**PORCINE STRESS SYNDROME AND ITS EFFECT TO SWINE POPULATION**

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**PORCINE STRESS SYNDROME (PSS)**

- A genetic disorder in pigs
- Halothane gene or ryanodine receptor 1 gene is responsible for porcine stress syndrome (PSS) that is elicited when the animals are experiencing stress or when they have been exposed to halothane (Rosenvold and Andersen, 2003)

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**RYANODINE RECEPTOR 1 GENE**

- Pigs under PSS condition may suffer the following symptoms:
  - heat stress, labored breathing, muscle rigidity, and in worst cases, death (Band et al. 2005)

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Figure 1. Structure of the Ryanodine Receptor

Figure 2. Rapid death of positive pigs can occur when exposed to severe stress
PORCINE STRESS SYNDROME (PSS)

- General anesthetics such as the halothane gas can also trigger the symptoms of PSS thus, the name “halothane gene”

PORCINE STRESS SYNDROME (PSS)

- PSS is caused by a defect in the ryanodine receptor 1 (RYR1) gene
  - The defect is caused by Cytosine/Thymine mutation at nucleotide 1843 in the RYR1 gene. As a result, the amino acid Cysteine is replaced by arginine (Jovanovic et al. 2005).

PORCINE STRESS SYNDROME (PSS)

- Favero (2000) added that the increased anaerobic respiration in muscles generates rapid decrease in pH after death
  - aﬀects the meat quality characteristics such as color and water-holding capacity which are not suitable for meat preparation due to excessive water loss
The HAL gene or RYR1 gene brings a condition describing the quality of pork as pale, soft and exudative (PSE) which is a negative effect.

The screening will enable breeders to effectively determine which pigs will be suitable for breeding. This will then allow only better quality of pork that will increase the economic value of the meat.
SCREENING FOR PORCINE STRESS SYNDROME

Figure 7 from Jin et al. (2005). The PCR-RFLP analysis of RYR1 gene. Lane 1, standard markers pUC18/HaeIII; Lanes 2 and 3, DNA from a normal pig; Lanes 4 and 5, DNA from a mutant pig; Lanes 6 and 7, DNA from a carrier pig; Lane 8, PCR products that amplified from 18,475 to 18,695.

APPLICATION OF MS-PCR IN SCREENING FOR PORCINE STRESS SYNDROME

- MS PCR is a PCR-based technique developed by Rust et al. in 1993, whereby both normal and mutant alleles can be amplified in the same reaction tube, using different length allele-specific primers.

PORCINE STRESS SYNDROME (PSS)

- The gene can occur in three possible genotypes: normal (NN), carrier (Nn) and positive (nn).
- Using MS-PCR the DNA of the animals had the size of:
  - 114 bp - Normal
  - 114 and 134 bp - Carrier
  - 134 bp - Mutant

Figure 8. Agarose gel electrophoresis of the Hal gene amplified by MS-PCR. Lane 1- Molecular weight marker ladder 50 bp; lane 2 is NC; lane 3 is PC; lanes 4-12 are DNA samples.
**PORCINE STRESS SYNDROME (PSS)**

Figure 9. Agarose gel electrophoresis of the Hal gene amplified by MS-PCR. Lane 1: Molecular weight marker ladder 50 bp; lanes 2-12 were classified as heterozygotes, Nn (134 and 114 bp)

**SCREENING FOR PORCINE STRESS SYNDROME**

- Manipulation of the breeding system can be done via molecular analysis such as genetic screening using live pigs which is a fast and noninvasive type of testing (Bastos et al. 2000)

**SCREENING FOR PORCINE STRESS SYNDROME**

- Correlation within and among the breed should be done so that one may be able to determine the relationship between PSS and breed in the swine population.

  ➔ This may help in the formation of a new breeding program that could possibly eliminate the PSS in the breeding stock.

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Figure 10. Autosomal Recessive Inheritance

- MOTHER: PSS GENE CARRIER
- FATHER: PSS GENE CARRIER
- NON CARRIER: 1 OUT OF 4 CHANCE (25%)
- GENETIC CARRIERS: 2 OUT OF 4 CHANCE (50%)
- AFFECTED: 1 OUT OF 4 CHANCE 25%
REFERENCES