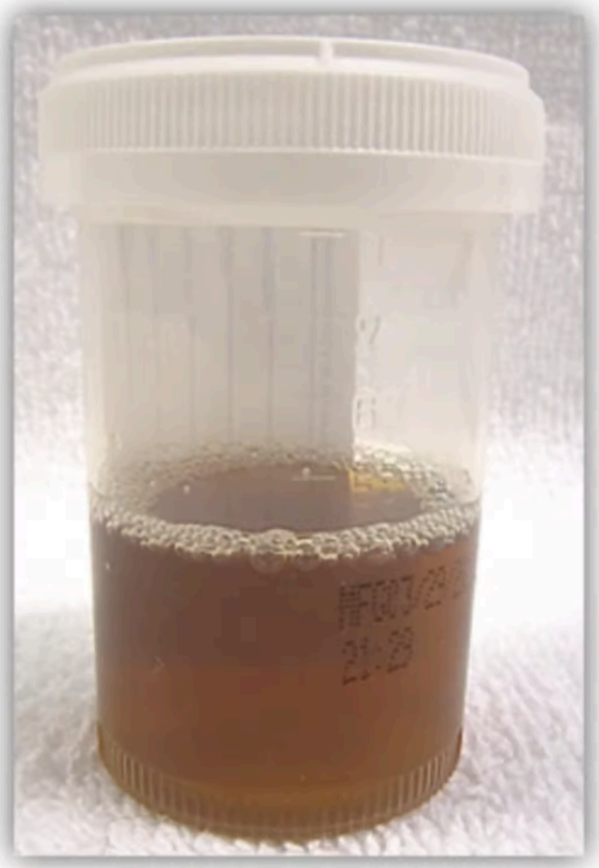
Rhabdomyolysis leading to AKI

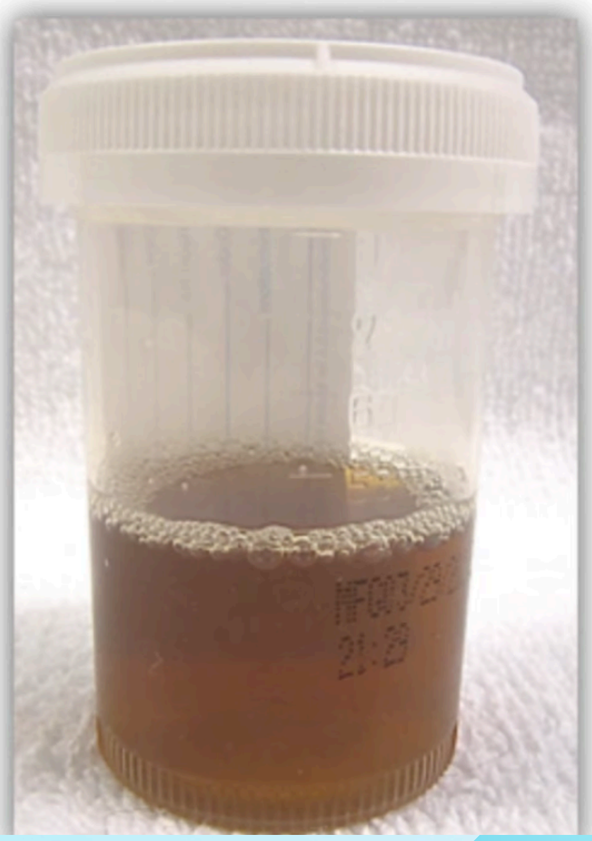
EPIDEMIOLOGY

- **Rhabdomyolysis** is the ***breakdown of skeletal muscle***, releasing intracellular contents into the bloodstream.
- Common causes in **adults**: ***drugs of abuse, alcohol, medications, trauma, and muscle diseases***.
- In **children**, causes include ***viral myositis, trauma, and connective tissue disease***.



EPIDEMIOLOGY

- ***Coma patients*** are at risk due to ***prolonged pressure on muscles***.
- ***Statin-related*** rhabdomyolysis is dose-dependent and varies by statin type.
- ***Infections***, both ***bacterial*** and ***viral***, can also trigger rhabdomyolysis
- **Strenuous physical activity**, particularly in poorly conditioned individuals or those exposed to ***high temperatures and humidity***.

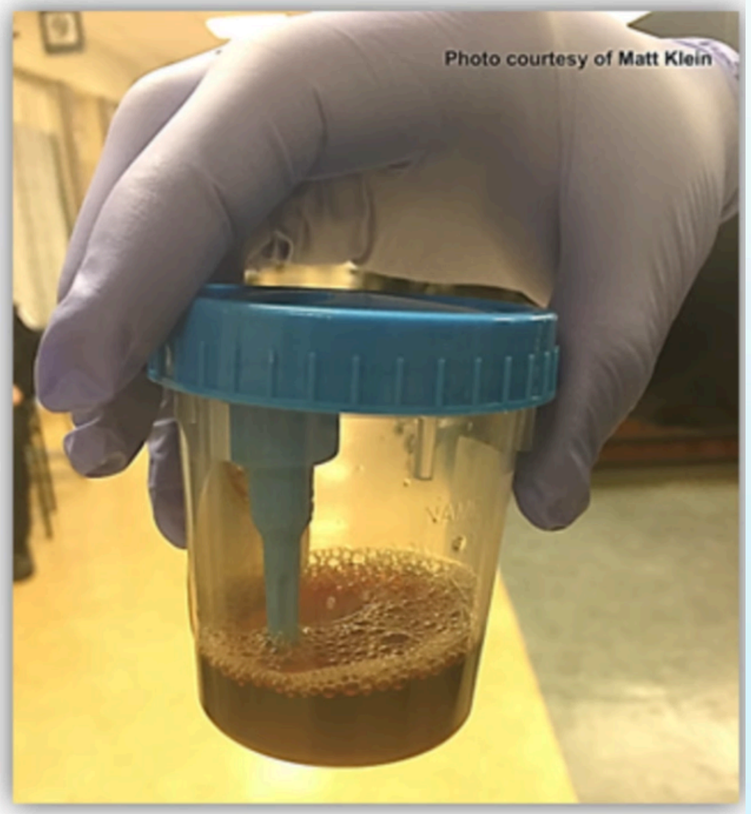


PATHOPHYSIOLOGY

- ***Muscle injury*** leads to the release of **myoglobin**, **creatine kinase (CK or CPK)**, and **potassium**.
- Disruption of the sodium-potassium ATPase pump increases intracellular calcium.
- Increased calcium activates enzymes and free radicals, causing muscle cell necrosis.

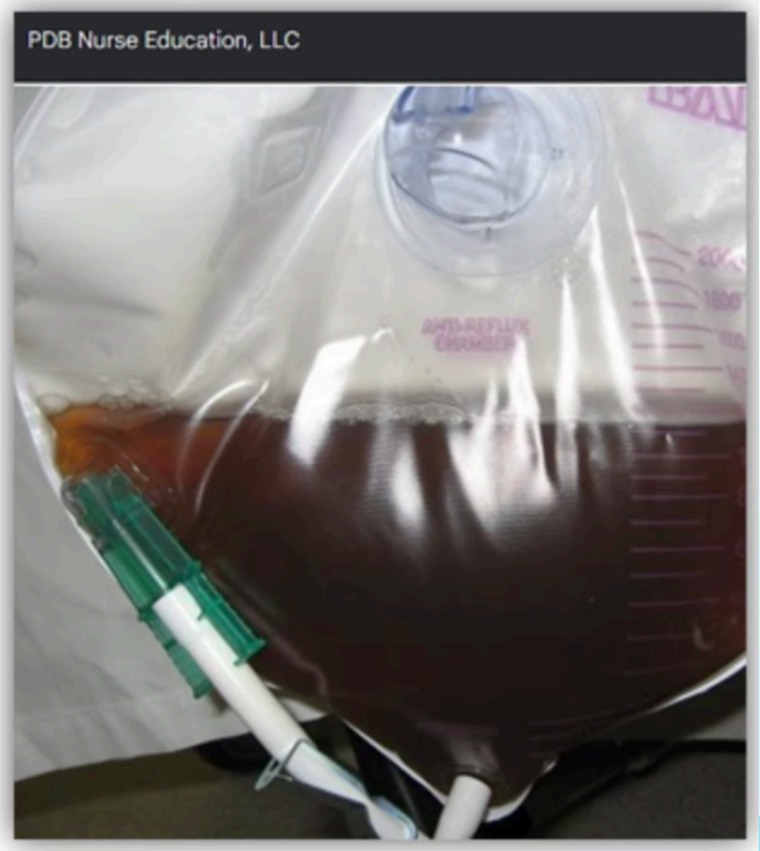
CLINICAL FEATURES

- Symptoms include ***muscle pain***, ***weakness***, ***malaise***, ***low-grade fever***, and **dark urine**.
- Muscle symptoms may be absent in up to ***50%*** of cases.
- Severe cases may present with ***nausea, vomiting, abdominal pain, and tachycardia***.
- ***Swelling and tenderness of affected muscles*** may occur but are not always present.



DIAGNOSIS

- Elevated ***serum CK*** is the most sensitive indicator of muscle injury.
- **CK levels >5 times the upper limit** of normal (800–1000 IU/L) suggest rhabdomyolysis.
- CK typically ***rise within 2-12 hr*** after muscle injury, ***peak within 24-72 hr***, and then decline at a rate of ***39%*** of previous day's value.
- **Myoglobinuria** occurs with >100 grams of muscle injury and causes **reddish-brown urine**.

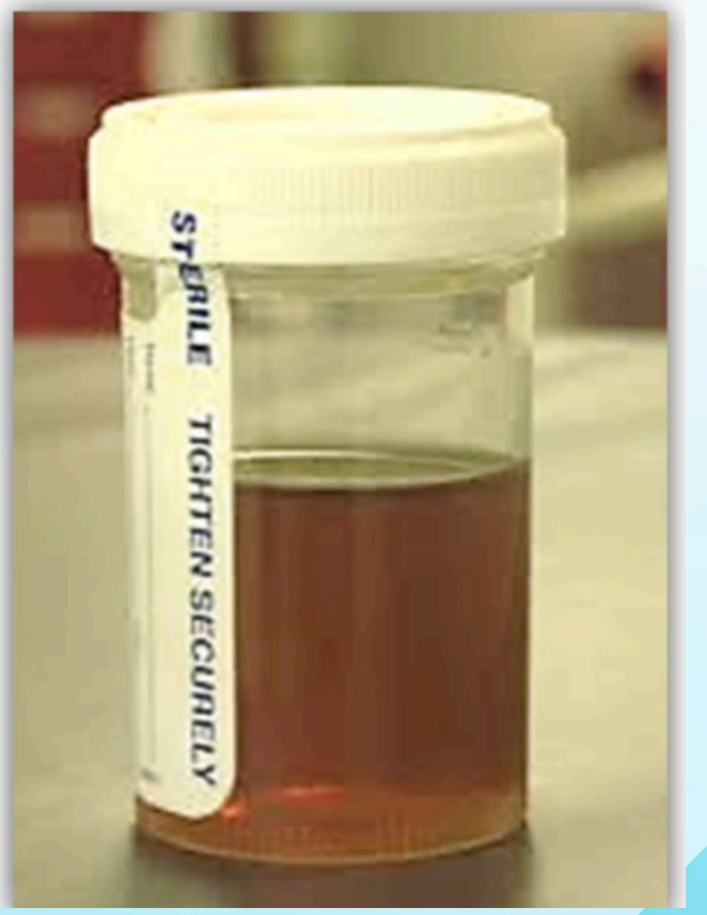


DIAGNOSIS

- **Urine dipstick positive for blood** but with few or no red blood cells suggests myoglobinuria.
- Additional tests: serum ***electrolytes, calcium, phosphorus, uric acid, ECG, BUN, Cr, CBC, PT, PTT***

PREHOSPITAL CARE

- Early and ***aggressive IV fluid resuscitation*** is critical to prevent acute kidney injury.
- Administer **normal saline** at ***1 L/hour*** initially, then ***500 mL/hour*** alternating with **D5S** (5% dextrose in normal saline).
- ***Avoid potassium- or lactate-containing solutions*** until electrolyte status is known.

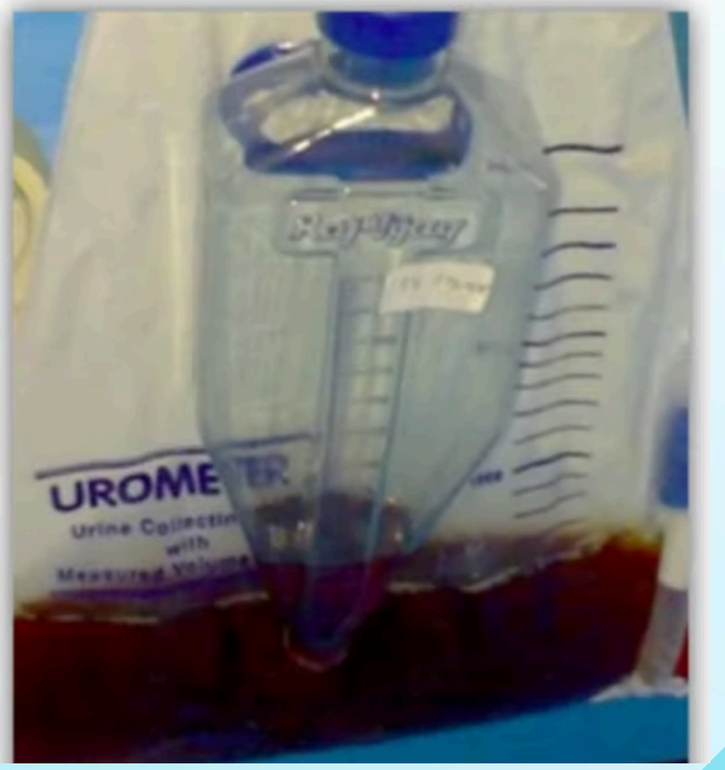


EMERGENCY DEPARTMENT CARE

- Continue ***aggressive IV rehydration*** for **24–72 hours**.
- Target **urine output** of ***3–4 mL/kg/hour*** or ***200–300 mL/hour***.
- **No strong evidence** supports ***urine alkalinization*** or ***forced diuresis*** with **mannitol** or **bicarbonate**.

EMERGENCY DEPARTMENT CARE

- ***Mannitol*** and ***bicarbonate*** may reduce acute renal dysfunction in **CK >10,000 IU/L**.
- Monitor urine output with a catheter in critically ill patients.
- ***Cardiac monitoring*** is essential due to risk of electrolyte-induced dysrhythmias (esp. ***hyperkalemia***).



ELECTROLYTE MANAGEMENT

- **Hypocalcemia** early in rhabdomyolysis usually does not require treatment.
- Treat **hyperkalemia** with ***insulin and glucose***, though it ***may be less effective*** in rhabdomyolysis.
- ***Ion-exchange resins*** (e.g., sodium polystyrene sulfonate) may be used for hyperkalemia.

ELECTROLYTE MANAGEMENT

- Treat **hyperphosphatemia** with oral phosphate binders ***if levels >7 mg/dL***.
- ***Dialysis*** may be necessary ***for severe hyperkalemia or renal failure***.

DISEASE COMPLICATIONS

- **Acute kidney injury** is a major complication, often due to ***hypovolemia, acidosis, and myoglobin toxicity***.
- Other complications: ***acid-base disturbances***, ***electrolyte*** imbalances, and **disseminated intravascular coagulation (DIC)**.

DISEASE COMPLICATIONS

- ***Mechanical complications*** include **compartment syndrome** and **peripheral nerve injury**.
- Compartment syndrome requires prompt recognition and management to prevent permanent damage.

DISPOSITION AND FOLLOW-UP

- ***Healthy patients with*** **exertional rhabdomyolysis** and no comorbidities can often be ***discharged after rehydration***.

- ***Admit patients with risk factors*** or ***complications*** for IV hydration and monitoring.

DISPOSITION AND FOLLOW-UP

- Monitor in a monitored bed for **24–48 hours** to detect ***dysrhythmias*** and worsening ***renal function***.
- Consult ***nephrology*** for hyperkalemia unresponsive to therapy or high McMahon risk score.

CONCLUSION

- **Rhabdomyolysis** requires prompt recognition and ***aggressive fluid resuscitation*** to prevent complications.
- Monitor ***CK levels***, ***urine output***, and ***electrolytes*** closely.
- Complications such as **compartment syndrome** and **hyperkalemia** require specific interventions.
- **Dialysis** may be necessary in severe cases of renal failure or hyperkalemia.

Thank You