

The International Scientific Conference on Deer Genetics and Management

Sigulda, Latvia, August 6 – 7, 2014

PROCEEDINGS



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Deer Genetics and Management**

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PROCEEDINGS

SCIENTIFIC COMMITTEE

Chairman: Dr. Aivars Bērziņš, Institute of Food Safety, Animal Health and Environment „BIOR”, LATVIA

Dr. Tomas Landete Castillejos, International Deer and Wild Ungulate Breeders Association (IDUBA), SPAIN

Dr. Dainis Paeglītis, Latvian Wild Animal Breeders Association (LWABA), LATVIA

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Latvian Wild Animal Breeders Association LWABA
Institute of Food Safety, Animal Health and Environment „BIOR”

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PROGRAMME

WEDNESDAY, 6 AUGUST, 2014

12.00-13.00 **Registration**

13.00-16.00 **Poster, video presentations and talks by non-attending speakers**

- Poster: “Reproduction of red deer in farm production”, *Jaroslav Pokorádi, Slovak Republic*
- Talk: „Tuberculosis in European deer”, *Dr. John Fletcher, Scotland (presented by Dr. Tomás Landete-Castillejos)*
- Video: “Genetic selection and breeding manipulation in New Zealand: a success story of Peel Forest Estate”, *Graham Carr, New Zealand*

THURSDAY, 7 AUGUST, 2014

9.00-9.50 **Registration**

9.50-10.00 Welcome and opening by *Dr. Dainis Paeglītis, Latvian Wild Animal Breeders Association LWABA, Latvia*

SESSION I

Chairman **Dr. Tomas Landete Castillejos**

10.00-10.30 „Genetic aspects of deer herd quality improvement”, *Dr. Dainis Paeglītis, Latvia*

10.30-11.00 “Manganese supplementation improves antlers of adult deer even under a balanced diet”, *Tomas Landete Castillejos, Spain*

11.00-11.45 “The important principles of mineral nutrition and mineral feed for deer: the success story of VVS Verměřovice feed company”, *Ondřej Faltus and Jan Záhora, Czech Republic*

11.45-12.15 „Deer nutrition: from evolution of digestive track to deer farming practice”, *Dr. Radim Kotrba, Czech Republic*

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12.15-12.45 „Principles for genetic selection and trophy production in white-tailed deer: from overview of the sector, to breeding top quality white-tailed stags at Glenn Dice Farms”, *Glenn Dice, USA*

12.45-14.00 **LUNCH**

SESSION II

Chairman

Dr. Radim Kotrba

14.00-14.45 “Innovation in red deer farming in Hungary”,
Dr. Árpád Bokor, Hungary

14.45-15.15 „Hybridization program in Deer Farm Rudzie - preliminary observations”,
Dr. Bartłomiej Dmuchowski, Poland

15.15-15.45 “The simple secrets of successful deer management at Woburn Deer Farm”, *Dan DeBaerdemaecker, UK*

15.45-16.15 „Characteristic of deer meat (*Cervus elaphus*) obtained in Latvia farms and wildlife”,
Vita Strazdiņa, Latvia

16.15-16.45 “The Federation of European Deer Farmers Associations (FEDFA) represents European deer farming industry”,
Dr. Radim Kotrba, Czech Republic

16.45 **Closing of Conference**

ORAL PRESENTATIONS

**GENETIC ASPECTS OF DEER HERD QUALITY
IMPROVEMENT**

Dainis Paeglītis

Owner of Saulstari deer farm, Latvia;

President of SDAA-LWABA (Latvian Wild Animal Breeders Assoc.);

Vicepresident of IDUBA (International Deer and wild Ungulate Breeders Assoc.)

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The presentation deals with a variety of breeding strategies and techniques to improve genetic quality of deer herd including: i) Selective shooting of stags with poor potential; ii) Introduction of high quality sire stags in hunting parks or game estates; iii) Changing of sire stags and/or hinds in deer breeding farms; iv) Crossbreeding and pure bloodline breeding techniques; v) The use of artificial insemination and embryo transfer techniques in deer breeding farms; vi) Selective breeding based on paternity/maternity control by DNA analysis. Technologies are discussed from point of view of speed of genetic changes in deer herd. The presentation shows the advantages of modern breeding technologies for achieving a quick improvement of genetic quality of a deer herd as well as the necessity to maintain animal populations (herds in the case of farms) of pure bloodline for successful development of the industry.

**MANGANESE SUPPLEMENTATION IMPROVES
ANTLERS OF ADULT DEER EVEN UNDER A
BALANCED DIET**

Landete-Castillejos, T.*, Garcia, A., Cappelli, J., Ceacero, F. and Gallego, L.

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Spain's National Game Institute; president of IDUBA;
Senior Vicepresident of FEDFA

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Mechanical properties, and in general, growth of antlers, has been thought to be mainly depending on Ca and P input. However, many other minerals can influence growth and mechanical performance in bones. Our research group examines mineral composition of antlers as a diagnostic tool to detect nutrition deficiencies, and also their effect in mechanical quality of the antler material, internal structure, density of cortical wall, and other antler characteristics. One of the most interesting minerals, although not the only one, seems to be manganese. In this presentation we remind early studies where a deficiency in manganese (and also phosphorus) detected in broken antlers naturally occurring in 2005, produced as a result a 30% reduction in antler weight, and a similar reduction in resistance to impact (impact energy), other mechanical properties, and thinner cortical wall. As a result of this experiment, we decided to examine the effects of manganese supplementation in spikers and adults of red deer under a balanced diet. Subjects were 29 deer of different classes of age (adult n=16, subadult n=3, spiker n=10) that were divided into a control group (n=15) and a group subjected to injection (n=14). Antler mineral content (ashes, micro and macro minerals), mechanical properties (Work to peak force, Bending strength, Young's Modulus of elasticity) and structure (average cortical thickness, cortical bone's specific gravity, cortical bone ratio) were examined in to 4 different

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test points along the antler beam. Each variable has been related to treatment, class of age, weight and year of growth of the antlers in a statistical test based on General Linear Model. The results show that manganese supplementation did not produce any effects in spiker antlers beyond an increase in manganese content. However, in adults results on the overall mean of the antler show a clear effect of manganese supplementation increasing the content of Ca, Na, P, B, Co, Cu, K, Mn, Ni, Se, Si, but no effect on mechanical properties. An analysis on the top portion of the antlers, where the effects are shown more clearly, showed the same effect in mineral composition, but also a 16% increase in work to fracture, much greater than in the mentioned study in wild deer. Thus, manganese supplementation can improve mineral composition of antlers, structure and some mechanical properties despite animals having a balance diet.

The results are important for mineral and feed supplements in deer, but they may also have implications for human health and bone biology.

**THE IMPORTANT PRINCIPLES OF MINERAL
NUTRITION AND MINERAL FEED FOR DEER: THE
SUCCESS STORY OF VVS VERMĚŘOVICE FEED
COMPANY**

Ondřej Faltus and Jan Záhora

VVS Verměřovice s.r.o., Czech Republic

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VVS Verměřovice s.r.o. is a family company located in the Eastern Bohemia, in Pardubice region. The mission of the company is ‘to propose and implement solutions of effective animal nutrition and breeding’. VVS produces mineral feeds, concentrates and premixes for farm animals, game (deer) animals, horses and pets. Main competence and focus of VVS is dairy cattle segment, which represents 80% of the company activities. The company has developed their principles of animal nutrition and experience in cattle, to game bovids and deer species. This talk will show some of those principles that may be of interest to deer breeders. The company pays a great attention to product and service quality as it has modern manufacture technology managed by integrated information system. This system enables full traceability of any compound applied. The production is GMP+ certified.

Among the authors, Ondřej Faltus has been working as Production and Quality Manager in VVS Verměřovice (VVS) since 1997. He is specialised in feed technology and he is passionate hunter. He managed to join his hobby with his job some years ago when he started to build up Premin® brand for high quality minerals for different deer animals. He takes care of this growing market segment.

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Jan Záhora is Commercial Director of VVS Verměřovice. His role in VVS is to select and purchase the best raw materials and ingredients for production of high quality mineral feeds. Also, he takes care of new business development and foreign markets of VVS. Jan supports niche segments of VVS mineral nutrition including horses and deer. He is specialised in feed additives, ingredients and business management.

The success story of VVS Verměřovice in deer feed program started in 2002 by cooperation of modern thinking hunters, university professors and VVS, who produced a simple mineral feeds for deer. First five years, there was a practical experiment with mineral feed of VVS conducted within breeding program for roe deer in Jeseníky mountains, the Czech republic. The results of the experiment was published in professional hunters' journal in Czechia and afterwards, VVS started to sell mineral feed for deer following a great interest of deer breeders. It continued step by step with developing a feed programme for deer based on scientific knowledge and customers' demand. VVS have organized many professional conferences to educate Czech deer breeders. Also, the company has already published 5 books about deer nutrition and management. It is involved and seeks to take a part in research projects of deer mineral nutrition.

Mineral nutrition should be the basic knowledge of any deer breeder. Mineral nutrition concerns macroelements as Calcium, Phosphorus, Sodium, Magnesium, Potassium as well as trace elements as Copper, Zinc, Manganese, Selenium, Cobalt and Iodine. Minerals are inorganic substances-chemicals prepared mostly from raw materials found in nature. They are essential compounds for living organism, responsible for tissue and antler growth, metabolism, muscle contraction, enzyme and hormone activity and hundreds of other function.

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While fewer studies have been done with deer, thousands of research tests were done on cattle and others livestock showing mineral supplementation to be necessary for optimal growth and production. Mineral nutrient requirements differ according to the specie, sex, age, pregnancy, nursing, young animals, antler growing phase, weather season etc.

Adding minerals trough mineral feed results in healthy animals, bigger bodies, bigger and heavier antlers, and greater cortical thickness. Very important is the fact, that minerals are transferred from mothers to fetus and after birth, via mother milk to young animals. Only well-bred young animals will give benefits for breeders in adulthood.

VVS Verměřovice is proud supplier of deer breeders in many countries, who achieved outstanding success in breeding. Deer breeders like to use knowledge and mineral feed from VVS for their professionalism and VVS like to use the experience of its customers to develop their products.

**DEER NUTRITION: FROM EVOLUTION OF
DIGESTIVE TRACK TO DEER FARMING PRACTICE**

Kotrba, R.*, Bartoš, L., Ceacero, F. and Pokoradi, J.

*Department of Ethology, Institute of Animal Science, Prague, Czech Republic;
Department of Animal Science and Food Processing, FTA, Czech University of Life
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Vicepresident of Deer Farmers' Association of the Czech Republic;
Small scale deer farmer;
Secretary general of FEDFA

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Evolution has shaped adaptations and strategies of ruminants to maximise energy and nutrient intake under different climate and vegetation zones. The deer in particular covers all the distribution of ruminants having different range of plasticity to adapt on diet with seasonal changes of accessible energy and mineral contents. This can be limiting factor for their intensive husbandry, including farming, to enhance animal's body or antler mass. Therefore, to understand evolutionary and biological base of deer anatomy, physiology of nutrition can help us to optimise composition of diet and techniques for proper distribution (access to feed) during day and within different seasons to fully meet needs of deer individual. Talk will be focused on both the evolutionary base of deer nutrition and its adaptation to farming condition based on results of experiment evaluating frequency of red deer access to concentrates (higher energy and minerals intake) on antler quality.

**PRINCIPLES FOR GENETIC SELECTION AND
TROPHY PRODUCTION IN WHITE-TAILED DEER:
FROM OVERVIEW OF THE SECTOR, TO BREEDING
TOP QUALITY WHITE-TAILED STAGS AT GLENN
DICE FARMS**

Glenn Dice

Glenn Dice Farms, USA

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Glenn Dice is the owner and operator of Glenn Dice Farms, peer recognized as one of the premier white-tailed breeding operations in North America. Located in south central Pennsylvania within 1.5 hours of Washington D.C. He began his dream of developing a globally recognized white-tailed breeding operation in January of 2001 and became instantly hooked. Glenn Dice specializes in the layering of specific genetic traits for a more predictable product. The antler traits he focuses on are long beams, wide spreads, and tall clean tines all embodied in a great look. Our live breeding and A.I. sires embody and pass on these traits and are some of the best and brightest in the industry. In this talk, Glenn Dice will share a brief history of the farmed white-tailed deer industry in the USA, discuss the economic dynamics of the white-tailed deer, he will show basic principles for genetic selection, breeding manipulation, deer nutrition, and herd management. The talk is particularly interesting for two reasons: there is an increasing interest in breeding white-tailed deer from some Russian Republics to Finland, and second, by comparing principles and techniques in white-tailed and red deer, it is possible to learn commons principles, or new aspects that may work also in red deer in addition to whitetail deer. He will also offer the audience the possibility to become breeders of high quality animals of this interesting species.

INNOVATION IN RED DEER FARMING IN HUNGARY

Árpád Bokor

Faculty of Agricultural and Environmental Science, Kaposvár University, Hungary;
Vicepresident of Hungarian game breeders association;
Owner of deer farm

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Intensive red deer farming has a 30 years history in Hungary; however the number of the farms is around 40 in the country. Most of the farms are small, with 10-15 breeding hinds and one or a few breeding stags. The main breeding goal for most of the farmers is the venison production, but breeding red deer for trophy (to achieve high point on the C.I.C. scoring system) can be an option; however animals raised behind fences cannot be hunted or removed to open area in the country. These animals are sold in other European countries or outside of the EU. Since the tradition of the intensive deer farming has only been three decades, the quality of technology and the management is questionable on most farms. For many years a large number of red deer were exported from the Carpathian basin to New Zealand and there, their offspring reached a great level of quality on the venison, velvet and trophy market all over the world. These pure eastern bloodlines are disappearing now.

Since red deer in Hungary has such genetic potential, farms should focus on management. Since 2008 post mortem semen collection is done by the Deer Trophy Farm during the rut on the best areas of Hungary. After a red deer stag with great phenotype (good trophy quality) was shot in open area, the testis is collected and transported into the laboratory. After some examinations the semen is diluted and frozen in 0.25 ml straws. The quality of the semen highly depends on the elapsed time between the shot and the freezing. Motility ranges

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between 30-80% and the number of straws is around 60-140 per each stag. First fawns were born in 2010 from those collected semen.

Deer Trophy Farm is the first company in Hungary which started an innovation to breed genetically superior animals for other farms. This innovation contains several methods from the nutrition thorough the molecular genetic examinations and breeding value estimations to the grazing management. Technology is based on New Zealand experience.

The farm records all of field data in its own developed software. Breeding history and pedigrees, deworming dates and veterinary test results for Bovine Tuberculosis, IBR, Brucellosis, etc. is continuously recorded. The farm is the only Bovine Tuberculosis free (officially) farm in Hungary. Phenotypic data, like growth and antler parameters are used for genetic parameter and breeding value estimations for all individuals.

Semen export from pure, healthy Eastern lines can be an option in the future.

**HYBRIDIZATION PROGRAM IN DEER FARM
RUDZIE - PRELIMINARY OBSERVATIONS**

Bartłomiej Dmuchowski

Deer Farm Rudzie, 19-500 Gołdap, Poland

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One of the breeding programs conducted at the Deer Farm Rudzie since 2008 concerns hybridization and relies on crossing the English hinds with Polish stags, Polish hinds with Hungarian stags etc. We will present preliminary data of body and carcass weights of hybrids, observations on the inheritance of traits of antlers and breeding & feeding problems.

**THE SIMPLE SECRETS OF SUCCESSFUL DEER
MANAGEMENT AT WOBURN DEER FARM**

Dan DeBaerdemaecker

Manager of Woburn Deer Farm, UK

Contact: DDeBaerdemaecker@bedfordstates.com

The world renowned Woburn Abbey Deer Farm was set up in 1993, with a long term vision of maximising the potential of the Woburn Red Deer genetics. We breed with only the very best Red Deer taken from Woburn Park and continue to produce some of the biggest antlered Red Deer in the world. Our Deer Farm is located alongside our 3,000 acre Deer Park.

Woburn Deer worked in partnership with The Stanfield Stud in New Zealand from 1994 to 2012 to establish a renowned herd of red deer in the southern hemisphere as well as in Europe. Woburn Oak has now taken the achievements of genetic bloodlines from Woburn Deer to new heights with the production of a world record weight of 23.7kg of hard antler.

This talk will show how Woburn Deer Farm achieved to be a world leading deer farm in antler genetics and the deer management techniques used for it: from electronic tagging, artificial insemination, embryo transplants the management of parasites and pasture management.

CHARACTERISTIC OF DEER MEAT (*CERVUS ELAPHUS*) OBTAINED IN LATVIA FARMS AND WILDLIFE

Vita Strazdina*, Aleksandrs Jemeljanovs, Vita Sterna and Dainis Paeglitis

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In last years diversity of species grown under organic farming system has expanded and consumption and assortment of game meat products has significantly increased. Game meat, characterised by high nutritional value and specific organoleptic qualities. Following the drive of consumers for consumption of high quality meat and its products, raising of wild deer in captivity becomes more and more popular sub-sector in Latvia, firmly establishing itself among the traditional branches of animal farming like cattle breeding, pig farming and poultry farming. This technology allows for efficient use of grassland areas, for acquisition of high quality meat, ensuring availability of game meat on the market. It is one of the most prospective sub-sectors in Latvia, opening up extensive opportunities for export. Following this method, it is possible to plan the number of harvested animals, amount of the meat obtained and produce a pre-defined amount of raw material for processing. Investigations about biochemical composition of game meat are few. The investigations were carried out in different regions of Latvia. The chemical analyses of 45 samples were done wild and farm deer and beef obtained in organic production sistem in Latvia. In the studied samples protein and amino acids, fat and fatty acids were determined. Content of protein in samples of game meat was 19.61 - 23.6%. The sum of essential amino acids in game meet samples were determined from 8.56 - 9.13 mg100g⁻¹. Concluded that the content of saturated fatty

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acids was lower in the meat samples of wild deer 33.3%, while in the meat samples of farm deer and beef it was higher 41.9% and 42.2% respectively. Because of the relatively high polyunsaturated fatty acid content and low saturated fatty acid content, wild game meat is more beneficial for human health. From results of our investigation concluded that the content of saturated fatty acids in meat samples of wild deer (33.3%) was lower in comparison with meat samples of farm deer (41.9%). From results of investigation we can see that ratio of polyunsaturated fatty acids n-6 / n-3 in deer meat samples were 2.5 - 3.6 and beef - 4.8. It is evaluated that nutrition value of wild game meat is higher than beef from organic farming system.

**THE FEDERATION OF EUROPEAN DEER FARMERS
ASSOCIATIONS (FEDFA) REPRESENTS EUROPEAN
DEER FARMING INDUSTRY**

Radim Kotrba (Maugli)

Department of Ethology, Institute of Animal Science, Prague, Czech Republic;
Department of Animal Science and Food Processing, FTA, Czech University of Life
Sciences, Prague, Czech Republic;
Vicepresident of Deer Farmers' Association of the Czech Republic;
Small scale deer farmer;
Secretary General of FEDFA

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The renaissance of deer farming in Europe begun in early seventies last century. After pioneering years eight European countries, namely Belgium, Denmark, France, Germany, Ireland, Netherlands, Spain and United Kingdom (UK), has founded The Federation of European Deer Farmers Associations (FEDFA) in 1990 during meeting in London. FEDFA's objectives as declared in its Constitution are to 'safeguard the interests of the industry vis-a-vis the European Community', to 'promote the science and practice of agriculture by encouraging and improving the efficient breeding of deer, deer husbandry and product marketing', to 'coordinate research into the subject of deer breeding, farming and associated matters and to exchange and publish results', to 'establish and maintain a register of member associations and to compile the industries' statistics' and to 'safeguard industry interests vis-a-vis third countries' has not changed over two decades. Figures based on survey made in 2010 show that FEDFA represents roughly 10,000 deer farmers from 16 countries with stock reaching 300,000 animals. If we compare the recent number of farms and the number of member countries with the year 2000, they are rather equal. From that we may consider that the deer farming industry stagnates in Europe. To explain why the number of farms has not changed is hard and

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probably not possible to answer, because of great differences between countries in environmental, cultural, political, economical and other conditions. In most cases basic explanation, based on examples from other niche agricultural sectors, can be oriented on lack of support or low market potential. Although, I can use as an example Germany, which has the highest number of deer farms (app. 5,600 farms). The farms in Germany are generally small having around 5 ha with stocking density from 3 to 7 deer per ha. It is clear that small farms can sell their production only locally and can not supply market on country level. The country where it is possible is UK, where they established Quality Assurance Scheme, which allow them to supply supermarkets with venison and venison production. Therefore, their production can more effectively compete with imported venison thorough better quality. It does not mean, that UK is not importing venison. Of course price matter.

According to figures, published in January 2014 at official magazine of Deer Industry New Zealand, 8 European countries are in top 10 importers of chilled venison from New Zealand in total volume of 11,658 tons (76 % of total New Zealand export) and value of roughly 93 million euro during 2013. This represents approximately venison from over 300,000 spikers! So the capacity of European deer farms can be doubled to meet increasing demand of European market. There is also good investment opportunity to establish larger operations to be able produce large amount of venison with higher productivity and affectivity. When I mentioned Germany as country with highest number of farms, it is on other side the biggest importer of venison from New Zealand (5,284 ton). The average export price of venison from New Zealand was 8 euro per kg. Why New Zealand is so successful? Historically it was explained that venison is secondary produce and velvet as first which allow them to export venison for more competitive price. The opposite is true and venison

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formed 72.4 % of total export value of deer products and velvet only 9.4 % in 2013. It is hard to believe, that EU under new Common Agriculture Policy will subsidise higher those farmers, who would reduce they production thorough support of Ecological Focus Areas ('greening') and on the other side will not support European deer farming industry allowing imports of so large quantity of venison, which Europe can easily produce. Another potential for deer industry in Europe are export possibilities to Asia. Recently, there has been interest from importers from China for hard antlers and other products. To meet this demand there must be better networking between member associations to organise collection of large amount of requested products like hard antlers, tendons, tales, penises etc. Another possibilities are in Europe, because recently countries like Russia, Belorussia are requesting breeding stock to establish deer breeding industry for trophy and venison production. All of that needs more effective and professional approach which would be tremendous workload for a FEDFA as non-professional platform of a few people representing national associations. Therefore, the future task is how to be more effective and successful in representing deer farmer's interests at an EU level or international level? One solution could be to transform FEDFA from a platform of joint interests into a professional organisation with permanent staff or to establish or have a partner organisation, which will be more commercially oriented. Luckily, in 2013 the International Deer & Wild Ungulate Breeders Association (IDUBA) has been founded and I wish success and increase of potential for all deer breeding industry in Europe including deer farming. I believe, that FEDFA and IDUBA would find a strong partnership to be mutually beneficial and wish to leaders of both organisations to have 'stag's power' to achieve it.

**POSTER, VIDEO PRESENTATIONS AND
TALKS BY NON-ATTENDING SPEAKERS**

**REPRODUCTION OF RED DEER IN FARM
PRODUCTION**

Jaroslav Pokorádi, Monika Pokorádi, Martina Repášová and Peter Cesnak
Xcell Slovakia Breeding Services, Ventúrska 1, 811 01 Bratislava, Slovak Republic

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One of the main objectives of our work was to collect available scientific and technical information concerning purpose and particularities of red deer farm breeding and reproduction, assisted reproduction, possibilities of long-term archiving of sperm using cryoconservation and verification of this knowledge in practice. Other intentions were the verification of practices for hormonal preparation of females in controlled reproduction and its relation to mating season - rut, and also the results evaluation of mating with selected sires on the intensity of the growth of progeny and production improvements monitored over 3-year period. From the presented results we found out, that the optimal dose of PMSG hormone to synchronize oestrus for farmed red deer is 200 IU. As we detect, 80% of the observed animals were positive pregnant, with the deposition of insemination doses to the uterus body. Small weight differences were found between progeny born from natural and artificial insemination. We described the methods and reasons for semen collection at breeding males wherein the positive results of the processes have been tested in praxis. Utilisation of proven breeding males with known and recorded information about their performance lead to improvements in breed values of their offspring, wherein semen collection and cryoconservation from quality proven breeding animals can save gene pool quality for the next artificial insemination and prevent inbreeding.

This work was also financially of EU project, code ITMS: 26240220080.

TUBERCULOSIS IN EUROPEAN DEER

John Fletcher

The Venison Advisory Service, Edinburgh, Scotland;
Reediehill Farm, Scotland

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In every country that has enclosed deer, bovine tuberculosis has been a problem. This disease is communicable to humans and is therefore subject to official controls. Tuberculosis (TB) is a word used to describe several diseases caused by Mycobacteria: i) *Mycobacterium tuberculosis* is the commonest form of TB in humans but only rarely affects deer; ii) *Mycobacterium avium* causes avian tuberculosis which can kill deer but only affects humans who are immunologically compromised; iii) *Mycobacterium paratuberculosis* causes Johne's disease which is a major cause of death and economic loss in farmed deer but is probably not infectious to humans; iv) *Mycobacterium bovis* is the commonest cause of TB in deer and infects humans and cattle. This presentation is about *M. bovis*. *M. bovis* can remain undiagnosed in apparently healthy deer for years. Conventional skin tests are not very effective in deer. When deer are stressed, as when introduced into a new herd, then the disease can spread quickly. At autopsy some such herds may have visible lesions in over 30% of animals. This talk suggests what tests may be suitable and advises all those with enclosed deer to consider precautions to prevent the introduction of infected deer. New Zealand has been very successful in reducing the infection of its farmed deer: Twenty years ago in New Zealand three hundred farmed deer herds were known to be infected with *M. bovis*. Testing of deer using the single comparative skin test and bovine tuberculin was used together with blood tests (first a lymphocyte transformation test and now an ELISA). In 2014 only three herds remain infected. The testing

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protocols of NZ are the ones being investigated in the UK where bovine tuberculosis affects very few deer. Using the same protocols in all Europe may be a breakthrough achievement in European deer farming.

**GENETIC SELECTION AND BREEDING
MANIPULATION IN NEW ZEALAND: A SUCCESS
STORY OF PEEL FOREST ESTATE**

Graham Carr

Peel Forest Estate, New Zealand

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Graham Carr is the owner of Peel Forest Estate in the middle of the South Island of New Zealand. This estate is the largest private deer farming operation in New Zealand, and as a farm in its strict sense (excluding game estates of larger size in other countries), it is likely the largest in the world. It covers some 2,400 hectare and runs over 8,000 fully recorded deer. The majority are red deer but some wapiti are used in certain breeding programmes. Peel Forest Estate is also New Zealand's largest deer stud, marketing a variety of genetics to both domestic and international markets. In this talk I will show the characteristics of our game estate. Then I will show the genetic quality of our trophies. Subsequently, I will explain the techniques in which this improvement is based. A key factor is to use a variety of science-based breeding technologies to accelerate their speed of genetic improvement. Our expansive range of world class genetics covers the field of trophy genetics for both CIC and SCI scoring markets as well as fast growth rate genetics for the venison market.

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