

# Rhabdomyolysis, Myoglobinuria

Updated: October 17, 2009

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- in acute muscle necrosis (rhabdomyolysis), myoglobin escapes into blood → urine (myoglobinuria).

RHABDOMYOLYSIS is synonym for MYOGLOBINURIA

- serum [myoglobin]** has same diagnostic significance as **serum [CK]**.
- modern techniques can detect minute amounts, so that brown urine discoloration may not be evident.  
 If there is no *hematuria*, positive benzidine test result strongly suggests *myoglobinuria!*  
 N.B. myoglobinuria itself can induce microhematuria!
- macroscopic myoglobinuria indicates massive rhabdomyolysis (risk of renal failure!).  
 N.B. renal failure is more likely if *hypotension (hypovolemia)* and *acidosis* coexist.
- clinically important syndromes are associated with *gross pigmenturia*.

<b>I. Hereditary Myoglobinuria</b>
Carnitine palmityl transferase deficiency - most frequent metabolic defect presenting with myoglobinuria!
Glycogenoses type V, VII-XI
Incompletely characterized syndromes: Excess lactate production (Larsson), some mitochondrial myopathies
Uncharacterized:
Familial; biochemical defect unknown: provoked by diarrhea / infection / exercise
Malignant hyperthermia
Repeated attacks in individual; biochemical defect unknown
<b>II. Sporadic Myoglobinuria</b>
<b>Exertion in untrained individuals</b> (e.g. military recruits)
"Squat-jump" and related syndromes, anterior tibial syndrome
Convulsions, agitated delirium, restraints, prolonged myoclonus or acute dystonia, status asthmaticus, high-voltage electric shock
<b>Crush syndrome</b>
<b>Ischemia:</b> arterial occlusion, compression and anterior tibial syndromes, DIC
<b>Metabolic abnormalities</b>
Metabolic muscle depression
Barbiturate, carbon monoxide, narcotic coma
Diabetic acidosis
General anesthesia
Hypothermia
Exogenous toxins and drugs
Haff disease
Ethanol (binge drink), heroin, Malayan sea-snake bite poison, plasmocid
Glycyrrhizate, carbenoxolone, amphotericin-B, phenylpropanolamine, lovastatin, succinylcholine
Malignant neuroleptic syndrome
Chronic hypokalemia of any cause
Heat stroke
Toxic shock syndrome
<b>Progressive muscle disease</b> ("polymyositis", "alcoholic myopathy")

**CLINICAL SYNDROME**

- Widespread myalgia, muscle swelling and weakness (may persist for weeks!)
- Renal pain → renal failure (anuria, azotemia, hyperkalemia)
- Fever

**DIAGNOSIS**

- Serum enzymes**↑ (CK can be > 1000 times normal), **K**↑, **phosphate**↑.
- Pigmenturia** (ceases within few days).
- EMG** abnormalities (fibrillations and myopathic units) can persist for several months.
- Muscle biopsy:**
  - shortly after attack - large numbers of necrotic fibers;
  - later - many regenerating fibers.

**TREATMENT**

- Halt **muscle destruction** – bed rest (up to neuromuscular blockade), treat cause.
- Promote **diuresis** > 2 ml/kg/h (with mannitol / dialysis) + **urine alkalization**\* (with sodium bicarbonate).  
 \*keep urinary pH > 6 - prevents toxic ferrihemate release from myoglobin
- Control **hyperkalemia**.

**TOXIC MYOPATHIES**

**Inflammatory myopathy:** cimetidine, D-penicillamine, procainamide, L-tryptophan, L-dopa  
**Non-inflammatory necrotizing or vacuolar myopathy:** cholesterol-lowering agents, amiodarone, chloroquine, colchicine, emetine, ε-aminocaproic acid, labetalol, cyclosporine and tacrolimus, isotretinoin, vincristine, alcohol.  
**Rhabdomyolysis and myoglobinuria:** cholesterol-lowering drugs, alcohol (due to prolonged obtundation, seizures, hypokalemia, and hypophosphatemia), heroin, amphetamine, phencyclidine, cocaine, ε-aminocaproic acid, pentazocine, toluene.  
**Myofibrillar myopathy:** emetine.  
**Myosin loss myopathy:** glucocorticoids (see p. 2740 >>), non-depolarizing neuromuscular blockers.  
**Mitochondrial myopathy:** zidovudine.

**Myotonia:** cholesterol-lowering drugs, propranolol, clofibrate, penicillamine, chloroquine, cyclosporine, anthracene-9-carboxycyclic acid, 2,4-d-chlorophenoxyacetic acid.

**Malignant hyperthermia** → see p. 3910 (1-2) >>

**Focal muscle damage** - injection of narcotic analgesics (esp. pentazocine, meperidine, and heroin).

BIBLIOGRAPHY for ch. "Neuromuscular, Muscular Disorders" → follow this [LINK](#) >>