

Porcine stress syndrome (PSS, Malignant hyperthermia)

Extended Version

Classic cases: TWO TYPES

1. **Sudden death** in several/many of a **group of pigs during handling, transport, hot days**
 - a. Pigs become very stiff and rigid, get very hot, and die
 - b. Muscles are pale, soft, and greasy at slaughter, cannot be used for meat
2. **Muscle stiffness, fast increasing temp. and CO₂ in a pig under inhalant anesthesia**

Presentation:

- History and Signalment
 - Breeds affected (usually heavy muscled breeds)
 - Pietrain, Poland China, Landrace, Large White, Hampshire, nearly any breed, also reported in pot-bellied pigs
 - Also seen in humans, dogs, cats, horses
 - Triggers:
 - Excitement, stress
 - Rough handling
 - Exercise
 - High ambient temperature
 - Inhalant anesthetics
 - Succinylcholine
- Clinical signs
 - Muscle stiffness, rigidity
 - Severe hyperthermia, up to 113°F (45°C)
 - Tachypnea, tachycardia, arrhythmias
 - Very high CO₂ – soda lime goes blue fast!
 - Acidosis – metabolic and respiratory
 - Skin becomes red, mottled
 - Death
 - Very rapid rigor mortis
 - Necrosis, degeneration of back muscles
 - Muscles pale, soft, exudative (PSE)

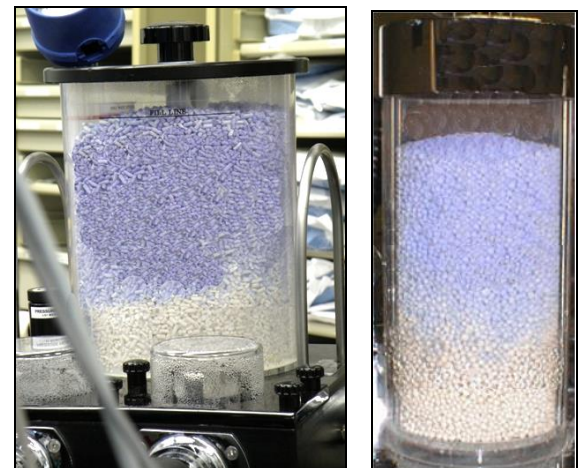


Landrace pigs are at risk of porcine stress syndrome (PSS).

Photo courtesy of Zeilog

DDX:

- Sudden death
 - Mulberry heart disease, acute bacterial septicemia, heat exhaustion, intestinal volvulus
- Stiff muscles
 - Hypocalcemia, Vitamin D deficiency, other exercise induced myopathy
- Pale muscles
 - Selenium/Vitamin E deficiency



Soda lime goes blue VERY FAST with malignant hyperthermia

photos courtesy Drs. JG Adams, CM Trim

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Test of choice:

- **Genetic testing now supersedes other diagnostics**
- History and clinical signs (**esp. w/ anesthesia**)
- **Creatine kinase** levels elevated

Rx of choice:

- Stop inhalant anesthesia
- IV dantrolene can reverse by inhibiting Ca^{++} release (muscle relaxant)
- Body cooling – hose down, ice, fans
- IV fluids, decrease K^+ , bicarbonate for acidosis,
- +/- steroids?
- If not anesthetized – abort procedure, separate if fighting, move pigs to cool area, hose down, fans, etc



Pig being treated for malignant hyperthermia (MH) – note rigid legs, spreading of toes (arrow).

*Pig has been iced (yellow circle) to help decrease temp. **Ventilation needed** because respiratory muscles are too stiff to function properly.*

Photo courtesy Dr. CM Trim

Prognosis:

Poor to grave if episode not recognized in time

Prevention:

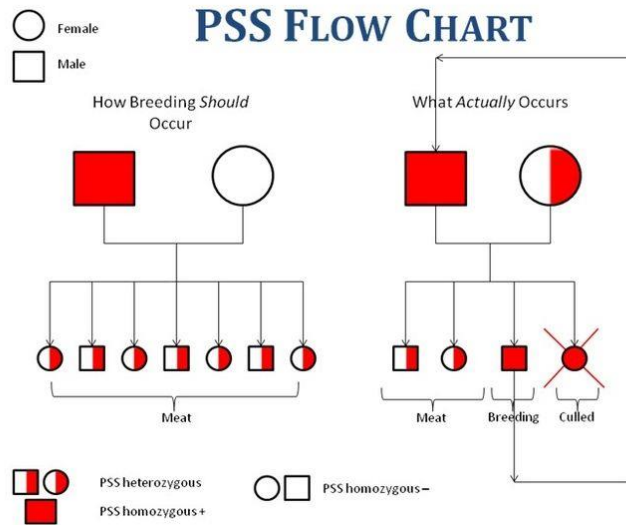
- IV dantrolene
- Change machine, hoses, and soda lime as needed; ventilate
- Breeding program to eliminate mutation
- Minimize stress to pigs, do not handle on hot days
- Avoid inhalant anesthetics

Pearls:

- **DANGEROUS AND RAPIDLY FATAL CONDITION** if not recognized
- Also called malignant hyperthermia (MH)
- **All inhalant anesthetics can trigger**
 - Halothane, isoflurane, sevoflurane, desflurane
- Hypermetabolic syndrome of skeletal muscles
 - Uncontrolled Ca^{++} release from sarcoplasmic reticulum in myocytes -> muscle contraction
 - Muscle metabolism goes crazy – producing heat, lactate, CO_2 , and acidosis
- Mutation usually at ryanodine receptor on Ca^{++} channels of sarcoplasmic reticulum
 - Autosomal recessive in pigs
 - Autosomal dominant in dogs, horses
- Porcine stress syndrome has been bred out of most production breeds, but still occasionally seen

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Porcine stress syndrome breeding practices. Chart courtesy of GreenGibbon

Refs: Tranquilli, Thurmon, and Grimm's Lumb & Jones Veterinary Anesthesia, 4th ed. pp. 761-2; Merck Veterinary Manual, Veterinary Medicine 10th edition (online): Malignant Hyperthermia; O.M. Radostits et al., pp 1750-1755; Interesting info on stress induced damage to pork from the Univ of Guelph Dept of Animal & Poultry Science; FASEB historical summary of malignant hyperthermia

My Notes: