

# LACTATE INFORMATION SHEET

## FOR CLINICIANS

Lactate is a normal product of anaerobic cell metabolism and is released into the blood and metabolised by the liver. It is produced in large amounts when there is insufficient oxygen for activity in the cell.<sup>1</sup>

Lactate production can be increased in conditions that cause inadequate oxygen delivery, such as trauma, as well as in conditions that have disproportionate oxygen demands such as hyperthermia and seizures.<sup>2</sup> Some medications such as salbutamol, metformin, phenformin and HIV drugs can also cause high lactate levels.<sup>3</sup>

Normal lactate levels are less than 1.0 mmol/L in both arterial and venous blood. Elevated serum lactate level is strongly associated with morbidity and mortality in critically ill patients. One study showed a level above 4.0mmol/L was associated with a 27% mortality rate compared with 7% for patients with a lactate of 2.5-4.0 mmol/L<sup>2</sup>.

### Lactate in sepsis

Elevated lactate is typically present in patients with severe sepsis or septic shock and has clinical and statistical significance in predicting mortality in patients with infections.<sup>4,5</sup> Measurement of lactate in all septic patients is a simple strategy that may assist clinicians to more effectively manage the care of septic patients and improve outcomes.<sup>6</sup>

The NSW Between the Flags system mandates that a patient with a lactate of 4.0 mmol/L or more should activate a Rapid Response with immediate intervention by a team of critical care experts.

### Lactate and cryptic shock

Cryptic shock is defined as a serum lactate greater than 4 mmol/L with a systolic blood pressure of at

least 90mmHg.<sup>7</sup> Severe sepsis with cryptic shock has a mortality rate similar to that of patients with overt septic shock.

Serum lactate should be screened in all patients who are suspected of severe infection and sepsis, irrespective of blood pressure and the appearance of being well-perfused.

### Lactate clearance

Serial lactate measures can assist in monitoring treatment progress.<sup>8,9</sup> Lactate clearance of at least 10% at a minimum of 2 hours after resuscitation initiation is a valid way to assess initial response to resuscitation in severe sepsis.<sup>8</sup>

### Lactate in children

Elevated lactate is a late sign of sepsis in children. Where lactate is greater than 2 mmol/L and sepsis is suspected, it is recommended that immediate treatment is commenced.

### Key messages

- Measurement of serum lactate should be undertaken in all patients with suspected infection.
- Adults with a lactate greater than 4 mmol/L should receive aggressive resuscitation, regardless of blood pressure.
- Children with a lactate greater than 2 mmol/L should be urgently reviewed by a senior clinician and treatment commenced.
- All patients with a lactate greater than 4 mmol/L should be admitted to intensive care unless there are limitations in treatment.

## Frequently asked questions

### Do I need a venous or arterial blood sample?

Obtaining a venous blood sample is often easier and less painful for the patient. Studies show that both venous and arterial blood can be used for lactate testing.<sup>9, 10, 11</sup>

### Do I need to take the tourniquet off before drawing a venous sample?

No, but the blood should be drawn within 2 minutes as lactate levels can be elevated with prolonged application of a tourniquet.

### Once the blood is drawn do I need to take any measures to preserve the sample?

Ideally the sample will be tested within a short space of time (less than 1 hour) to allow rapid management of the patient. If this is not possible a grey-top tube (fluoride oxalate) can stabilise the sample for later testing.

### Is point of care testing accurate?

Point of care testing can be used provided validated equipment is used, users are trained and a quality control system is in place. The local pathology laboratory can advise on this.

### What should I do if I think the lactate result is falsely elevated?

Repeat the blood test in 30 minutes to confirm the result. If the patient is floridly unwell, do not delay in administering sepsis treatment as per the sepsis pathway in consultation with a senior clinician.

## References

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### About the Clinical Excellence Commission

The Clinical Excellence Commission (CEC) has a central role in the responsibility for quality and safety in the NSW health system. It was established in 2004 to promote and support improved clinical care, safety and quality across NSW.

The CEC's SEPSIS KILLS program works with doctors, nurses and health service managers to improve the recognition and treatment of severe infection and sepsis, to reduce its impact, mortality and financial costs in NSW.

For further information on the SEPSIS KILLS program, please visit: [www.cec.health.nsw.gov.au/programs/sepsis](http://www.cec.health.nsw.gov.au/programs/sepsis)