

Farming Connect Management Exchange

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Scandinavian methods of artificially inseminating ewes

SWEDEN & DENMARK

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This study aimed to

1. Identify differences in the approaches used for cervical artificial insemination (AI) in Denmark and Sweden compared to the UK, that have consistently lead to high conception rates in sheep programmes
2. Learn about breeder attitudes to the use of AI in sheep
3. Highlight changes that could be implemented to enhance cervical AI programme in Wales



Introduction

Artificial Insemination methods

In Wales, most ewes are inseminated laparoscopically (Lap AI) which is carried out by a qualified veterinary surgeon. Lap AI offers the best conception rates, these can vary from 60% to 80%, by using fresh semen, conception rates can increase to 90%. Lap AI is an invasive procedure and there are risks to be considered, especially as the breeders select their very best ewes for insemination. Lap AI requires a synchronisation programme using a

progesterone sponge which is inserted into the ewe's vagina. Over a period of 14 days the hormone is released into the blood stream via the wall of the vagina. During the breeding season, the hormone temporarily prevents the ewe coming into season and it primes the ewe to respond to an injection of pregnant mare serum gonadotrophin (PMSG). When the sponge is taken out, the blocking effect of the hormone is removed and she will come into heat approximately 48 hours after injecting with PMSG.

Insemination is carried out at a fixed time of 55 hours after the injection of PMSG. The ewe is lightly sedated before placing her in a cradle. The abdomen of the ewe is then penetrated and her uterine horn injected with thawed semen (100 million spermatozoa) that had been frozen in a pellet.

To justify the high costs of Lap AI (Vet visit fee £125, sponges and PMSG £3.75/ewe, Lap AI £12-£15/ewe, semen handling £20/batch and the cost of semen) high conception rates which are then converted into a high number of lambs born are essential.

An alternate is intravaginal insemination (Cervical AI). This does not require a vet and fresh semen from a stock ram is used. It does carry the same synchronisation programme costs as Lap AI but without the cost of frozen semen. Cervical insemination conception rates using fresh semen vary from 50% to 70%. Frozen semen trials carried out in the UK have resulted in very disappointing conception rates varying from 5% to 30%.

In all Scandinavian countries Lap AI is illegal and only Sweden allows the use of sponges and PMSG. Norway does not even allow farmers to use vasectomised rams to detect natural oestrus. Due to these legal restrictions, the Scandinavian countries have developed a method of **cervical insemination of sheep using frozen semen** out of necessity. Currently, the leaders in cervical insemination using frozen semen are to be found in Norway. It is carried out by farmers themselves and is called a "shot in the dark". They are now regularly achieving conception rates between 60 to 70% on thousands of ewes. That is comparable to Lap AI results without the risks, the costs and the interference of PMSG. Swedish and Danish sheep farmers have been practicing the Norwegian method quite successfully for a number of years. For cervical AI using frozen semen, they use straws containing 200 or 240 million spermatozoa and find that this is far better than freezing in pellet form.

Synchronised induced oestrus resulting from the use of sponges and PMSG is different to natural oestrus. The mucus from natural oestrus improves transport of spermatozoa through the cervix to the intrauterine horn where the eggs are fertilised. This is an important factor when using thawed frozen semen as its motility is much lower than fresh semen, therefore, it is vital that it quickly travels to fertilise the eggs.

Sweden

The first farmer I visited in Sweden was **Mr Torgil Moller**, who runs a pedigree flock of fifty Texels ewes. He is one of the leading Texel breeders in Sweden and sells 5 breeding rams in their one and only national sale; he achieves some of the highest prices. The remainder of

his rams are sold off farm to commercial lamb producers. All the rams must pass an inspection on farm before being allowed to enter the Texel National Society sale.



Torgil first started using frozen semen in 2011, using a teaser to mark the ewes, he recorded the time and inseminated 24 hours later. The ewes were inseminated once with a straw frozen semen thawed for 12 seconds and containing 200 million spermatozoa. The pregnancy rate was 38% and conception rate was 167%. However, inspecting the ewes 3 or 4 times a day and recording the time each ewe was marked by the teaser was time consuming and a little confusing at times. It also resulted in a long lambing period which was inconvenient, as Torgil works full time as head salesman for the local Vallberga Lantman Co-operative.

In 2013 he started using sponges, withdrawn on day 12 and injected with PMSG 320-360 i.u. Inseminated at a fixed time 52 hours later with a straw containing 200 million sperm. The pregnancy rate was much improved with 51% and the average number of lambs per ewe that lambled was 145%. He thought that the PMSG injection 320-360 i.u was too low hence the low conception rate. By using sponges and PMSG he had a tight lambing period conducive to his working pattern.

By 2015 using sponges and PMSG, he increased the PMSG dose to 400-440 i.u. The ewes were inseminated twice with a straw containing 100 million sperm at 48 hours after withdrawal of sponges and again at 54 hours. The straw was thawed for 6 seconds allowing for further thawing inside the ewe. The pregnancy rate increased to 65.5% and the average number of lambs per ewe was 195%.

The second visit was to **Mr Anders Gunnarsson** who has a pedigree flock of over 100 Texel ewes; he carried out the same programme and had similar results to Torgil.



I then travelled down country to **Maycon Vyborg**, Brazilian by birth. In February 2017, he was nominated for and won *the best countryside entrepreneur in Sweden* presented to him by the Swedish king. His objective is to improve the national Swedish sheep by introducing new genetics. He owns a large breeding company carrying out a lot of AI work and has his own flock of 1,500 ewes. He breeds Gotland, Finnish Landrace, Texel, Suffolk, Border Leicester sheep and produces breeding rams and cross bred ewes for the commercial lamb producer. He has access to free grazing from arable farmers who grow white clover for seed production and in the summer grazes land under environmental schemes.

Maycon carries out 1000 cervical inseminations for himself and 400 for other sheep breeders. He uses sponges and PMSG for all his cervical A.I. The ewes go through the race and are loaded into a Modulamb docking crate which restrains the ewe, raising her up to eye level to insert the sponges. This speeds up the work and reduces stress to both the ewe and the operator.

Before inserting the sponges, Maycon sprays the outside of the vagina with Iodine and wipes clean with paper towels. He feels that it is important that you do not contaminate the sponges with faeces or dirt when you insert them. Maycon lubricates both ends of the tube used to insert sponges so they slide easily into the vagina and avoids irritating the vagina wall which could possibly cause inflammation. When the sponges are taken out they are clean and

are not foul smelling that could indicate presence of an infection inside the vagina. He does not take the sponges out until day 15 and then injects with PMSG.

Maycon uses the Modulamb crate to cervically inseminate ewes at a fixed time of 58 hours after withdrawal of sponges and injecting with PMSG. The vulva is cleaned and lips parted and the AI gun is gently inserted horizontally until contact (resistance) with the cervix is made. The gun is gently withdrawn about 2 to 3 mm and the semen is expelled.

The ewe is inseminated twice using two straws 0.25ml each containing 120 million sperm and he consistently achieves 63% -65% conception rates.

There are two types of straw on the market; one 0.25ml and the other 0.5ml; he believes using the thinner 0.25ml straw results in less damage to the spermatozoa membrane in the freezing process and results in a higher number of live spermatozoa after thawing. He is actively looking at different diluents and adding egg yolk as he thinks it will protect the semen from damage when freezing. This will allow him to inseminate with one straw 0.25ml containing 240 million sperm. He is using the French IMV equipment, the cattle AI gun, straws and a plastic sheath with a bulbous end which has four holes placed diagonally so that semen has a spray effect when expelled to replicate the ram's action when he serves an ewe naturally. Maycon says it is important that the room temperature where the insemination takes place be warm and all equipment used kept as near as possible to body temperature. The shock or a sudden drop in temperature can kill a percentage of spermatozoa.

Denmark

My first visit was to see **Uffe Worm**; he farms as part of an organic co-operative farm. Uffe owns and runs a 200 ewe Lleyn flock. He has been ruthlessly selecting replacements that are resistant to both mastitis and footrot. In Denmark, *the use of sponges and PMSG are not allowed* therefore teaser rams are relied upon to mark ewes for natural oestrus.

Uffe has been cervically inseminating ewes with frozen semen for many years having attended training courses in Norway. He uses German Minitube equipment with the sheep AI gun and 0.25ml straws with 200 million spermatozoa, thawed for 15 seconds at 35 C.

Uffe uses a teaser ram to mark ewes, and always uses raddle paint, topped up every day. He checks the ewes three times a day, ignoring the first mark. When an ewe has been heavily marked in the *morning*, he cervically inseminates with frozen semen and then again if the ewe still stands to the teaser in the evening. An ewe that is heavily marked *during the day* is inseminated late evening and if she still stands to the ram is inseminated next morning. Any ewes that are not standing 8 hours later are only inseminated once. He has made notes on every insemination and the resulting conception rate since he began AI. Commenting on behaviour, and procedures and keeps referring to them. From his notes a ewe that is heavily marked and standing alongside the teaser for insemination will not be inseminated if she becomes agitated when lifting her tail. He waits until her next cycle if she has been selected for AI or puts her to the ram to be served naturally.

When he inseminates, he believes that it is important that the teaser be with the ewe to calm her and stimulate her ovulation and reduce any stress to her. All the ewes stay with the

teaser after insemination as they will still be ovulating for a few more hours afterwards and he believes that the presence of the teaser ram assists in the transport of the spermatozoa through the cervix and towards the egg.

The AI gun is slowly placed horizontally in the cervix, pushed until one feels some resistance against the cervix. A little pressure is applied against the cervix and the semen is slowly expelled followed by the slow withdrawal of the AI gun. The AI gun and plastic sheath is so thin the ewe is not irritated or conscious of its presence and insemination is carried out in seconds.

My next visit was to **Arne and Winnie Hansen** who have 35 pedigree Shropshire sheep and successfully sell pedigree rams in Denmark, Norway and Germany. They both work full time; Arne is a manager of an AI cattle company.



They inseminated 6 ewes and followed Uffe's instructions thoroughly with all ewes inseminated twice. Arne said that the extra cost of semen was justified in achieving new blood lines and 11 live lambs. They had a 100% conception rate. They inseminate 8-12 hours after the ewe is observed to be standing to the teaser and again 8 -12 hours later, whether or not she is still standing to the teaser.



When he inseminates the AI gun is inserted slightly upwards and then horizontal for approximately 10 to 20cm until he encounters light resistance, at which point the semen is expelled. He uses the German Minitube equipment and their cattle AI gun.

My final visit was to **Aase and Christian Svensen** who farms 200 hectares, has a flock of 900 ewes and are in the process of increasing the flock to 1200 ewes. They have Lacaune and Poll Dorset ewes and they lamb three times a year to produce spring lamb all the year round. They have developed a niche market selling direct, at a fixed price, throughout the year to the best chefs in Denmark. They also aim to produce a small suckling lamb, at the request of the chefs for which they receive an extra premium which is almost the same as for a 20kg carcase.



Aase tried cervical insemination using frozen semen last year but was not satisfied with the conception rates - again the timing of oestrus is crucial. This year Aase will start inseminating ewes as soon as they have been marked and again 12 to 15 hours later. Aase does not think that stress is very important when dealing with their own sheep and in familiar surroundings. He points out that under field conditions where ewes run with several rams, the ewes are pushed around and head butted and this does not seem to have an impact on conception.

Aase uses Hungarian AI equipment which is quite different to the German and French. He brings the ewes to the shed and inseminates them in their own crate.

The Hungarian people inseminate their ewes by lifting their hind legs over a bar and inseminating downwards. They have used this method over many years and have inseminated thousands of ewes successfully.



Discussion

Latest figures show that over 48% of Welsh lambs fail to achieve the desired carcass grade. It's the same in all the home countries. The quickest way to improve carcass quality is by using superior genetics. Welsh Lamb with PGI status is a brand recognised world- wide. It makes sense to increase the number of Welsh Lamb that meet the specification in order to obtain more money from the market place and therefore to be more profitable.

90% of our lambs are exported- this will be extremely relevant in the coming years as subsidies are reduced and our relationship with Europe changes. Hybu Cig Cymru – Meat Promotion Wales (HCC) have over the years developed good relationships with numerous

countries and we know it takes many years for an agreement to be signed allowing us to sell our lamb to them. HCC can only promote and market what we as farmers produce and we can only improve the end product, the carcass, by using the best genetics. We are facing tough times in the next five years as more money is being transferred from Pillar 1 to Pillar 2 and we have to change our management and the way we farm. Whatever decision we come to, it will take at least five years to implement. We do not know how the outcome of Brexit will affect our currency and interest rate; it could be quite dramatic. As lamb producers and breeders, we must look at everything and anything that will reduce our cost of production and increase our competitiveness in a global market.

New Zealand was the first country to stop subsidising their farmers and as our payments are being reduced we can learn from their experience. They embraced superior genetics.

Just one, out of many examples how New Zealand survived without subsidies.

In 1989 64.57 million sheep produced 1,230,000 tons of sheep meat; fertiliser use was 2,012,589 tons.

In 1999 46.08 million sheep produced 1,229,000 tons of sheep meat; fertiliser use was 1,480,760 tons

We are in a better position than New Zealand when their subsidies stopped overnight. We are still in the EU until 2019 and the government has agreed in principle to keep SFP until 2022. We have the largest pool of sheep genetics in the world compared to New Zealand who have very few sheep breeds to work with. We also have the benefit of IBERS at Aberystwyth, another world leader, that continues to breed superior grasses and undertakes invaluable research work into improving and acquiring a better understanding of our soils in the of production of healthy grass at a lower cost.

The cost of producing grass is 5/6p per KgDM and compound food 24/25p/KgDM. Sheep and cattle graze grass - pigs and poultry eat compound food.

We have the climate to grow grass even better than New Zealand, which has the dramatic influence of El Nino and La Nina. New Zealand farmers survived after losing their subsidies by improving their grass production and embracing superior genetics out of necessity.

Cervical insemination of ewes using frozen semen offers the breeder an affordable opportunity to speed up the genetic gains in his flock (thus improving the national flock), improving connectedness across flock linkages and giving more robust and accurate Estimated Breeding Values (EBV) figures. Going forward, the creation of a large population of performance recorded sheep to start a Genomic Breeding Values (GBVS) programme would identify potential superior animals at an early age. GBVs will identify markers that are hard to measure; traits such as resistance to mastitis, foot-rot, worms etc. reducing reliance on antibiotics, prolificacy and meat eating quality and many other traits. GBVs in the dairy industry have been ongoing for many years to the benefit of the whole industry. The sheep industry can learn from the cattle experience, and accelerate progress in GBVs for our sheep.

Conclusions

My visit to Sweden and Denmark has been enjoyable, informative and intense. The people I met were very open in sharing their expertise, their successes, but just as important what they learned from failures. I think the fact that I brought with me information about my flock was key to their willingness to share their knowledge. They answered every question I asked of them and in return I honestly answered questions about my flock and performance recording. In the six days, I travelled nearly 2000 miles and visited six farms, three in Sweden and three in Denmark and was invited to visit other flocks but time did not allow.

Cervical insemination using frozen semen will initially be taken up by pedigree breeders. Also by innovative commercial lamb producers if we can achieve 70% conception rates using cheaper semen like 'bull of the day' in the cattle.

AI has improved the performance of the dairy industry through better genetics, whilst the sheep industry has been slow to embrace AI. The main reason being that in cattle the inseminator can penetrate the cervix and deposit the frozen semen directly into the uterus whilst in the ewe it is nearly impossible to penetrate the cervix as its tortuous – *however these visits to Denmark and Sweden have demonstrated just how successful the technique can be.*

Training courses for sheep farmers are needed as have happened for dairy farmers- which could possibly be provided through the Farming Connect programme. Once trained, the breeder can have a flask on farm holding semen from different proven rams to be used on selected ewes. AI offers access to superior genetics, reduces risks of importing diseases and a wider choice of proven rams. It allows the purchase of semen from rams to improve the individual ewe's weaker EBVs, while avoiding risk of in-breeding. It could be cheaper to buy semen from proven rams than having to pay a high price for a stock ram which may not improve the flock and in some instances may have a relatively brief working life in a natural mating system.

Before my visit I thought using my Coldlite ewe scope to deposit semen in the os cervix would increase conception rate but I am not so sure now.

Going forward...

Research is also needed to study the effect of freezing and thawing of semen. Diluents that protect the spermatozoa membrane when freezing, reduce damage to the spermatozoa thus increasing motility after thawing. This could reduce the number of spermatozoa required per straw and still maintain high conception rates. Looking at the freezing and thawing curve could lead to ways to improve conception rates. Knowing our AI dates, we can produce EBVs for gestation length and its influence on ease of lambing. Rams can be identified with high libido, quality and volume of spermatozoa and given an EBV.

Cervical insemination using frozen semen achieving conception rates of 50% -70% gives us a huge opportunity to improve the national flock. Coming back to the opening point in the

discussion this could benefit producer and processor alike by reducing the number of carcasses that fail to achieve the desired grade in the EUROP grid, thus improving farm profitability and also lowering the cost of processing as well as reducing waste in the plant. Cervical insemination using frozen semen gives us an opportunity to rapidly improve the Welsh sheep industry, make our farming business more viable and more competitive in order to face the challenges coming our way in the next few years.

To make sheep farming profitable we need healthy soils, healthy grass and superior genetics and cervical insemination using frozen semen is an important component as the way forward. We need to reduce our production costs and our carbon footprint per kg of lamb produced. Also, grass-fed lambs have a higher content of health-promoting Omega 3.

Following my visit, I will be cervically inseminating my own sheep this autumn using frozen semen.

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