

## **For PCP Distribution Only.**

### **Rose Yang – ECC Case Study for PCPs, May 2025**

**Attending veterinarian: Dr Nadine Jones, Specialist in Emergency and Critical Care**

To Our Valued Colleagues in Practice,

It's my pleasure to share the journey of one of our most resilient recent patients—Rose.

Rose, a 1-year-old female Golden Retriever, was referred to our Emergency and Critical Care (ECC) service on 21st May 2025 following suspected heat stroke. She arrived in a critical condition: stuporous, non-ambulatory, with respiratory distress, pale to purple mucous membranes, poor pulses, severe peripheral oedema, and haematochezia. Bilateral pulmonary crackles were identified on auscultation.

She was admitted directly to the ICU for aggressive stabilisation. Rose received intravenous fluids, oxygen therapy, vasopressor constant rate infusion, analgesia, and multiple plasma transfusions to manage coagulopathy and shock. Her initial diagnostic tests revealed evidence of multi-organ dysfunction syndrome (MODS), with acute liver injury, hypoglycemia, prolonged PT/aPTT, thrombocytopenia, leukopenia, and acute kidney injury (IRIS grade II). Her ALT exceeded 2000 U/L—indicative of severe hepatocellular injury consistent with heat stroke-related hypoperfusion and inflammatory damage.

The first 48 hours were critical, but with intensive management, Rose's condition gradually improved. Her respiratory effort stabilised with oxygen support, and her mentation became more responsive. Despite ongoing liver enzyme elevations and critically low platelets (as low as 23k/ $\mu$ L), she made small improvements day by day. She required a central venous catheter for repeated blood sampling and CRIs, and a nasogastric feeding tube to provide enteral nutrition. Rose developed anaemia due to gastrointestinal and dermal bleeding.

After a week in ICU, she could finally be discharged, although still thrombocytopenic and anaemic (platelets 55k/ $\mu$ L, PCV 27%) and her last ALT prior to discharge was 1483 U/L (RI 10-125 U/L). She was eating with encouragement and ambulating short distances for toileting. Rose's case underscores the devastating potential of heat stroke and the vital role of critical care in navigating MODS.

## **Understanding Heat Stroke:**

## Pathophysiology

Heat stroke is a life-threatening condition caused by failure of thermoregulation, leading to dangerously elevated body temperature, systemic inflammation, central nervous system dysfunction, and multi-organ dysfunction.

Canine heat stroke occurs when thermoregulatory mechanisms fail, resulting in non-pyrogenic hyperthermia. Dogs typically dissipate heat via panting, but in hot, humid environments—especially when humidity exceeds 80%—evaporative cooling via panting is ineffective. As core temperatures rise, systemic inflammation, endothelial damage, and circulatory collapse develop, potentially resulting in MODS and death. Heat stress triggers three key protective responses: thermoregulation, an acute-phase inflammatory response, and production of intracellular heat shock proteins. The acute-phase response involves a balance of pro- and anti-inflammatory cytokines that stimulate leukocytosis, acute-phase protein synthesis, hypothalamic-pituitary-adrenal (HPA) axis activation, and immune cell function. Heat shock proteins help protect cells from thermal damage, stabilize proteins, and support cardiovascular function by modulating baroreceptor responses.

Heat stroke occurs when thermoregulation fails, the acute-phase response becomes dysregulated, and heat shock protein function is impaired. Increased gut permeability may also allow endotoxin absorption, contributing to inflammation. Notably, many mediators involved in heat stroke overlap with those seen in sepsis and systemic inflammatory response syndrome (SIRS).

## Consequences

Complications include AKI, hepatocellular injury, DIC, and ARDS, all of which stem from heat-induced hypoperfusion, oxidative stress, and cytokine release.

Thrombocytopenia, nucleated RBCs, and hypoglycaemia are common and can indicate poor prognosis. Neurological dysfunction, rhabdomyolysis, and bacterial translocation worsen systemic instability. Concurrent DIC and AKI notably increase the risk of death.

## Prognosis

Despite aggressive care, the mortality rate in canine heat stroke remains high, often 40–50%. A 2015 retrospective study of 126 dogs with heatstroke found a 53% mortality rate, with risk factors for death including tachycardia, prolonged coagulation times, hypoglycaemia, altered mentation, high BCS, collapse, seizures, DIC, AKI, and respiratory distress. (Segev et al., 2015) Early recognition, rapid cooling, and intensive monitoring are critical to improving outcomes.

We are immensely proud of Rose's progress and were thrilled when she visited us on 4th June, her tail wagging and full of energy. Our thanks to her family and to Advanced Vet Care for entrusting us with her care.

Please feel free to reach out with any questions or referrals. I also recently wrote an article in The Straits Times about heat stroke prevention in pets—please share it with clients. Prevention, as always, is far better than cure.

Kind regards,  
Dr Nadine