INFORMATIVE FOR MAKING AI STATION FUNCTION FROM CIMCO ON JAPANESE BREEDING COMPANY

Masamitsu Tomiyama[1], Makoto Kimata[1] and Kazuo Ishii[2]

[1]CIMCO Corporation

Koto-Ku, Tokyo, Japan

[2]NARO Institute of Division of Animal Breeding and Reproduction, Institute of Livestock and Grassland Science

Tsukuba, Ibaraki, Japan

E-mail: tomiyama@cimco.co.jp

ABSTRACT

CIMCO Corporation is a Japanese swine breeding company offering quality gilts, boars and the semen for the Japanese pork industry. CIMCO has several artificial insemination (AI) stations across Japan operating under different climatic conditions. In the present seminar, key information and data obtained from our AI experiences and studies are discussed. It is important for pork producers to understand that the semen quality is influenced by various factors, including AI boar traits as well as transportation and environmental factors. For example, we recommend to our customers that our semen products should be used within 3 days of receipt based on a transportation study we conducted. We also know that, except for some northern areas in Japan, the semen quality can be adversely affected in the summer. Since the climate varies among countries and within a country, data collection is essential for each AI station to promote the best AI practice in the region.

Keywords: Artificial insemination station, Japanese swine breeding company, heat stress.

INTRODUCTION

Currently, about 839,000 sows are used for pig production in Japan, and estimated 60% of them are receiving artificial insemination. At CIMCO Corporation, a Japanese swine breeding company, we use our own genes to produce high quality breeding stocks and pork at six specific-pathogen-free (SPF) farms approved by the Japan SPF Swine Association. We sell Landrace and Large White hybrid parent stock (PS) gilts, purebred Duroc boars, purebred Berkshire gilts and boars, and liquid

extended semen from Duroc and Berkshire boars. We are also an exclusive sole distributor of DanBred International A/S in Japan. Each of our farms has its own AI station, and its operations include raising of boars, semen collection, inspecting of semen quality, and production and shipment of liquid extended semen. Purebred Landrace and Large White for PS, Duroc and Berkshire are produced and continuously improved at these farms. The CIMCO's extended semen accounts for approximately 4.5 percent of 3.5 million doses estimated to be used across Japan.

The semen quality from AI boars is influenced by various factors depending on individual genes and environmental factors. Located from northern to southern parts of Japan, CIMCO's AI stations are operating under different climatic conditions. In the present seminar, we will discuss several key insights from our AI experiences and studies.

EXPERIENCES AND DATA FROM CIMCO AI STATIONS

Semen Collection

Various AI boars are used at AI stations. Among abnormal boars, there are individuals that can be and cannot be collected. For example, semen can be collected from boars having penile distortion. Boars with an abnormally located urethral opening require more hygienic procedures. Semen cannot be collected from boars with penile adhesion. For cautious boars that do not mount in the presence of humans, video monitoring is recommended. Some boars refuse to move out of their pen, and in these cases it is necessary to lure the boar by artifice.

Training to mount dummies is essential. Mounting behaviors are different among boars. Time to mount depends on boars; some boars mount immediately, while it may take up to an hour for others. Moreover, some boars do not mount unless they are the first to be collected, while others do not mount unless it is after other boars.

We only collect the sperm-rich fraction of the ejaculate (i.e., white-colored and thick fluid). Sometimes, however, the sperm-rich fraction cannot be clearly distinguished, i.e. white-colored and thick fluid at the ejaculate.

Transportation

Japan has considerably accurate and efficient transportation systems. Still, it is important to understand the effect of transport on semen quality. For this reason, we conducted a study in which extended semen samples were transported from

a northern AI station to a southern AI station on three different occasions, and sperm motility was assessed. The results are shown in Table 1. A difference in motility between the shipping farm and the receiving farm became notable at 5 days after collection. This is the reason why we recommend our customers that our products should be used within 3 days of receipt.

Heat Stress

A statistical analyze was conducted to evaluate the effect of heat stress on boar semen quality. This work was supported by a grant from the Ministry of Agriculture, Forestry and Fisheries of Japan (Development of Breeding Technology for Animal Life Production). Data from 28,670 records on 686 boars used for insemination and for production of extended semen from 2000 to 2015 were used to evaluate the effect of heat stress on boars on semen characteristics. Traits analyzed were semen volume (Vol, in ml), sperm concentration (Con, in 100 million cells/ml), % normal sperm (Normal, in %), % motility (Mo, in %), total number of sperm cells (Ntotal, in 100 million) = Vol × Con, and number of functional sperms (Nfunc, in 100 million) = Ntotal × Normal × Mo. Statistical models were included effects year, month, farm, collection interval, number of weeks after the initial collection, breeding values, permanent environmental effect and residual. Restricted maximum likelihood (REML) procedure using a four-trait or two-trait animal model was used. The results on genetic parameters are shown in Table 2. Heritabilities were estimated of low as similar as female reproductive traits.

Trends of estimates with Vol, Ntotal and Nfunc on each farm are shown by month in Fig. 1. Akita was the northernmost site analyzed, followed by Toyama, and the summer temperature is relatively low at these sites. Chiba is located in the middle part of Japan, and Kagoshima in the south. The differences in semen traits observed among these sites in the summer indicate that management of AI boars in summer months is important for semen quality. The strategies to reduce heat stress in AI boars may include methods of breeding, nutrition and facility structure. Japan has four seasons, and temperature varies within the day and within the year, making it difficult to design pig facilities that are suitable for all seasons. Barns designed to reduce heat stress are typically open systems with high ceilings and ventilation and would not be suitable for the Japan's climate. The use of air conditioners is costly, but it is one solution we can use.

Heat stress on boars is extensively studied and published. Many of these studies, however, were reported in non-Asian countries with different environmental

conditions. Even within Asia, the climate differs greatly. For each AI station, therefore, it is essential to collect data to understand its own characteristics to promote the best AI practice in the region.

Table 1. Results of transport test.

Dept. time at NA		Arr. time at SA		breed	Im-mature	abnor.	mob.	collect 23-Jul	1 d. after 24-Jul	2 d. after 25-Jul	3 d. after 26-Jul	4 d. after 27-Jul	5 d. after 28-Jul	6 d. after 29-Jul
23-Jul	13:30	25-Jul	14:05	L	4	9	NA	90	85	85	85	85		
							SA			85	75	70	50	20
				W	3	7	NA	90	85	80	80	80		
							SA			90	85	80	75	75
								6-Aug	7-Aug	8-Aug	9-Aug	10-Aug	11-Aug	12-Aug
6-Aug	13:40	8-Aug	14:00	L	4	9	NA	90	85	85	80	80	80	80
							SA			85	80	60	30	20
				W	3	6	NA	90	85	80	80	80	70	70
							SA			85	80	50	30	10
								20-Aug	21-Aug	22-Aug	23-Aug	24-Aug	25-Aug	26-Aug
20-Aug	13:35	22-Aug	14:00	L	4	8	NA	90		85	85	80	85	80
							SA			90	80	70	65	60
				W	3	4	NA	90	85	85	85	85	80	70
							SA			90	85	80	65	50

NA: North area in Japan, SA: South area in Japan. Directly: 1,290 km.

Table 2. Genetic parameters with semen traits.

	σ_p	Vol	Con	Normal	Mo	Ntotal	Nfunc
Vol	43.00	**0.17**	−0.56	0.00	0.13		
		±0.03	±0.06	±0.11	±0.09		
Con	1.87		**0.22**	−0.29	−0.18		
			±0.02	±0.08	±0.07		
Normal	6.32			**0.23**	0.84		
				±0.04	±0.05		
Mo	4.16				**0.17**		
					±0.03		
Ntotal	203.78					**0.20**	0.95
						±0.04	±0.01
Nfunc	169.78						**0.16**
							±0.04

Diagonal (bold text): heritability, above: genetic correlations.

Vol: semen volume, Con: sperm concentration, Normal: normality, Mo: mobility, Ntotal: total no. of sperm, Nfunc: no. of functional sperm.

Fig. 1 Estimates of month effect on each farm.