pristinamides combination quinupristin/dalfopristin, also rifampicin and chloramphenicol. In comparison with MSSA isolates (n=70), MRSA isolates showed decreased susceptibility (percentage susceptible in parentheses, MRSA:MSSA) to the macrolides erythromycin (26:79), azithromycin (20:83) and clarithromycin (26:90).

Several recent studies have verified the accuracy and utility of the Etest for determining bacterial susceptibility to tigecycline.[10] A paucity of data on tigecycline activity against UK isolates prompted this study. The results showed that tigecycline exhibited potent activity against ESBL-*E. coli* and MRSA isolates collected from a regional hospital in the UK during 2007–2008, as determined by Etest. Compared with previous studies on isolates from different countries/regions, where most determined tigecycline activity by microbroth dilution, there was no evidence to indicate a trend towards increasing tigecycline MIC values.

The results of the present study not only inform clinical decision-making within a district general hospital in the UK, but also serves as a timely monitor for the emergence of multidrug resistance. As tigecycline is utilised more widely, the involvement of clinical laboratories, using simple Etest and automated systems (e.g., Vitek-2), are likely to have an increasingly important role in monitoring trends in resistance on a local, national and global scale. Further study or surveillance is suggested to monitor the development of resistance to tigecycline and other antibiotics. Tigecycline has limited effectiveness in the treatment of urinary tract infection, which further highlights the need for alternative antibiotic therapy, as well as the need for new antibiotics in the future.

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The lactate gap revisited: variable interference with lactate analyses in ethylene glycol poisoning

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Ethylene glycol poisoning may present with a profound metabolic acidosis due to an accumulation of its metabolites, glycolic acid and glyoxylic acid. Glycolic and glyoxylic acids, however, may or may not interfere in lactate assays based on lactate oxidase methods and therefore may give false high lactate results depending on the analytical platform used.[1–5] These metabolites, however, do not interfere in lactate dehydrogenase methods used for lactate measurement.[6] It has therefore been suggested that the presence of a 'lactate gap' when the same sample is analysed on different platforms is an indication of ethylene glycol poisoning,[1,5–9] allowing earlier initiation of treatment while awaiting definitive biochemical confirmation of ethylene glycol ingestion.[6]

The authors recently encountered a case of ethylene glycol poisoning where blood lactate measured on a Radiometer ABL 835 blood gas analyser in the accident and emergency department was disproportionately high compared to serum lactate measured on the central laboratory's Roche Modular analyser. Glycolic acid and glyoxylic acid interference in lactate assay on the Radiometer ABL 835 is well recognised.[1–3,6] There are, however, no data on possible interference from ethylene glycol metabolites in lactate assays performed on the widely used Roche Modular.

This study aims to assess the effects of glyoxylic and

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glycolic acids on the lactate assays based on lactate oxidase methods on the Roche Modular compared to the Radiometer ABL 835.

Point-of-care quality control material (cobas Auto-Trol PLUS B level 3; Roche Diagnostics D-68298, Mannheim) with a target lactate value of 0.7 mmol/L was spiked with increasing concentrations of glyoxylic acid, glycolic acid or equimolar glyoxylic and glycolic acids (Sigma-Aldrich, St Louis, USA). Two series of solutions contained 0, 5, 10, 15, 20 and 40 mmol/L of either glyoxylic acid or glycolic acid. A further series of solutions contained 0, 5+5, 10+10, 15+15, 20+20 and 40+40 mmol/L of glyoxylic acid and glycolic acid, respectively. These concentrations were chosen as they are typical of the levels found following ethylene glycol ingestion.[1]

Samples were analysed in triplicate on the Roche Modular analyser (Roche Diagnostics) and a Radiometer ABL 835 blood gas analyser (Radiometer Medical ApS, Brønshøj, Denmark), which both utilise the lactate oxidase method for measurement of lactate. However, the Roche Modular relies on the production of a chromogen measured at 660 nm, whereas the Radiometer ABL 835 relies on the generation of a current that is measured using a silver/platinum electrode.

The results are shown in Table 1. At all concentrations, glyoxylic acid and glycolic acid cross-reacted in the lactate assay on both analysers to give false-positive lactate values, and increasing concentrations resulted in increasing interference on both analysers. On an equimolar basis, glyoxylic acid produced greater interference than did glycolic acid on both analysers. Interference in the lactate assay was greater on the Radiometer analyser than on the Roche Modular.

The data presented indicate that glyoxylic and glycolic acids result in positive interference in the lactate assay on the Roche Modular analyser and also confirm their positive interference in lactate assays on the Radiometer ABL 835.[1–4] The positive interference is greater on the Radiometer ABL 835 than on the Roche Modular and is consistent with previous studies indicating that the Radiometer ABL 835 is markedly affected by this interference compared to other analysers.[2,3] It has been suggested that glyoxylic and glycolic acids cross-react in lactate oxidase methods because they have a similar size and chemical structure to lactate,[4] and, like lactate, are capable of donating hydrogen to oxygen to produce hydrogen peroxide. It is also possible that differences in assay conditions (e.g., buffers and co-factors) may explain the variation in levels of interference.

It is important to recognise that glyoxylic and glycolic acids cause false-positive lactate results on the Roche Modular as well as the Radiometer ABL 835. Unless this interference is recognised by laboratory staff, the metabolic acidosis associated with ethylene glycol poisoning may be attributed wrongly to lactic acidosis. Even though both analysers utilise lactate oxidase for lactate measurement, the greater interference seen on the Radiometer ABL 835 compared to the Roche Modular gives rise to an 'apparent lactate gap', which, using these analysers, may help to indicate ethylene glycol poisoning.[1,6–9]

Ethylene glycol, a constituent of antifreeze, coolants and brake fluid, is rapidly absorbed from the intestine. Peak concentrations occur between one and four hours after ingestion. It is metabolised to glycolaldehyde then to glycolic, glyoxylic and oxalic acids, which are responsible for the majority of its toxic effects. Glycolic acid is cleared by the

Table 1. The effect of increasing concentrations of glyoxylic acid and/or glycolic acid in the lactate assays on the Roche Modular and Radiometer analysers.

		Lactate values (mmol/L)					
		Roche Modular			Radiometer		
	mmol/L	Mean	SD	%change	Mean	SD	%change
Glyoxylic acid	0	0.75	0.01	0	0.63	0.06	0
	5	3.08	0.07	309	5.07	0.06	700
	10	4.94	0.03	556	9.27	0.12	1363
	15	6.47	0.08	759	14.23	0.21	2147
	20	7.64	0.11	914	18.00	0.00	2742
	40	11.49	0.12	1425	35.00	0.00	5426
Glycolic acid	0	0.74	0.03	–2	0.63	0.06	0
	5	2.60	0.01	245	8.90	0.20	1305
	10	3.89	0.04	417	17.00	0.00	2584
	15	4.83	0.03	541	26.00	1.00	4005
	20	5.51	0.03	632	33.33	1.15	5163
	40	7.35	0.23	876	52.33	1.53	816
Glyoxylic and glycolic acids	0	0.74	0.03	–2	0.63	0.06	0
	5+5	4.76	0.08	532	13.33	0.47	2005
	10+10	7.11	0.12	844	26.00	0.00	4005
	15+15	8.48	0.01	1025	37.33	0.58	5795
	20+20	9.85	0.11	1207	45.00	0.00	7005
	40+40	12.80	0.20	1600	76.00	2.65	11900

kidney and is largely responsible for the marked acidosis seen in severe cases.

Patients who ingest ethylene glycol will develop a high osmolar gap as they absorb the glycol over the first few hours. Thereafter, as the ethylene glycol is metabolised to acids, the osmolar gap decreases while the anion gap increases and acidosis worsens. Patients presenting early may or may not have an acidosis, but their osmolar gap will be high. Patients presenting late with a high anion gap metabolic acidosis may or may not have an increased osmolar gap because the osmolar gap decreases as ethylene glycol is metabolised. A high anion gap metabolic acidosis is not specific to ethylene glycol ingestion and can occur following ingestion of other toxic alcohols (e.g., methanol) or with other clinical conditions including renal failure and those associated with ketoacidosis and lactic acidosis.

Ethylene glycol assays are not always immediately available. Where there is uncertainty as to poisoning or its source, an increased anion gap metabolic acidosis in the presence of an increased osmolar gap should alert to the possibility of ethylene glycol poisoning. Furthermore, the presence of an apparent lactate gap on different analysers makes this so likely that treatment for ethylene glycol poisoning may be initiated while awaiting confirmation of ethylene glycol poisoning.

In summary, this study shows that glyoxylic and glycolic acids, metabolites seen in ethylene glycol poisoning, cross-react in the lactate assay on the Roche Modular analyser to give false-positive lactate results. This interference on the Roche Modular is much less than that seen with the Radiometer ABL 835, giving rise to an 'apparent lactate gap' which may be used to indicate ethylene glycol poisoning as the cause of an increased anion gap metabolic acidosis.

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Evaluation of the Sebia Capillarys zone electrophoresis system for monoclonal paraprotein analysis

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Laboratories continue to be faced with increasing workloads and often the solution to this management problem is to automate processes. While large-scale automation has featured in 'routine' clinical chemistry and haematology departments for many years, it is only relatively recently that other 'lower volume/esoteric' sections have experienced such revolutionary developments.

Over the past few years, capillary zone electrophoresis (CZE) has emerged as a powerful automated tool for the separation of proteins and other biopolymers, including serum protein fractions,[1] offering rapid detection of monoclonal immunoglobulins and other serum protein abnormalities. In comparison to traditional electrophoretic methods (e.g., agarose gel electrophoresis), CZE offers many advantages (e.g., automation, primary tube sampling, automated data transmission and faster turnaround time).[2]

The authors recently decided to centralise their electrophoresis workload within a managed pathology network and therefore needed to consider an automated solution. Thus, it was decided to evaluate the Sebia Capillarys system (Sebia, Issy-les-Moulineaux, France) by comparing results with the department's existing Sebia Hydrasis gel system, the aim being to design a simple and practical evaluation procedure that would mirror routine methods for the interpretation and reporting of serum electrophoresis and be applicable to other district general hospitals considering implementation of this technology.

In preparation for the evaluation, a series of 242 anonymised patient serum samples were collected over a six-month period and stored at –20°C prior to analysis. The samples were from patients with paraproteinaemia, immunodeficiency and also from a limited number of cryoglobulin-positive samples (n=10) and from a single patient with α1-antitrypsin deficiency that had been received by the laboratory for routine clinical analysis. As a consequence, ethical approval was not required for the study.

The CZE system was installed in the laboratory and the authors received appropriate training from Sebia. The evaluation samples were then run in the Sebia Hydrasis and Capillarys systems and the authors read each gel track and CZE profile independently. In order to avoid bias, this was performed without knowledge of clinical information or total immunoglobulin results. Each protein fraction (excluding albumin) was commented upon and described subjectively as normal (N), increased (I), slightly increased (SI), decreased (D), slightly decreased (SD) or paraprotein

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