

## Management of Hyperglycaemia in Sepsis

Hyperglycaemia is not uncommon in patients with sepsis, and may be associated with stress, and insulin resistance associated with severe disease. Hyperglycaemia has been associated with negative outcome in several human studies of sepsis, and recommendation is therefore made to normalize blood glucose concentrations in these patients. The following protocol outlines the use of insulin continuous infusion, or intermittent intramuscular insulin injection for the control of blood glucose in septic patients.

### Insulin Therapy

1. Begin insulin therapy after acute blood volume resuscitation is complete, and rehydration of the patient is well underway, to minimise fluid shift and electrolyte changes during insulin therapy. Additionally, the blood pH should ideally be at or above 7.2 prior to commencement of treatment, as insulin is less effective at pH below this level.
2. Insulin should **never** be administered subcutaneously in the emergency setting, as its absorption rate will vary considerably, leading to erroneous conclusions regarding subsequent doses.
3. Intravenous regular insulin using CRI is the preferred method for administration. However intramuscular regular insulin protocols may also be effective.

### Insulin Continuous Infusion:

- a. Use regular insulin only for the emergency treatment of hyperglycaemia
- b. Dose
  - a. Dogs - dose = initially 2.2 U/kg/day. This equates to 0.09 U/kg/hr CRI
  - b. Cats - dose = initially 1.1 U/kg/day. This equates to 0.05 U/kg/hr CRI
- c. Solution Preparation
  - a. Dogs: Add 2.2 units/kg regular insulin to 100 ml 0.9% NaCl
  - b. Cats: Add 1.1 units/kg regular insulin to 100 ml 0.9% NaCl
  - c. Allow 20 ml of the prepared solution to run through administration set, and discard, as insulin will bind to plastic tubing.
- d. Administer the continuous infusion in the following manner:

| Blood Glucose  | Insulin dose | Insulin Solution Infusion Rate |
|----------------|--------------|--------------------------------|
| >15 mmol/L     | 0.15 U/kg/hr | 4.4-7.6 ml/hr                  |
| 13-15 mmol/L   | 0.08 U/kg/hr | 4 ml/hr                        |
| 11-13 mmol/L   | 0.05 U/kg/hr | 2.8 ml/hr                      |
| 8.5-11 mmol/L  | 0.04 U/kg/hr | 2 ml/hr                        |
| 5.5-8.5 mmol/L | 0.04 U/kg/hr | 2 ml/hr                        |
| <5.5 mmol/L    | STOP         | STOP                           |

## Management of the Septic Canine and Feline Patient

Once the blood glucose drops to below 13 mmol/l, the insulin administration rate is decreased (as above) and 2.5 or 5% dextrose is added to the fluids in the following manner

NB - once glucose is stable at or below 11 mmol/l, begin SC insulin at 0.5 U/kg q 6-12 hr

| Blood Glucose (mmol/L) | Glucose Supplementation     |
|------------------------|-----------------------------|
| 13-15 mmol/L           | None                        |
| 11-13 mmol/L           | 5% dextrose @ 0.5-2.5 ml/hr |
| 8.5-11 mmol/L          | 5% dextrose @ 0.5-2.5 ml/hr |
| 5.5-8.5 mmol/L         | 5% dextrose @ 1-5 ml/hr     |
| <5.5 mmol/L            | 5% dextrose @ 1-5 ml/hr     |

### Insulin Intramuscular Injection Protocol:

- Patients >10 kg 0.25 U/kg initially, then 0.1 U/kg/hr
- Patients 3-10 kg 2 U initially, then 1 U/hr
- Patients <3kg 1 U initially, then 1 U/hr
- Decrease frequency of administration to every 4 hours once glucose concentrations stabilize or fall below 13 mmol/L, at a dose of 0.1-0.4 U/kg
- Supplement with intravenous glucose infusion as outlined above once glucose concentrations fall below 11 mmol/L