

# **ARTIFICIAL INSEMINATION TECHNIQUE AND ITS ADVANTAGES IN SWINE INDUSTRY**

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## **ABSTRACT**

*Artificial Insemination (AI) is a process which including semen collection, diluted, stored and transferring semen to oestrus female animal. Semen is normally available either as fresh, chilled or frozen. There are two main techniques in AI which are technique of passing through the cervix (normal) and the technique of inserting the back of the cervix with the trumpet (Deep insemination)*

*The AI has brought a numerous advantage to the swine industry. Firstly, AI can enhance the rate of genetic improvement, accelerate traits performance. Secondly, using AI in swine industry decrease the number of boars needed by a farmer is an economic benefit. Thirdly, AI helps minimise the risk of disease transmission. Another advantage of AI is that it allows the mating of swine in different sizes and ages.*

Keywords: Artificial insemination, swine, mating, oestrus, onset of heat, genetic improvement, cost-effective, disease control

## **I. INTRODUCTION**

Artificial insemination (AI) is a process of collecting semen from a high genetic merit animal, testing the semen and transferring it to oestrus female animals. This practice can be applied in wide variety of mammals including humans, farm livestock and exotic zoological species (Flowers and Alhusen, 1992). Flowers and Alhusen (1992) said that. AI can be used in various ways as the method of mating in pig herds. Semen is normally available either as fresh, chilled or frozen. AI can be used with one of those styles or in combination with natural service.

First AI in swine had done in Russian by Ivanow from XXth century (Ivanow, 1907). In the 1930s, the AI technique had development and received achievement in Russia (Milovanow, 1938; Lipatow, 1935). After that, AI was applied in many countries such as USA (McKenzie, 1931), Japan (Jto và cs., 1948), UK (Chris Polge, 1956).

Recently the use of AI in pigs has significantly increased in the last three decades (Kadirvel et al., 2013). There are 83% of Danish farms using AI. In the year 2001/2002, there was about 3.35 million doses of semen were used in Denmark (Christinanse *et al.*, 2013). More than 75% of farms in Spain had applied AI in their breeding programs (Glossop, 1991). In Germany, the use of AI had increased by 0.25 million sows from 2.2 million in 1992 to 2.45 million in one year later (Gronbach, 1995). Further, approximately 155 million doses of semen were used for Pig AI in a single year in the World (Weitze, 2000).

The AI was firstly introduced in Vietnam since 1958. With consultant of Russian, a numerous of testing farms was established such as Gia Lam, Van Dien, Thuy Phuong. Up to now, the rate of using AI in practical has got a huge achievement. The rate of AI in Vietnam increased from 29.1% in 2008 to more than 70% in 2011 (Dao *et al.*, 2011).

This report will review the AI technique in swine and its advantage in swine industry.

## **II. SWINE AI TECHNIQUE**

### ***2.1. Semen collection, diluent and stored***

#### *2.1.1. Preparing instruments*

The equipment used for semen collection and diluent: glass cups, gauze filter, gloves, vial must be hygienic.

#### *2.1.2. Semen collection*

Cleaning the boars and male sex organs before semen collection. In the semen collection process, urine and other contaminants must not collect with semen.

Hands with rubber gloves stimulate the male boar penis, using hand to grasp with moderate pressure and slightly pull out so that the head of the penis does not rotate. Do not hold the pen too tight to make pigs pain and fear, should not be too loose because it can cause the penis to slip out of hand. Always put the tip of your penis in the palm of your hand.

Notes:

When ejaculation, remove the first transparent color (5-15ml).

When collecting semen, the semen flows slightly in the cup.

Do not let your head of penis touch the glass or jumping.

Avoid sperm contact with any metal objects.

When the boar has ejaculated, relaxing the hands which is holding the penis so that the pig themselves will shrink and fall off the jumper.

### *2.1.3. Diluting and conserve semen*

#### *a) Semen diluent*

The semen extender used to increase the volume of the boar ejaculate until that of the required dose. The ingredient of diluent are Glucose, Sodium Citrate, Sodium Bicarbonate, EDTA, antibiotic. The pH was 6.9 – 7.5. With these ingredients, the functional characteristics of the sperm cells are preserving so that it remains the fertility rate when AI with the female.

Diluted semen must be sterilized and the temperature of the medium diluted to the semen temperature.

The principle of diluent: pour slowly semen extenders into the cup which contain the pure semen (do not reverse). It should be done in two phases. The first once was poured an amount of semen extender was much as the volume of pure semen. The second phase was be done after 5 – 10 phase since phase one which poured the rest of semen extenders.

After diluent, sperm motility should be checked ( $A \geq 0.7$ ).

Then proper packaging.

#### *b) Conserve semen*

Packaged semen should be cooled down at the temperature 25<sup>0</sup>C then stored.

The appropriate preservation temperature for diluted semen is 17-18<sup>0</sup>C. For a long-term preservation, semen should be reversed lightly twice a day to prevent sperm deposition.

Before AI, all semen must be checked.

The quality of semen before AI should be total direct sperm count/dose  $\geq 3$  billion,  $A \geq 0.7$ ,  $K \leq 10\%$ , pH: 6.9 – 7.5.

## ***2.2. AI technique in Swine***

### *2.2.1. Preparation*

All the equipment must be hygiene before using (not using chemist to clean)

Using a paper towel to clean the vulva area

Before mating:

+ Using the hands or legs to stimulate the heated sows/gilts such as punch the flank with clenched fist or foot; clutching and lifting the groin and striking the under; thrusting and punching under the genital opening with clenched fist. Staff can also using the riding test.

+ For diluent semen: need to warm up the semen to 35 -37<sup>0</sup>C by holding the diluent semen in hands.

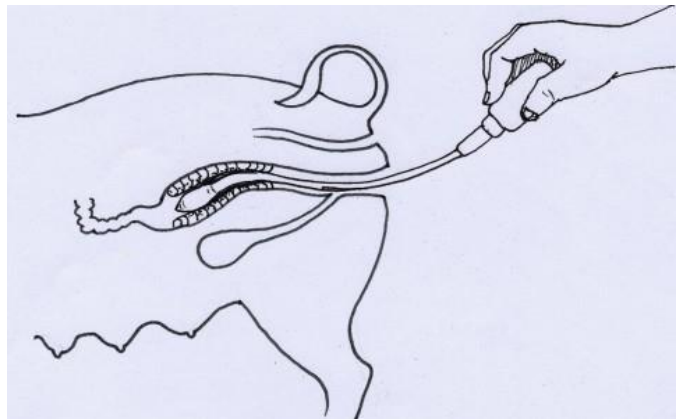
+ For frozen semen: the number of frozen semen using for each AI depending on the volume and size of frozen semen. Preparing the warm water (42<sup>0</sup>C) before thawing. Preparation the vials containing cryoprotectant in the middle of water at 38<sup>0</sup>C. Take each straw (one each) and submerged them into the 42<sup>0</sup>C basin (Note that do not keep the straw outside more than 8 seconds). Keep the straw in the water for 20 seconds then immediately take out the straw and dry it with paper towel. Then gently shake the straw, using scissors to cut the knot then pour the semen by pressing the cover with the pump. Repeating with other straws.

### 2.2.2. Insemination technique

#### ***The technique of passing through the cervix (normal)***

Lubricant the catheter before pushing catheter into female sex organs. The catheter is pushed along the back in order not to hit the urinary. When the catheter is inside the cervix, turned half around to the left and pushed ahead.

When the catheter in the cervix, connect the flat-pack semen with other head of catheter. Then holding the semen tube so that semen can flow in. Do not press the tube.

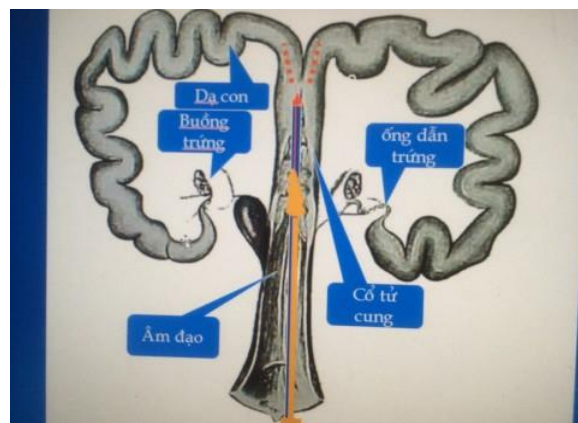


In the process of AI, keep stimulating the heated sows/gilts.

When all the semen has been deposited into the female, remove the catheter by rotating it clockwise while gently pulling. Some people prefer to leave the catheter in place for several minutes to prolong cervical stimulation.

### ***Technique of inserting the back of the cervix with the trumpet (Deep insemination)***

The process of this technique is normally the same as the technique of passing through the cervix. There is only one difference is this technique used a polyurethane sponge tip catheter which is locked in the outer part of the cervix as normally. When the catheter is inside the cervix, the tube is carefully passed through the catheter into the uterus where the semen is deposited.



In comparison with the normal technique, this method reduces the amount of semen required. The total direct sperm count/dose  $\geq 1$  billion.

### **III. The advantage of using AI in Swine production**

#### ***1.1. Acceleration of genetic improvement of livestock on a global scale***

In the past, AI could not be widely used because of technology limitations. But nowadays, with the development of technology, the semen of boars can be frozen, stored and banked, for example, Swine genetic international (SGI) (Roca et al., 2006), until their genetics are needed to re-introduced genes into herd or shipped globally in dry shippers (Purdy, 2008). Therefore, pig farmers can access top-tier genetic (Bengt Eriksson, 2000).

The producers can import the semen of outstanding boars to improve their genetic material (Kadirvel et al., 2013). Therefore, this will raise the incidence of genetically advantage of traits in pig herds and encourage the well-known use of high genetic merit semen in worldwide. This can also be to the advantage of breeding program, allowing accelerated improvement and facilitating progeny testing.

#### ***1.2. Cost-effectiveness***

The use of AI is significantly cost-effective to improve local pig breeds. This is because the import of frozen semen is cheaper and safer compared to the import of live animals for adding new genetics to a flock. Semen selected from expected boars is frozen and stored in semen straws in containers containing liquid nitrogen. Semen straws are very easy to handle and transport whereas live boars require more expensive means of transportation. Furthermore, in some circumstances live animals may die or

they may be infected some contagious diseases during transportation. That is why the use of live animals to improve local breeds can be costly and risky.

The use of AI would also reduce numbers of boars in farms. This is cost-effective because fewer boars result in less feed consumption, less labor cost, and less maintenance cost. For instance, one boar may cost as much as \$2 per day in feed and maintenance cost and has an estimated needed 20 months productive life expectancy in a herd. In addition, in natural mating, the ratio of boar: sow is 1:16 whilst this ratio of AI is 1:98 or even higher (PigChamp, 2009). Because two times of ejaculate of boar can mate for one oestrus sow while a typical ejaculate could be diluted with extender so as to provide 12 insemination doses (Flowers and Alhusen, 1992). A 2 – 3-year boar can service for 936 sows and gilts per year as they can collect in 52 week x 3 times per week x 12 doses per collection and divided by 2 doses per sow in oestrus. A same boar using in natural service never mate that figure of sows/gilts in the one year.

Flowers and Alhusen (1992), and Willenburg et al. (2003) indicated that in the time of taking natural mating on female, it can be up to 4 sows/gilts are bred by AI. Moreover, it is not necessary to move the oestrus sow or gilt to the boar for mating. Additionally, as the number of mating per day increased, so did the relative labor advantage of AI over natural service.

### ***3.3. Disease control***

Some diseases are transmitted from sick animals to healthy ones via natural mating as well as AI, Porcine reproductive and respiratory syndromes are examples. However, another disease such as pseudorabies cannot be transmitted through semen (Bailey et al., 2008). Semen can be also tested prior to insemination and the addition of antibiotics to semen could reduce the chance of venereal transmission of bacterial disease. Therefore AI helps minimize the risk of disease transmission (Knox et al., 2008). The addition of antibiotics to semen extenders also reduces the chances of venereal transmission of bacterial disease when compared with the risk with natural service.

### ***3.4. Another benefit***

Another advantage of AI is that producers can use pure semen of one boar or mixture semen of two or three breeds to inseminate to sows/gilts in different sizes and ages (Knox et al., 2008). Mostly, in commercial farm, in order to improve rate of mating and increase the number piglets born alive, the producers can mix semen of two or three pig breeds. For example, Danish producers mix semen of Duroc and Pietrain to

inseminate with Landrace or Yorkshire to produce commercial pigs. It is difficult to mate an old, large, exotic boar with a small gilts or indigenous sows, but AI can take advantages.

#### **IV. CONCLUSION**

Artificial Insemination (AI) is a process which including semen collection, diluted, stored and transferring semen to oestrus female animal. Semen is normally available either as fresh, chilled or frozen.

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