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present there are no laboratory strategies to detect manipulated genes because these products would be almost indistinguishable from the endogenous molecule. The potential scenarios are detrimental. For example, the recently developed technique to differentiate recombinant erythropoietin from the natural protein, based on isoelectric focusing and reported in a recent issue of this journal (2), would be ineffective in identifying products of the up-regulation of the gene encoding for human erythropoietin. Additionally, despite an increasing commitment of the World Anti-doping Agency, who recently hosted a conference on the potential for gene doping, the detection of gene cheats might be further hampered by the diversity in athletic abilities, sport disciplines, and genetic polymorphisms associated with enhanced athletic performance.

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Hemoglobin in Samples with Leukocytosis Can Be Measured on ABL 700 Series Blood Gas Analyzers

To the Editor:

Automated hematology analyzers are prone to spuriously increased hemoglobin (Hb) results in the presence of high leukocyte counts. Interference becomes significant above 50 × 10^9 leukocytes/L (1). Therefore, in patients with high leukocyte counts, Hb concentrations may have to be measured with alternative methods. Many laboratories use the manual hemiglobincyanide method (2) for Hb measurements in samples from patients with high leukocyte counts. This method is commonly considered as a reference procedure (3).

For daily routine it would be convenient to have a less labor- and time-consuming method available to measure Hb in patient samples with high leukocyte counts. We therefore investigated whether samples with leukocytes >50 × 10^9/L can be measured reliably on an ABL 700 series blood gas analyzer (Radiometer Copenhagen) if they were collected in K3EDTA Vacutainer Tubes (BD). On the ABL 725, 1 μL of blood is ultrasonically hemolyzed in the co-oximeter, and a continuous spectrum derived from 128 wavelengths between 478 and 672 nm is used to calculate the Hb concentration in the sample (4). Results generated by the ABL 725 were compared with Hb concentrations obtained with the manual hemiglobincyanide method. Commercial reagents, calibrators, and controls (J.T. Baker) were used in the manual Hb determination. To remove unlysed white blood cells, samples with high leukocyte count were centrifuged for 10 min at 2400 g before the Hb in the supernatant was measured spectrophotometrically at 540 nm.

The Passing–Bablok comparison in Fig. 1 shows good agreement between the two methods for measuring Hb concentrations. The slope does not differ significantly from 1.0

Fig. 1. Hb in samples with leukocytosis can be measured on ABL 725 blood gas analyzers.

Hb in 28 samples from patients with leukocytosis of myeloid or lymphatic origin was measured with the hemiglobincyanide method and on an ABL 700 blood gas analyzer. (A), agreement was tested with the Passing–Bablok method comparison module of Analyse-It (Analyse-It Software Ltd.). The gray line is the line of identity; the dashed lines indicate the 95% confidence interval. The correlation coefficient was calculated according to Spearman. The equation for the line is: y = 1.0x – 0.20 mmol/L (r = 0.99). (B), the difference between Hb measured with a blood gas analyzer minus Hb measured with the hemiglobincyanide method is not influenced by leukocyte concentration.
(95% confidence interval, 0.98–1.05), and the constant bias of −0.2 mmol/L (−0.53 to −0.05) is acceptable. As also shown in Fig. 1, the difference between the two methods is independent of leukocyte concentration up to at least 450 × 10⁶ cells/L. White cells, which interfere during spectrophotometric measurement of Hb on automated hematology analyzers, are ultrasonically lysed in the co-oximeter of the blood gas analyzer. This together with the turbidity correction on the ABL analyzer (4) explains why leukocytosis does not influence Hb measurements on the ABL. The bias between the hemiglobincyanide method and the ABL is independent of Hb concentration and leukocyte count; it thus may be attributable to differences in standardization.

In conclusion, Hb measurements on an ABL 700 series blood gas analyzer in samples with a leukocyte count that may interfere with Hb measurements on automated hematology analyzers are in good agreement with the reference method. The co-oximetry method on the ABL gives results more quickly and is less expensive and less labor-intensive than the manual hemiglobincyanide method.

References

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Detection of SARS Coronavirus RNA in the Cerebrospinal Fluid of a Patient with Severe Acute Respiratory Syndrome

To the Editor:
Severe acute respiratory syndrome (SARS) is a recently emerged disease caused by a novel coronavirus, the SARS coronavirus (SARS-CoV) (1, 2). Although the respiratory manifestations of SARS are well recognized, the neurologic manifestations have been much less studied (1). Here we report a SARS patient with clinical and laboratory evidence of neurologic involvement.

A 59-year-old woman with IgA nephropathy was admitted to the Prince of Wales Hospital in Hong Kong in early May 2003 because of swaying fever, chills, productive cough, and diarrhea. She was previously admitted in April with fungal peritonitis related to her peritoneal dialysis. Despite antifungal and antibiotic therapy, her respiratory function deteriorated. She became increasingly dyspneic and required supplemental oxygen. High-resolution computer tomography of the thorax revealed progressive bilateral consolidation. On day 5 of admission, she began to vomit, and episodes of four-limb twitching were documented. Within a few hours, she became confused and disoriented.

Laboratory investigation showed electrolyte and blood pH values within the appropriate reference intervals and a static urea of 20 mmol/L. Seizures recurred despite phenytoin administration and became prolonged, lasting >30 min. Oxygen saturation decreased to 40%, requiring immediate resuscitation and intensive care support. She was ventilated and sedated with propofol, and valporate therapy was commenced.

In view of the progressive respiratory failure despite conventional antibiotic therapy, SARS was suspected. The Prince of Wales Hospital was the site of a major SARS outbreak in Hong Kong (1). Confirmed SARS exposure was traceable to her last admission. SARS-CoV was isolated from the tracheal aspirate, and seroconversion was subsequently demonstrable. Ribavirin and pulse steroids were initiated, but her seizures persisted.

A computer tomography of her brain showed no intracranial lesions, cerebral edema, or stroke. Lumbar puncture was performed within 24 h of her first seizure, and the opening pressure was normal. The cerebrospinal fluid (CSF) was clear with no cells detected microscopically. The CSF protein and glucose were 0.28 g/L (reference interval, 0.15–0.45 g/L) and 5.9 mmol/L (reference interval, 2.8–4.2 mmol/L), respectively. Bacteriologic and fungal cultures of the CSF were negative. After additional doses of propofol and phenytoin, she remained seizure free from day 7 of admission onward and was discharged on day 19.

Further virologic investigations were performed in view of the seizures. We analyzed the extracted RNA from the CSF and serum samples of the patient by real-time quantitative RT-PCR assay targeting the polymerase region (orf1ab polyprotein) of the SARS-CoV genome (3). Our data showed that SARS-CoV RNA was present in both the CSF and serum, with viral loads of 6884 and 6750 copies/mL, respectively. These positive results were confirmed by another real-time RT-PCR system targeting the nucleocapsid region of the SARS-CoV genome (3).

These results represent the first demonstration of the entry of SARS-CoV into the CSF. This is also the first case report of status epilepticus associated with SARS. In this regard, it is interesting to note that coronaviruses have been implicated in demyelinating brain pathology (4). Arbour et al. (4) documented the presence of the seemingly harmless human respiratory coronavirus OC43 in the brain parenchyma of patients with multiple sclerosis. Murine hepatitis virus, another coronavirus, has been linked to chronic inflammation and demyelination of the central nervous system (5). Therefore, SARS-CoV infection of the brain is a distinct possibility. Our data thus suggest that a severe acute neurologic syndrome might occasionally accompany