; **532**: 104–9.

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