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BOOK OF ABSTRACTS

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ORAL PRESENTATIONS

SUSTAINABLE DEVELOPMENT IN LIVESTOCK PRODUCTION: WHAT AND HOW CAN RESEARCH CONTRIBUTE?

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World-wide livestock constitutes a substantial component of agricultural production by contributing to the agricultural GDP of many countries. Livestock contributes to food and nutrition security through the provision of animal-sourced foods. It is a source of income and capital assets, as well as a source of draught power and manure for farming. In pastoral societies, livestock is the prime resource and the largest non-land asset they own. Smallholder farmers contribute a large share to the agricultural production throughout the developing world. Poor households especially depend on and keep livestock. At the same time, we can observe an increasing demand, particular in developing countries, for animal-source food. This so-called livestock revolution is often seen as an opportunity for livestock owners to improve household incomes, secure food for their families and escape poverty. But simultaneously livestock keepers are confronted with many challenges such as climate change, volatile prices and new market demands. There is increasing consensus that change is accelerating and becoming less predictable, as global interconnections lead to events having consequences beyond their immediate context. Research, innovation and (higher) education can play an important role in addressing many of the challenges livestock keepers are facing. But this requires a paradigm shift towards more inter- and transdisciplinary research. Beyond the engagement of the relevant disciplines, it is now increasingly acknowledged that the understanding of and solutions to societal challenges may be better achieved by involving academic and non-academic partners in all stages of the research process. Collaboration of different stakeholders can lead to new thinking and might bring new solutions - not only technical, but also institutional ones. In recent years, innovation platforms have gained some attention as it gives different actors along a certain value chain the opportunity to interact on a regular basis. These platforms provide the necessary room to discuss current and relevant topics. For researchers it will remain difficult to balance their efforts between basic and more applied research – both equally important for the sustainable development of the livestock sector. By supporting resource-poor and often marginalized livestock keepers, research can contribute to achieving the SDG-Sustainable Development Goals endorsed by the United Nations.

ANIMAL FIBRE PRODUCTION IN EUROPE: SPECIES, BREEDS AND CONTEMPORARY UTILISATION

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Keratin-based fibre ("wool") is produced in specialised hair follicles located in the skin of the integument of a range of animal species routinely farmed in Europe[1]. The fibre is a renewable, natural and biodegradable product of longstanding value. Its use in recent decades has reduced, for example, following political changes, poor economic returns and from competition with petro-carbon-based artificial fibres. Disadvantageously, undegraded artificial microfibres from clothes are now considered to wash into, and to pollute, the world`s oceans and the food chain[2]. Background knowledge on hair follicle biology continues to advance in the context of regulatory mechanisms, internal signaling of external environment and improved understanding of genomic expression. The major animal species are wool-producing sheep, which include 62m breeding ewes (Eurostat) with annual production (EU28) for both fleece and skin (abattoir) of an estimated 186,000 tonnes of raw wool. There is considerable variation in estimated sheep populations (million, (m)) and quantities of raw wool (thousand tonnes (kt)) produced in different countries: examples are the UK (31m: 67kt), Spain (18.5m; 28kt)), Italy (8m; 9kt), France,(8m; 5kt) and Germany (2.1m; 13kt). A further contribution is made by smaller numbers of goats (Angora, cashmere), South American camelids (SAC: Alpaca) and rabbits (angora wool). Numbers of these animals, systems of husbandry and for collection and marketing of fibre also vary in different countries in Europe. The fibres from all species have a range of properties, such as medullation, tensile strength, diameter (fineness) and staple length, which determine end-use. There is very limited production of fine fibre as primary product in the EU, where sheep are kept mainly for meat and to a lesser extent for milk. There is variation in breeds, for example, 74 are identified by the British Wool Marketing Board with wool graded into 6 categories. The wools from these animals may vary in colour and lustre, and, for diameter are typically in the range 16-21µ (eg. Merino superfine/fine; used in superfine knitwear and fine fabrics) to coarser-woolled breeds (at 36-42µ, used predominantly for carpets, furniture upholstery and insulation products). Uses for intermediate fineness material include knitting yarns, wool blends for apparel, blankets and Japanese futons. Utilisation may be small-scale craft, or at larger scale industrial level. Poor quality wool may be disposed of in landfill or incinerated. Up to 90% of better quality may go for export, with China a major importer. Finer qualities are typically imported into Europe from other countries (eg. China for cashmere and Australia and New Zealand for sheep wool). These are processed into high value products such as suiting and knitwear. European countries participate in initiatives such as "The Campaign for Wool"[3] which acts to promote the utilization of wool internationally.

[1]Galbraith, H. 2010. Animal fibre: connecting science and production. Animal DOI:10.1017/S1751731110000741

[2]Roch, S. and Brinker, A. 2017. Rapid and Efficient Method for the Detection of Microplastic in the Gastrointestinal Tract of Fishes.   Environmental Science and Technology DOI: 10.1021/acs.est.7b00364

[3]The Campaign For Wool. http://www.campaignforwool.org/category/events/   (Accessed 12.04.2017)

EFECTO DE LAS ALTERNATIVAS TECNOLÓGICAS EN LA MITIGACIÓN DEL CAMBIO CLIMÁTICO EN LA CRIANZA DE ALPACAS SOBRE LOS 4,000 msnm PUNO PERU

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El objetivo del estudio fue evaluar el efecto de las alternativas tecnológicas en la mitigación del cambio climático en la crianza de alpacas sobre los 4,000 msnm. El estudio de validación se realizó en 06 comunidades campesinas en dos zonas agroecologicas. Las variables en estudio fueron el peso al nacimiento, peso al destete, peso de vellón, porcentaje de preñez y mortalidad, durante el año 2014 en el que no se aplicaron alternativas tecnológicas, en tanto que en los años 2015 y 2016 se aplicaron este conjunto de alternativas. Los datos se analizaron en un diseño completamente al azar mediante el programa estadístico SAS versión 9.4. Los resultados muestran que los pesos al nacimiento fueron de 6.01, 6.254 y 6.83 kg para los años 2014, 2015 y 2016 respectivamente ($p<0.05$). Los pesos al destete fueron de 29.02, 29.73 y 30.99 kg para los años 2014, 2015 y 2016 respectivamente ($p<0.05$). Los pesos vellones fueron de 2.28, 2.35 y 2.75 kg para los años 2014, 2015 y 2016 respectivamente ($p<0.05$). Los porcentajes de preñez fueron de 68.33, 72.84 y 83.77% en los años 2014, 2015 y 2016 respectivamente. Los porcentajes de mortalidad fueron 10.39, 5.11 y 2.44% para los años 2014, 2015 y 2016 respectivamente ($p<0.05$). Se concluye que el conjunto de las alternativas tecnológicas aplicadas durante los años 2015 y 2016 tuvieron un efecto significativo sobre el peso al nacimiento, peso al destete, peso vellón, porcentaje de preñez y mortalidad de las alpacas.

COLLECTION OF DIVERSITY - PRESERVING RARE INDIGENOUS SHEEP BREEDS IN GERMANY

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Aim of the study/project: to preserve the following rare indigenous sheep breeds Alpine Stonesheep, Black Mountain Sheep, Brown Mountain Sheep, Carniolan Stone Sheep, Coburger Foxsheep, German Karakul Sheep, Forest Sheep, Pomeranian Coursewool Sheep, Spectacle Sheep, Vallachian Sheep and White Mountain Sheep and use their unique wool . Every single one of these endangered coloured sheep breeds have a very special wool, typical of the particular breed.

Main results: maintaining rare indigenous sheep breeds for the future, wool quality becoming a very important breeding aspect, raising the economic value of wool, selling high quality products directly to the customers, quality/products from the region for the region and developed a brand and give the customer the opportunity of a transparent production

-Relevant methods: Wool examinations, Development of sales strategies and PR, Interaction through social media, Market and customer research

Conclusions/ Results: One big step we still have ahead of us is to preserve the "wool infrastructure" e.g. souring plants, spinning mills, in Europe and deregulate the EU- regulation 1069/2009 . Greasy wool is classified as an animal-by-product of category 3.

Gefährdete Nutztierrassen. Ihre Zuchtgeschichte, Nutzung und Bewahrung. Hans Hinrich Sambraus. 3., erweiterte Auflage 2010
http://www.g-e-h.de/geh/jupgrade/die-rote-liste/246-kriterienkatalog

SUSTAINABLE CASHMERE, PASTORALISM, AND COEXISTENCE WITH PREDATORS IN EUROPE

Nora Kravis

The creation of a European model of SUSTAINABLE CASHMERE produced by cashmere goats born and raised in Italy. Economic, environmental, energetic, occupational and socio-political sustainability are examined, as well as the fiber characteristics that define the process of genetic selection practiced since 1995. Land management, biodiversity, and animal welfare in the European community are dependent on pastoralism: the essential link between intensive farming and abandonment of marginal agricultural land. The effect of wolf protection and consequent increase of the density of predators in many European countries has had major ripercussions on pastoralism and extensive livestock management. The practice of non-lethal predator control ("PREDATOR FRIENDLY FARMING") is essential to create and maintain sound ecological equilibrium but much still needs to be done at the political level to assist the shepherds and to make it viable on a larger scale.

ADVANCES IN NUTRITION ON CHINESE CASHMERE GOAT
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Cashmere fibre is an important commercial product of certain Chinese cashmere goats. The paper reviews contemporary information that evaluates current feed system for Chinese cashmere goats and the effect of grazing environment, selected nutrients and photoperiod upon hair follicle activity and fibre characteristic.

BLOOD LEVELS OF PHOSPHORUS IN PUBESCENT ALPACA (*VICUGNA PACOS*) AND THE EFFECT OF DIETARY PHOSPHORUS ON GROWTH OF FEMALE ALPACAS POST WEANING IN PERUVIAN ANDES

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Phosphorus deficiencies have been reported for alpacas in the Peruvian Andes. This is of special relevance because their hidden effects may be affecting some reproductive variables and the growth in one-year-old pubescent alpacas forcing the farmers to start mating at two years with the economic consequences of feeding without producing and delaying genetic progress. This study is performed in an effort to know the status of phosphorus and the effects of this mineral on feed consumption and live weight variables in young female alpacas in two important stages of production such as breeding season (January - February) and weaning (August - September). In the first stage of the study, blood levels of phosphorus were determined in 180 female alpacas of approximately 11-13 months of age located in four regions of greater importance for alpacas breeding in Perú. Levels of 8.25 ± 1.63, 5.25 ± 1.46, 6.42 ± 1.84, 4.8 ± 1.61 mg / dl were found for Cerro de Pasco, Junín, Cuzco and Puno regions, respectively. Significant differences ($P <0.05$) were found among the four regions, and these data were compared with the expected range for alpacas (Van Saun and Herdt, 2014: 5-11.5 mg / dl). Two regions (one below the mentioned limit and another at the limit) can be considered deficient in phosphorus. This may be related to the deficiencies of this mineral in the high Andean grasslands reported by some authors and may be affecting some reproductive, consumption and growth parameters associated with this mineral. In a second part of the study, a controlled experiment with different concentrations of phosphorus in the diet was performed: 0.16% (T1), 0.25% (T2), and 0.34% (T3). Forty-five female alpacas post weaning (25.25 ± 1.62 kg) were used, with ad libitum feeding, with 15 animals per treatment housed in individual pens for a period of 4 months. Ages range from six to eight months. Dry matter intake, phosphorus intake and live weight were evaluated. The average dry matter intake expressed per kg/d was 0.458, 0.562 and 0.652 for T1, T2 and T3 respectively, while the average consumption of alpacas expressed per kilogram of live weight was 1.52%, 1.73% and 1.97% respectively. In both cases there were significant differences between treatments ($P <0.05$). There was an appreciable reduction in feed consumption when the diet had 0.16% of phosphorus, while for the diets of 0.25% and 0.34% of phosphorus consumption values are expected in camelids for this stage. Finally, the live weight was 30.58 ± 1.42, 32.4 ± 0.92 and 33.3 ± 2.43 kg for T1, T2 and T3 respectively, with significant differences ($P <0.05$) between T1 vs T2 and T3. The effect of lower consumption on T1 may have influenced in weight gain. Effects of phosphorus on reproductive variables to which it is associated are still being evaluated.

Van Saun, R Y Herdt, T. 2014. Llama y Alpaca Care Book. Nutritional assessment. Chapter 12. p 115.

Jeffs, S; Parraguez, V; Urquieta, B; Reyes, M. 1996. Endocrine study of puberty in female alpacas of the coastal dryland of central Chile. University of Chile. Department of Animal Biological Sciences.

NRC (National Research Council). 2007. Nutrient Requirements of Small Ruminants: Sheep, Goats, Cervids, and New World Camelids.

ALFALFA HAY SUPPLEMENTATION TO IMPROVE LLAMA MEAT PRODUCTION FOR SMALLHOLDERS IN PASCO REGION, PERU

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Previous studies have shown that smallholders in Pasco Region, Central Andes of Peru mainly keep llamas for meat production. Most llamas are grazing in mixed herds with alpaca and sheep. Rangelands have low quality forage due to overgrazing. Therefore a main constraint for improving meat production in llamas is the availability of appropriate amount and quality of feed, mainly at the beginning of the dry season when most llamas are sold to the meat market. The aim of this study was to evaluate the effect of supplementation with alfalfa hay on body weight gain and carcass weight in young llamas selected for meat market. The study was carried out in Ninacaca, Pasco during 100 days from April to July 2016. A total of 32 young llamas were randomly assigned to diet A: Grazing in native pasture and diet B: Grazing in native pasture plus alfalfa hay supplementation. All llamas were allowed to graze and drink water during the day for about 10 hours. Only llamas belonging to diet B received hay supplementation in an individual cage. The daily amount of alfalfa hay that each llama received was the 30% of dry matter requirements. Live body weight (LBW) and some body measurements were recorded every 14 days. Alfalfa hay consumption was recorded daily. The native pasture used in the experiment was in regular condition for llamas. Llamas were slaughtered and hot carcass weight was recorded (HCW). The model used for comparing the two diets included the diets as fixed factor and the LBW at the beginning of the experiment was included as covariable. Results are summarized in Table 1. The results indicate that alfalfa hay supplementation increased LBW gain and HCW. Further studies have been carrying out to evaluate the effect of alfalfa supplementation on llama meat quality.

Table 1. Spearman´s rank correlation coefficient between farmers and technicians

Diet	Initial live body weight (kg)	Final live body weight (kg)	Body weight gain (kg)	Hot carcass weight (kg)	Dressing percentage (%)
Native pasture	56.39	65.30	8.91	34.65	52.9
Native pasture plus alfalfa hay supplementation	55.79	68.00	12.21	36.26	53.4

FEED INTAKE AND ANIMAL BEHAVIOUR OF ALPACA AND LLAMAS CO-GRAZING ON ANDEAN HIGHLANDS IN PERU

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Despite huge interest in raising South American Camelids (SACs) – either as a hobby or for livelihood – and a vast number of scientific publications addressing SACs, relatively few efforts have been made to study feed intake and animal behaviour under grazing conditions. Data on voluntary feed consumption and nutrient requirements are mainly from animals kept in barns or derived from studies involving sheep, goats and cattle (National Research Council, 2007), therefore, limited information on grazing behaviour of SACs is available (Gauly, 2011). Hence, a comparative study with alpacas and llamas co-grazing on Andean pasture in Peru was conducted with the aim at (i) Exploring group specific differences (i.e. alpaca/llama, male/female) on activity patterns, feed intake, and digestibility; (ii) Relating individual and group behaviour, intake and digestibility parameters with performance indicators and vegetation characteristics. Out of 634 alpacas and 74 llamas co-grazing on an area of 340.6 ha, twelve eight-month-old alpacas (huacaya) and llamas (q'ara) (six females and six males, respectively) were randomly selected for the study. Data was collected during the transition from dry to rainy season between October and December 2016 in the Pasco region (4,350 m.a.s.l.) of Peru. Animal movement was monitored by fitting the animals with global positioning system devices for twelve consecutive days. Simultaneously, visual observation at a 30 seconds interval was performed, with one and a half hours observation per animal. Animal activities monitored were grazing, traveling, resting, drinking, and others. Feed intake and organic matter digestibility were estimated by the combination of internal (Titanium dioxide, 2.5 g/d) and external markers (acid insoluble ash). Faecal grab samples were collected during five days. Diet simulation sampling was performed for four alpacas and four llamas. Vegetation samples for biomass production and botanical composition were taken at two different moments from 14 transects across the grazing area. Live weight of animals was recorded every four weeks. Finally, fibre of alpacas was cut (mid side sampling) at the beginning and at the end of the experiment to estimate clean fibre weight, mean fibre diameter, and fibre length. Differences in grazing behaviour and vegetation utilization between both species and between sexes within a species will be evaluated. Similarly, the relationship between grazing parameters and performance between species and sexes will be assessed. Finally, the existence of a preferential grazing, or not, by different species as affected by biomass availability, quality and botanical composition will also be tested

Gauly, M., Vaughan, J., Cebra, C., (2011). Neuweltkameliden - Haltung, Zucht, Erkrankungen. 3rd edition, Stuttgart: Enke Verlag (p 62).
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DAILY AND SEASONAL CHANGES IN BODY TEMPERATURE AND ACTIVITY PATTERNS OF LLAMAS IN THE HIGH ANDES OF PERU

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Endothermic animals have to invest a substantial amount of energy to keep their body temperature (T_b) within a narrow limit. Recent studies on wild ungulates, however, revealed that they are able to adjust their T_b and locomotor activity (LA) according to season and time of the day and thus save energy during adverse environmental conditions. Therefore, the aim of the study was to determine whether the llama, one of the most extensively kept domestic livestock breeds, also exhibits seasonal adjustment mechanisms in terms of T_b and LA under High Andean conditions. For the present study 7 female adult non-pregnant llamas were kept within a herd of approx. 300 female llamas under a traditional herding system in the High Andes of Peru. The study site was a semi-arid habitat and located 80 km to the North of the city of Arequipa in Southern Peru at an altitude of 4,400 m. The LA and T_b (measured in the rumen) were recorded continuously for each animal every 3 min and the location every 30 min for 10 months using a telemetry system. Relative humidity and ambient temperature (T_a) were recorded every 60 min using miniature data loggers. Daily T_b varied considerably with daily maximum (mean max. ± SD: 39.47 ± 0.32 °C, max. range: 40.55 - 38.97 °C) and minimum (mean min. ± SD: 37.49 ± 0.36 °C, min. range: 36.58 – 38.12 °C) T_b's occurring around midday and early morning, respectively throughout the study period. The daily T_b amplitude differed significantly ($P < 0.001$) between seasons and was highest in June-Sep, when T_a was low (average daily mean ± SD: 1.94 ± 1.43 °C, average daily amplitude: 34.54 ± 4.79 °C) and lowest in Dec-March when T_a was high (average daily mean ± SD: 6.93 ± 1.22 °C, average daily amplitude: 22.34 ± 3.68 °C). Average daily T_b followed the T_a pattern, i.e. T_b was correlated with T_a ($r = 0.43$, $P < 0.001$). Daily distances covered averaged 5.3 ± 1.2 km and ranged from 3.4 - 11.2 km per day. Mean daily LA varied considerably over the study and followed a similar pattern as T_a with the lowest daily average LA recorded in June (19.58 ± 16.34 %) and the highest in Jan (36.35 ± 32.9 %).
The results indicate that llamas in the high Andes adjust their T_b and LA according to season and time of the day in accordance to T_a. Throughout the study we found a distinct daily T_b and LA rhythm. Therefore, llamas seem to have maintained despite of the domestication process the ability to adjust their T_b under adverse environmental conditions as has been reported for some wild ungulates.

WOOL SCOURING IN EUROPE : URGENT AND ECOLOGICAL SOLUTIONS

Chaupin M. T.,

Coordinator of the association ATELIER-Laines d'Europe

Aim of the project and publication: Wool scouring is the essential intervening step between agriculture, which provides the fleeces and the craft and textile industries which make them into finished products. However there are now many concerns for the future with the disappearance of many scouring plants across Europe in the recent years and difficulties being experienced by some others. If this stage, already fragile in Europe, is broken then the whole value chain may also disappear. Organization of an European meeting: On the initiative of associations *ATELIER-Laines d'Europe, Pôle Laine du Pays de Saugues and Lainamac,* 150 people from 15 European counties, representing all stages of the wool processing industry met in Saugues, Haute-Loire, from 4-6 November, 2015 to share ideas and look for solutions.

Objectives of the meeting:
1. Take into consideration the operation of wool scouring as a final link in the livestock sector. Can farmers and agricultural organisations take a more active part of the running and development of this process?
2. Examine the possibilities of integrating the 50% impurities of the weight of the greasy wool as a valuable resource and not as waste that must, expensively, get discarded.
3. Decide whether closer coordination in the sector, exchange of experiences, research and pilot projects for ecological scouring

The proceedings of the meeting includes the oral presentations, descriptions of various projects, report of debates, local visits, with an annexe including maps, useful addresses and a glossary. Dissemination at all levels, farming, crafts and industry, local authorities and EU bodies, will allow everyone to participate in the development of the European wool industry and consider his future with optimism.

FARMERS WOOL AND TRACEABILITY

Thompson N.

Consortium Biella The Wool Company

Globalisation has been of great benefit for many, but in many cases it has caused unrepairable damage to minor supply lines of agricultural by products , such as wool.   Cheap freight costs to asia have heavily diminished wools value, especially where the wool is not destined for quality products, but mainly towards the upholstery and furnishings sector. However new opportunities for the small sheepbreeder   are presenting themselves, thanks to a more knowledgeable consumer, who may not be totally in favour of biological labelling (often not quite as transparent as one would hope) but believe in transparency. Wool is natural, renewable and sustainable, so has the prefect characteristics for ethical processing here in Europe, and satisfy this growing demand.

ADVANCES IN LLAMA *(LAMA GLAMA)* COAT COLOR GENETICS

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Domestic species present a wide phenotypic diversity. As their genomic sequences become available, finding the connection between the genotype and the observed phenotype is a goal possible to achieve. The study of the genetic basis of coat color determination is an example of this. In several species, the genes and mutations responsible for the different coat colors and patterns have already been identified. Color is a Mendelian trait, with little or no environmental influence. Moreover, the biochemical pathway of pigment synthesis is well-known and highly conserved among mammals. Thus, in species such as llama whose complete genome has not yet been sequenced, the study of candidate genes results a valid alternative to identify the genetic variation responsible for different phenotypes. In this context, the objective of this lecture is to present the recent advances in the knowledge of the genes that control the coat color in llamas, and to discuss the orientation of future research in this field.

ANIMAL WELFARE PROBLEMS IN SOUTH AMERICAN CAMELIDS KEPT IN EUROPE

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Since the beginning of the 1980s, lamas and alpacas have been increasingly used as pets, companion and recreational animals in various European countries. They are often kept in smaller herds (2 to 8 animals), which underlines the hobby character. A few breeders are aiming at an agricultural use of the animals. The legal basis for keeping domesticated camelids (llamas and alpacas) is in most countries the Animal Protection Law and in addition, in the case of farming, specific regulations for farm animals. Only in some countries specific regulation are available for South American Cameilds (SACs). SACs are herd animals. Therefore group housing with at least two animals is required. Exceptions are sexually mature males. However, even they, if kept alone, must have at least visual contact with the herd. The majority of SACs kept in Europe are on pasture from April to November, which is good from an animal welfare point of view if minimal requirements are fulfilled. SACs older than 6 months, need at least 1000 m^2 area for the first two animals. Each additional animal needs about 100 m^2 more. SACs are "distance animals". If possible, they avoid direct contacts to each other. This must be taken into account, in particular, in the design of stables and shelters. Because of the small herd size and their use as pets, they are in close contact with humans. This may lead to miss behaviour (Berserk-Male syndrome), especially if this is practiced during the early life of the cria. Several typical welfare problems are discussed in the presentation.

CHARACTERIZATION AND EXPRESSION ANALYSIS OF SLC7A11 IN LLAMAS

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The llama (*Lama glama*) is a South American camelid which is gaining worldwide recognition for its fiber. Coat color is one of the most cherished and commercially important characteristics, however, there is very little information about the molecular mechanisms that control pigmentation in llamas. *Slc7a11* (solute carrier family 7 number 11) encodes light chain of cysteine/glutamate exchanger, xCT, which has a major role in pheomelanin synthesis. Chintala et al. (2005) found that a mutation in *Slc7a11* gene is responsible for the subtle gray (*sut*) phenotype in mouse. Sut mutants show a diluted coat, due to a reduction in pheomelanin production. Furthermore, brown and white alpacas present differences in the expression levels of *Slc7a11* (Tian et al., 2015). The aim of this study is to describe *Slc7a11* coding region and to analyze its variation and expression in llamas. For this purpose, fiber samples or skin biopsies from animals with different coat color phenotypes were collected, the RNA extracted and total cDNA obtained. cDNA was used for PCR amplification and sequencing of the fully coding region. Expression levels were analyzed by Real Time PCR. Coding region sequence of *Slc7a11* consisted of 1512 bp and encoded a 503 amino acid protein. Nine SNPs were observed, 6 synonymous and 3 non synonymous. Slc7a11 protein sequence analysis showed 12 transmembrane helix regions with citoplasmatic N-terminal and C-terminal residues. BLASTP analysis showed 91%-99% homology to other mammals as well as a highly conserved amino acid permease domain. Finally, preliminary results indicated that expression levels of *Slc7a11* in undiluted phenotypes differ significantly from those in diluted and white, but no differentiation was found between diluted and white phenotypes. This study contributes to better understand the role of *Slc7a11* and the molecular mechanisms involved in the pigmentation of llamas.

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HERITABILITY ESTIMATE OF MEDULLATED FIBRE IN ALPACA HUACAYA

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The aim was to estimate the heritability of medullated fibre in alpaca Huacaya. Samples from 36 fleeces of white males Huacaya (0.4-10.4 years old), from Pacomarca Ranch (Puno, Peru) were measured by projection microscope (PM) to record the fibre diameter (FD) and the class of medullation (CM) of 600 fibres per sample. The CM was recorded according the classes stablished in the literature (eg. Villarroel, 1963). Also, the percentage of medullated fibre (PMF) per sample were calculated by two methods (PM and the optical fiber diameter analyser 100-OFDA). The statistical model used for genetic parameters estimation for CM included aged and age^2 as fixed effects and the animal and permanent environmental as random effects, the model for FD was similar except permanent environmental effect. Bivariate models were used to estimate heritability and genetic correlation for DF and CM. Moreover, different models considering CM as continuous or a categorical trait were tested by TM software. The PMF ranged from 12.33% to 91.67% per sample. The correlations between OFDA and PM measurements were 79% for PMF. The highest heritability estimate for CM were 0.36 ± 0.13 obtained using a bivariate continuous model where CM was a binary trait (non-medullated versus medullated-fibre) and FD was a continuous trait. Using the same model, the heritability estimate for FD was 0.35 ± 0.15 and the genetic correlations between CM and FD was 0.93 ± 0.12. This study was the first to estimate heritability for CM and genetic correlations between CM and FD. These results implied that selection against medullated fibre is feasible without affecting the reduction of FD in alpacas. Since measurement of CM per fibre sample was time-consuming, PM measured by OFDA will be used as an indicator trait for reducing medullatted fiber in alpaca fleece.

BREEDING OBJECTIVES FOR ALPACAS OF THE HIGHLANDS CENTRAL OF PERU

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The aim was to determine the breeding objectives for alpacas. The study was carried out in the communal cooperative San Pedro de Racco located in the region of Pasco-Peru; the records of 2933 alpacas were evaluated during the period 2006-2012. The determination of the breeding objectives, profit equation and economic values was made based on Ponzoni (1986); Tolone et al. (2011); Alfonso et al. (2012), Borg et al. (2007). The breeding objective was determined assuming the following economic scenario: Sale of white alpaca fiber with flat price, sale of alpacas for meat and sale breeding animals. The profit equation formulated was:

EC2 = NM × TN × SV (PVL1 × pf + P1E × pcb × 0.43 + (DF1E + DS + RZ + BG) × pp × 0.2 - ct) + (NM + NP) (PVL × pf + PV × pcb × 0.2) + NP ((DF + DS + RZ + BG) pp × 0.1) - NM × cm - NP × cp

Where the characters were Survival at the 1st shear (SV), Diameter of fiber at the 1st shear (DF1E), Weight of fleece at the 1st shear (PVL1), Weight at the 1st shear (P1E), Diameter Fiber (DF), fleece weight (PVL), live weight (PV). The visual evaluation characters of fiber were general balance (BG), density (DS) and curls (RZ). The economic value of SV, DF1E and P1E was S/. 411.18, S/. 3.86 and S/. 1.10 soles per alpaca mother respectively. ; the economic value for DS, RZ and BG was S /. 0.24 soles per alpaca mother, being minimal in comparison to the other characters evaluated. The breeding objective determined was:

H2 = 411.18 × GSV + 3.86 × GDF1E + 4.92 × GPVL1 + 1.10 × GP1E + 0.24 × GDF + 8.26 × GPVL + 0.86 × GPV + 0.24 × GDS + 0.24 × GRZ + 0.24 × GBG

Where: GSV, GDF1E, GPVL1, GP1E, GDF, GPVL, GPV, GDS, GRZ, GBG, are the genetic additive values of the characters studied. It is concluded the production traits SV, PVL, PV, DF, DF1E, P1E y PVL1 have of greater economic importance than the visual evaluation characters BG, DS and RZ. Therefore the production traits must be included in the breeding objectives for the breeding of alpacas.

PERFORMANCE EVALUATION OF LLAMA, ALPACA AND SHEEP HERDS OF A COMMUNITY IN PASCO, PERU

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In Peru highland livestock production is especially developed in the South and Center of the country, between altitudes ranging from 2,200 to 4,500 meters above sea level. Usually, raised by peasant communities who have pastures as the main resource for feeding their animals (Flores, 1992). Llama breeding is, commonly combined with other species, such as alpacas and sheep. One way to technically evaluate livestock systems is by calculating technical parameters. These indicators allow us to synthesize the information contained in the production records and to standardize the evaluation criteria of the production unit (Pumayalla, 1980). The parameters show the efficiency with which the herd is being managed, as well as the success or failure of the management that is carried out (Cuadros, 1981). Gutiérrez (1993) points out that the following parameters should be used to perform a technical evaluation: Annual average capital (AAC), gross birth rate (% GBR), real birth rate (% RBR), mortality (%M), harvest (%H), gross increase (% GI), real increase (% RI) and livestock efficiency (% LE). The AAC is an indicator that expresses the monthly average number of animals that exists in the herd during the year. The % GBR is an indicator of reproductive efficiency in breeding, while the% RBR expresses the relation between the number of born and the AAC. The % M indicates the percentage ratio of the number of deaths among the CPA and the % H considers the number of animals sold, benefited and includes those destined for self-consumption and donations. The % GI expresses the increase of animals per year in the herd and the % RI expresses the increase of the population due exclusively to the technical management of the herd. Finally, % LE is an indicator of efficiency in the technical management of the herd. In the present study, the technical evaluation of livestock was carried out using the monthly records of llamas, alpacas and sheep of the Communal Cooperative San Pedro de Racco, located in Pasco Region, Peru. The evaluation period for llamas and alpacas was from 2012 to 2015, whereas for sheep the evaluation period was from January 2014 to December 2015. The Communal Cooperative San Pedro de Racco shows values of technical parameters corresponding to a company with a good technological level. The technical parameters of the llama herd during the period 2012-2015 were 46%, 25%, 5.3%, 21.1%, 2%, 2% and 23% for %GBR, %RBR, %M, %H, %GI, %RI and %LE, respectively. In the case of alpacas during the same evaluation period, the technical parameters obtained were 60%, 29%, 5.4%, 23.3%, -2%, -2% and 21% for %GBR, %RBR, %M, %H, %GI, %RI and %LE, respectively. In relation to sheep during the period 2014-2015, the paremeters found were 66%,

41%, 16.5%, 23.6%, 2%, 2% and 25% for %GBR, %RBR, %M, %H, %GI, %RI and %LE, respectively.

THE CAMELID REGISTRY LAREU: WHAT ARE WE BREEDING IN EUROPE?
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The Llama and Alpaca Registry Europe ("LAREU") is providing an online registration system for breeders and owners of South American camelids (SACs), free of charge. Founded in the year 2005, over 19000 animals from more than 10 European countries are stored in LAREU's database up to now, with a yearly growth of about 10%. The database itself is professionally maintained by the animal welfare organization TASSO, based in Germany, hosting data from a few million animals, mostly dogs and cats. The data of the animals registered with LAREU are entirely separated from the TASSO database, also the registration software has been established independently. The transparent borders within the European Union are offering breeders of SACs great opportunities for improving the genetics of their animals, both with respect to fiber quality as well as to conformation and health. LAREU has recognized from the beginning the importance of a Europe-wide registry and of a world-wide standard of the DNA markers used for SACs. Upon initiative of LAREU the "International Society of Animal Genetics (ISAG)" developed in the years from 2008 until 2012 a unique marker panel for alpacas and llamas. In this paper we will present comprehensive statistical material from the LAREU database of 19 000 SACs. The main subjects of the data analysis are concerned with the distribution of the different types of alpacas (huacayas and suris) and of llamas (light, medium, heavy wool, and suri), as well as the distribution in the various color classes (for alpacas), according to the color code scheme defined by ALSA. The LAREU registry also allows filling the parents for each animal, which in turn results in an "infinite" pedigree. Information is presented about the frequency of parentage for sires and dames, giving some idea about the number of "proven" reproducers. Finally, a statistic is presented concerning the herd sizes per owner in the various European countries.

COMPARISON OF FARMERS´ SELECTION CRITERIA WITH THE OFFICIAL NATIONAL REGISTRATION SYSTEM FOR LLAMAS IN PERU

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Several studies have shown that farmers´ selection criteria have to be taken into account while setting up breeding programs. This ensures that farmers breeding objectives are reflected and famers´ viewpoints are considered. This helps to ensure ownership by farmers of a breeding program. The Peruvian Ministry of Agriculture established a national registration system for llamas and alpacas (Registro Genealógicos de Alpacas y Llamas del Perú – RGALLP). The system evaluates the phenotypic appearance of animals and comprises of 10 different phenotypic traits (e.g. head shape, chest with, fleece quality). Only animals which get at least 75 out of 100 points, are officially registered by the ministry. The aim of this study was to compare the selection criteria of farmers with the criteria developed in the national registration system. The study was carried out in 4 places in the Region of Pasco, Central Peru. In each place 4-5 farmers were invited to rank in a group of 6-11 young male animals from best to worst animal using their own selection criteria. Kh´ara male animals in the age range of 1-2 years were used in the experiment as this llama type is the most common type in the region. In addition, farmers were asked to give also an explanation for their ranking decisions. At the same time 2-3 technicians, who were familiar with the official registration system, were also asked to rank the same animals. A series of different body traits and body weight were taken from each animal. The ranking decisions of farmers and technicians were compared with Spearman´s rank correlation coefficient using version SAS9.4. Results are summarized in Table 1. The results indicate that there is good to very good correlation between farmers and technicians, who use the official guidelines. This is also a good indication for the use of the official format for further use in setting up a breeding program for llamas.

Table 1. Spearman´s rank correlation coefficient between farmers and technicians

	Group 1	Group 2	Group 3	Group 4	Group 5
N farmers	5	5	5	5	4
N technicians	3	3	3	3	2
N animals	3	11	6	6	6
Spearman´s Coefficient	0.99	0.68	0.88	0.89	0.76

SELECTION AND EVALUATION OF FIBER CHARCATERISTICS OF AN EXTREME FINE ALPACA STRAIN AT VICTORY FARM IN MISSOURI

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Data recordings of animal breeding, fleece production, and fiber characteristics in an alpaca herd was analyzed and presented. Selective mating strategy was applied during establishing an extreme fine fiber alpaca strain at Victory farm over 10 years. Herd size was expanded from just a dozen breeding females and five males to 200 heads in 2016. Animals were mated in early fall and unpacked early fall of the each following years. All animals were recorded for sires, dams, and registered pedigree, birth weight, weaning weight, shearing weight, and fleece weight. Midside flank fleece samples were measured for OFDA fiber characteristics, including mean fiber diameter, fiber length and fiber curvature. Live weight, fleece weights and fiber characteristics were analyzed using GLM procedures of SAS. Mean birth weight, weaning weight, mixed age shearing weight, fleece weight, fiber diameter, fiber length, and fiber curvature were 6.72 kg, 25.23 kg, 48.84 kg, 0.82 kg, 16.6 μ, 58 mm, and 26.4°/mm. Whereas, the finest 25% of the herd fleeces were tested at average fiber diameter of 14 μ, which was within vicuna fiber diameter ranges. These characteristics were not significantly increased with increased ages. Heritability estimates for the fleece weight, fiber diameter, length and curvature were 0.40, 0.65, 0.29, and 0.50. The average fiber diameter measurements of herd at Victory Farm were significantly ($P < 0.001$) finer than the compared herds. It can be concluded that a strict selective breeding is effective for genetic gaining an ultralow fiber diameter and fleece quality in extreme fine alpaca strain.

MERINO BREEDING PROGRAM IMPROVES WOOL QUALITY IN US WOOL SHEEP FLOCKS

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A Merino breeding resource flock was established at Rafter 7 Ranch through cooperation of the University of Nevada and The Edwin L Wiegand Trust. Initially, 500 Rambouillet ewes were purchased from two established breeders. These ewes were bred naturally or by AI to imported Australian Merino rams and to rams selected from within the flock. Over the 16 years, 16 rams and the semen from 41 Australian Merino rams have been imported from Australia. Selection was based on objective wool measurements and phenotypic performance traits. Merino crossbred ewes showed that wool fiber density, clean wool yield, staple length, and grease fleece weight were increased by 41% per unit area of skin, 15%, 2.5 cm and 1.14 kg per head shorn, respectively. The current flock wool fiber diameter was reduced by 3 micron on average compared with the foundation flock (23 micron). The flock was expanded to 1300 ewes and was bred in 30 single sire mating groups in 2006. The Merino flock is managed in two breeding lines, one as a registered Merino flock (n = 650) and the other as Rafter 7 line (n = 650), which is selected for wool, lambing, and meat production traits. Sheep producers from 17 states, Canada and Mexico had purchased breeding rams and ewes from Rafter 7 ranch. These resource flocks have made significant progress over the foundation ewe flock during the crossbreeding and upgrading phase in major selection traits and are disseminating Merino genes in the US wool sheep flocks.

ALPINE STONESHEEP

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Aim of the study: preserving the breed, development of new breeding criteria, conservation of pristine habitats of alpine pastures for sheep farming, evaluated the wool quality according to the age of the sheep, raising public awareness e.g. establishing an information center in the national park in Berchtesgardener Land /Bavaria the natural habitat of the Alpine Stonesheep

Relevant methods: development of an "Almindex", development of a breeding index and research into different breeding lines.

Conclusions/ Results: We managed to raise the number of Alpine Stonesheep from 120 sheep in 2000 up to 800 animals in 2016. Another result is the development and application of a breeding program and the "Almindex"

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VICUGNA PACOS AS1-CASEIN: IDENTIFICATION OF NEW POLYMORPHISMS AT THE *CSN1S1* GENE

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Genetic polymorphisms in milk proteins is due to gene mutation resulting in either substitution or deletion of amino acids sequence along the peptide chain. South American camelids were genetically poorly investigated so far and little information is available in alpacas (*Vicugna pacos*) regarding the diversity of the caseins. The aim of this study was to investigate the presence of polymorphisms at the *CSN1S1* gene in alpacas at protein and DNA level. The analysis of whole alpaca milk by IEF from 20 samples evidenced polymorphic protein patterns corresponding to αs1-CN migration area. According to the nomenclature in Llamas, the variants were 2 and 3 with 2 being the anodic one. Three variants (2/2, 2/3, 3/3) could be observed. Estimation of frequencies resulted in 0.475 and 0.525 for the variants 2 and 3, respectively. Blood and hair samples were collected from 130 alpacas belonging to different flocks in Germany and Italy. They were used for DNA isolation. The SNP c.366A>G at the exon 12 was successfully genotyped by PCR-RFLP. Two (AA, AG) of the three possible genotypes could be demonstrated resulting in estimated allele frequencies c.366 A 0.91 and c.366G 0.09. Milk samples from IEF showed different genotypes at DNA level for the SNP (c.366A^{Ile}>G^{Val}) as the mutation at the exon 12 does not lead to a relevant change in terms of *pI* of protein and therefore it was not possible to establish a link with IEF results. The polymorphisms found in alpaca have not been described before. The presence of the adenine (c.366A) at the exon 12 of the alpaca *CSN1S1* might represent the ancestral condition of the gene because it has been found also in the other camelids. These data add knowledge to the genetic variability of a species little investigated and they open the opportunity for further investigation in the field of milk protein for South American camelids.

THE ALPACA CRIA, CLINICAL AND IMMUNOLOGICAL IMPLICATIONS

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Alpaca offspring, cria, as called in South America, is born in an advanced state of maturity, weighing from 4 to 10 kg. Heavy crias weigh 9 kg and come from 8-9 years old dams. Al birth, neonates are covered by an extra membrane, the epidermal membrane, which covers the whole body with the exception of the natural openings. Rectal temperature of the neonate is similar to their dams, 37.5 °C; this temperature drops transiently to 35 ºC during the first 30 to 45 minutes, then rises to 37.5 °C and then remains as such. A 16% of crias may stay at 35 °C and become hypothermic, which necessarily would need immediate assistance. Vital signs at birth, heart beat 60 to 90/minute, breath rate, 10 to 30 per minute are normal. Colostrum intake occurs an hour after birth, then occurs every 30 minutes for the first 4 hours of life, end then every hour. Colostrum is the primary source of antibodies, being IgG the main and represents 80% of all immunoglobulins. The highest IgG concentration is registered 24 to 48 hours after birth and is 2,500 to 3,000 mg/dL. If the neonate sucks colostrums during the first 8 hours of life is better. However, if suckling occurs after 24 hours of birth, concentration of IgG is very poor, 175 mg/dL. Failure of passive transfer of IgG requires the administration of plasma from an adult animal. This transfer could be by intravenous and/or intraperitoneal transfusion. Crias are subject to different insults according to the country where are born. Nonetheless, its care is vital for its well being and would have a positive impact on the number of weaned crias.

INNOVATIVE ANDROLOGICAL EVALUATION TO OPTIMIZE THE SELECTION OF FIBER ANIMAL

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Breeding soundness evaluation (BSE) is an overall assessment of the ability of a male to mate and to initiate reproduction. It is estimated that sub-fertile males represent the 20% in an unselected population. Classical BSE includes: libido assessment, physical examination, examination of the reproductive organs and semen evaluation. The development of new diagnostic techniques has introduced new tools to integrate the classical BSE. Trans-scrotal ultrasonography is a non-invasive technique that is ideal in on-farm condition. The echo-doppler approach can increase the accuracy on the testis vascularity evaluation. Ultrasonography applied on the accessory glands can optimize the precision of the BSE in camelids, ram and buck. Testicular fine-needle aspiration cytology reports are available in many species and it has been described to enhance BSE accuracy. The exogenous administration of GnRH has the effect to increase serum levels of LH and testosterone. GnRH challenge test has been associated with the scrotal thermography evaluation. Some studies showed the relation among seminal plasma components with sperm function, stress resistance and cryopreservation success. The *sperm zone pellucida binding test* is based on the concept that spermatozoa need to be able to pass the zone pellucida in order to fertilize an oocyte. The *sperm oviductal cell adhesion test* based on the evidence that *in-vivo* adhesion of spermatozoa to isthmic cells is necessary to develop the ability of fertilization. *In-vitro taxis factors test* with microfluidics technologies and *in-vivo sperm test*, based on the use of fibered confocal microscopes, can be able to identify the place reached by sperm after time unit from the insemination. All the new approaches available can increase precision and accuracy of a classical BSE during the selection process of males.

ADDITION OF SEMINAL PLASMA TO FROZEN-THAWED LLAMA SPERMATOZOA DOES NOT PRESERVE SPERM MOTILITY

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Artificial insemination (AI) results in South American Camelids (SAC) have been poor when using cryopreserved semen, even when inseminating the same number of live motile sperm (0 to 26% pregnancy rates). Furthermore, to obtain pregnancies with cryopreserved semen, insemination immediately after confirming ovulation seems to be necessary (Giuliano *et al.,* 2012), perhaps indicating that SAC sperm survival is low after thawing. In some species, the addition of seminal plasma (SP) improves sperm survival after cryopreservation, but in llamas this has not been studied. Therefore, the aim of this study was to determine the effect of the addition of different dilutions of seminal plasma on the survival of frozen-thawed llama spermatozoa. Sixteen ejaculates from four adult llama males were obtained by electroejaculation, under general anesthesia. All procedures were approved by the Committee for the Use and Care of Laboratory Animals (CICUAL) of the Faculty of Veterinary Sciences, University of Buenos Aires (protocol 2010/24). Semen collection, evaluation, and freeze-thawing were carried out according to Carretero *et al.* (2014). Briefly, to separate spermatozoa from SP, each ejaculate was diluted 4:1 in 0.1% collagenase in HEPES-TALP medium and incubated 4 minutes at 37 ℃. Immediately after incubation, ejaculates were centrifuged for 8 min at 800g and the pellets were re-suspended in LEY-DMF extender (11% lactose, fresh egg yolk and 7% dimethylformamide (DMF). Samples were equilibrated for 20 min at room temperature, placed in 0.50-ml straws and frozen. After thawing, samples were divided into three aliquots for addition of SP: 0% (control), 10% and 50% (final concentrations) and then incubated at 37 °C for 3 h. Sperm motility, viability, membrane function, acrosome status and DNA quality (chromatin condensation and fragmentation) were evaluated in raw semen and in post-thaw samples at time 0, 1.5 and 3 h. A split-plot design was applied, blocking the males and using the treatment as one factor with three levels (0, 10 and 50% SP) and time as the other factor, also with 3 levels (0, 1.5 and 3h). No interaction was observed between treatments and times for each of the seminal characteristics evaluated. After thawing, the control and both SP dilutions (10 and 50%) maintained sperm viability, membrane function, acrosome status, chromatin condensation and DNA fragmentation (p>0.05) over the incubation time. Sperm motility significantly declined (p≤0.05) at 3 h of incubation in all treatments (control, 10 and 50% SP). The rapid loss of motility of post-thaw llama spermatozoa while maintaining other seminal characteristics when in the presence of SP seems important to highlight and requires further studies. To conclude, post-thaw addition of 10% and 50% seminal plasma was unable to preserve sperm motility or improve the survival of llama frozen-thawed spermatozoa.

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ALPACA SEMEN QUALITY THROUGHOUT THE BREEDING PERIOD

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Semen characteristics were determined in twelve male alpacas (4 young, 4 adult and 4 old) during an entire breeding period, two months at La Raya research station. Semen characteristics included volume (mL), motility (%), and concentration (million spz/mL). This center is located at 4200 m sea level and on the Southern hemisphere. Males were separated at random from a group of 150 breeding males and were maintained under natural pastures, with no nutritional supplementation. Three-age males were considered: young (3 years old), adult (6-7 years old), and old males (10-12 years old). Semen was collected by vaginal aspiration following natural breeding to a receptive female. Semen volume was determined reading the collecting tube graduation, and 15 mL tubes were used. Semen motility was determined by the percentage of spermatozoa with tail movement on a microscopic field. Semen concentration, million spz/mL, was determined using the hemocytometer method. Data were analyzed using the NCSS software and with general linear method. There were some males, independent from age and number of breeding that did not yield a semen sample and were separated from the analysis. Ejaculated volume increased from 0.5 mL at the beginning of breeding to 5 mL at the end of the breeding period; however, sperm motility showed an opposite trend, decreased from 50 to 17% ($P \leq 0.05$). Sperm concentration started at 5 million spz/mL, increased to 70 million a month later, and by the end of breeding decreased to 16 million spz/mL ($P \leq 0.05$). The length of breeding, 2 months, affected differently to ejaculated volume, motility and concentration under field conditions which definitively could affect male fertility.

USE OF SEMINAL PLASMA ON INTERVAL TO OVULATION, SUSCEPTIBILITY OF CORPUS LUTEUM TO PROSTAGLANDIN AND IMPROVING OF REPRODUCTIVE PERFORMANCE IN ALPACAS (*Vicugna pacos*) UNDER PERUVIAN HIGHLAND CONDITIONS

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Alpacas, like all camelids are induced ovulators witch means mating is required to induce ovulation (San Martin et al 1968). The reproductive efficiency of alpacas under Peruvian highland conditions is low due high embryo mortality, short breeding season and long gestation period and it is one of the main factors that affect the development of breeding programs to produce genetically superior animals with natural mating. The presence of an ovulating inducting factor (OIF) in the seminal plasma of alpacas has been reported by Rios (1989) and later confirmed by Adams et al (2005). Seminal plasma can, therefore, also be used as an alternative for inducing ovulation with subsequent development of a corpus luteum (CL) capable of maintaining pregnancy and improve the reproductive performance in alpacas. Experiments were performed with the objective of evaluate the effect of seminal plasma (SP) application on: the interval at ovulation (Exp. 1); susceptibility of the corpus luteum to the prostaglandin (PG) induced to ovulation with seminal plasma (Exp. 2); improve the pregnancy rate in alpacas under natural mating (Ex. 3); or to evaluate the effect of seminal plasma in females with different times of mating (Exp. 4). Adults alpacas non pregnant were used to the different experiments. The animals were evaluated by ultrasound to determine the presence of a dominant follicle $\geq$ 7 mm and then assigned to the treatments. Exp. 1: Alpacas were assigned to T1 (n=12) application of 1.0 mL of SP or T2 (n=12) application of 0.04 mg of GnRH (Acetate of busereline) and evaluated by transrectal ultrasonography with a transducer 7.5 MHz (Aloka SSD500) every two hours from 20 to 40 hours or disappearance of dominant follicle previously observed. Exp.2: alpacas were assigned to the following treatments: T1 (n=8): SP + PG D4; T2 (n=8): GnRH+PG D4; T3 (N=8): SP+PG D5; T4 (n=8): GnRH+PG D5; T5 (n=8): SP+PG D6; T6 (n=8): GnRH+PG D6; T7 (n=8): SP+PG D7; T8 (n=9): GnRH+PG D7; T9 (n=8): SP+PG D8; T10 (n=8): GnRH+PG D8; T11 (n=6): Control: 1mL Saline solution. Animals were evaluated by ultrasonography every twelve hours after application PG (196 µg. Tiaprost). Exp. 3: Non-pregnant alpacas with a follicle $\geq$ 7 mmm were breed by natural mating and then assigned to T1 (n=40): Mating + 1 mL SP; T2 (n=39): Mating + 0.042 mg GnRH and T3 (n=38): Control. Animals were evaluated by ultrasound to pregnancy rate on Day 25 and 62; Exp. 4: Alpacas evaluated by ultrasound were assigned randomly to the following treatments: T1 (n=28): natural mating 5 min; T2 (n=28): natural mating 5 min. + 1.0 mL SP; T3 (n=27): natural mating 10 min.; T4 (n=27): natural mating 10 min + 1.0 mL SP; T5 (n= 26): natural mating $\geq$ 15 min; T6 (n=26): natural mating $\geq$ 15 min + 1.0 mL SP. Results were: EXP.1: Interval to ovulation was 27.1 ±1.9 and 26.6 ± 1.6 h. to SP and GnRH, respectively. EXP. 2: luteolysis was 0.0%, 0.0%, 25.0%, 0.0%, 100.0%, 100.0%, 100.0%, 100.0%, 100.0%, 100.0%, and 0.0% for the treatments T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, and T11 respectively. EXP. 3: Pregnancy rate was 67.5 %, 51.3 % and 55.3 % to D25 and 92.6 %, 80.0 % and 85.7 % of embryo survival to D62 to T1, T2 and T3 respectively. EXP. 4: Pregnancy rate was 50.0 %, 64.3 %, 62.9 %, 70.3 %, 76.9 % and 80.0 %

to D25. The results suggest that the SP not have differences with GnRH on interval to ovulation and susceptibility to corpus luteum but would be an important alternative to improve the reproductive performance in alpacas with an increase of embryo survival and the use of males to mating a major number of females with similar pregnancy rate.

INDUCTION OF SUPEROVULATION IN ALPACAS ACCORDING TO THE NUMBER OF FOLLICLES RECRUITED TO THE EMERGENCE OF FOLLICULAR WAVE

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Two experiments was designed to evaluate the response to induction of superovulation with equine Chorionic gonadotropin (eCG). EXP. 1: 34 Alpacas were evaluated by ulttrasonography to determine the presence of a dominant follicle ≥ 7 mm and then induced to ovulation with 0.04 mg of GnRH (Acetate of busereline) and evaluated on D2 to determine ovulation on the disappearance of dominant follicle previously observed and then evaluated by transrectal ultrasonography with a transducer 7.5 MHz (Aloka SSD500) every two day to determine the number of follicles recruited in successive follicular waves. EXP 2: According to the number of follicles emergent ≥ 3 mm at Day 4 post induction of ovulation the alpacas were assigned to T1 (n=13) with 2.4 ± 0.5 follicles and T2 (n=12) 6.0 ± 2.27 follicles. Alpacas with presence of a dominant follicle ≥ 7 mm were induced to ovulation with 0.04 mg of GnRH (Acetate of busereline) and evaluated on D2 to determine ovulation on the disappearance of dominant follicle previously observed and then induced to superovulation with 700 IU of eCG IM according to the protocol described by Huanca et al 2009. The alpacas were mounted with fertile males and seven days later were flushing to embryo recovery. The average number of emergent follicles ≥3 mm at 4 was 3.6 ± 2.6 follicles. The repeatability of the number of recruited follicles in successive follicular waves was 0.46. The superovulatory ovarian response in T1 and T2 was 10.0 ± 6.9 and 10.0 ± 8.1 follicles (P = 0.68) and 8.5 ± 4.3 and 7.5 ± 4.3 (p=0.77) corpus luteum. Embryo recovery rate was 2.6 and 2.2 embryos to T1 and T2 respectively (p=0.47) with embryos of good quality. The results suggest that the alpacas resent a small number of emerging follicles by folicular wave during their recruitment and that affect the selection of donors with irregular and low response to superovulatory protocols and that would be linked to intrinsic factors associated with ovarian reserve and genotype.

THE SPERM CHROMATIN DISPERSION ASSAY (HALO test) CORRELATES WITH THE TUNEL TECHNIQUE.

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Evaluation of routine seminal characteristics (concentration, motility, morphology and membranes) is used to predict fertility but cannot always reveal defects in genome integrity. Thus, evaluation of sperm DNA becomes important for assessing ejaculates prior to applying Assisted Reproduction Techniques. To evaluate llama sperm DNA fragmentation, we set up the Sperm Chromatin Dispersion assay (SCD) in our laboratory (Carretero et al., 2012). This technique does not require costly equipment and can be prepared using lab supplies without the need to buy special kits. On the other hand, due to its objectivity and reliability, the TUNEL (terminal deoxynucleotidil transferase mediated dUTP nick end labelling) technique has become the assay of choice to measure sperm DNA fragmentation. The objective of this study was to use SCD to evaluate llama sperm DNA fragmentation in raw semen and correlate this technique with the TUNEL assay. Sixteen ejaculates were obtained from 5 males using electroejaculation under general anesthesia. All procedures were approved by the Committee for the Use and Care of Laboratory Animals (CICUAL) of the Faculty of Veterinary Sciences, University of Buenos Aires (protocol 2010/24). To reduce thread formation and improve handling, each ejaculate was incubated in 0.1% collagenase in HEPES-TALP medium. The protocols described by Carretero *et al.* 2012 and 2015 were used to evaluate DNA fragmentation with SCD and TUNEL respectively. Incubation with 0.3 M NaOH during 5 min was used in both techniques as a control of DNA fragmentation. Pearson's correlation test was used for statistical analysis. Sperm DNA fragmentation values were 13.7 ± 6.3 and 8.6 ± 5.6 for SCD and TUNEL respectively and in both assays, 0.3 M NaOH produced DNA fragmentation in 100% sperm. Despite the greater fragmentation values in SCD compared to TUNEL, a highly positive correlation was observed between the techniques ($r= 0.80$; $p= 0.0002$). The percentages of DNA fragmentation observed with both techniques and in the controls, were comparable to those obtained previously (Carretero *et al.,* 2012 and 2015). These results indicate that DNA evaluation with SCD gives similar results to TUNEL and so could be used in andrology laboratories that don't have expensive equipment and even in high altitude labs, such as those in the Puna region.

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TEETH IN CAMELIDS: MYTHS, FACTS, PROBLEMS
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Alpacas and llamas are kept in Europe since more than 20 years, but up to now breeding these species is a niche. Most owners have only small groups of these animals, and most of them have no education in keeping and breeding agricultural animals. In addition it is difficult for the owners to find correct information about alpacas and llamas in their native language. The nutrition of camelids consists of grass and hay and they can ruminate. This eating technique is very efficient but it requires correct and healthy teeth. There are different teeth problems seen in camelids and one can find various "explanations", better "myths", for these teeth problems. One such myth concerns the prognathism of incisors in some alpacas, stating that the incisors are growing during the whole life of the animal and that they protude from the mouth because the grass and hay in Europe is not hard enough. Fact is that the very long incisors move up during the lifetime (like in other species) and that the incorrect position of the incisors is inherited. Cutting the incisors may in some cases help for a limited time, but breeding selection for correct teeth is the better solution. Another myth is that cutting fighting teeth without anesthesia is admissible. Fact is that fighting teeth have a pulpa with nerves, but flight animals do not express pain by screaming. Cutting teeth without anesthesia is not compatible with animal welfare. Alpacas and llamas cannot open their mouths very wide and therefore the control of premolar and molar teeth is not easy, for example when the animals do not want to eat. Young and middle age animals have cheek teeth with an oblique, very sharply pointed surface, necessary to chew the hay and grass. With time the surface of the cheek teeth will flatten out in the middle of the surface, the lingual edge (mandibular) and the labial edge (maxilla) will stay pointed for longer time. Some veterinarians (mostly horse practitioners) believe that these points may be a problem for the animal and will grind them off. Grinding of a cheek tooth is only necessary if the position of the tooth has changed. The most important cheek teeth are the three molar teeth in the maxilla and mandibular of each side. Infections of the roots are a big problem for the camelids. Since such infections are seen mostly in more than one tooth, extractions may lead to chewing problems. The anatomical and pathological facts of teeth and teeth problems are presented in detail in this paper.

MEAT AND CHARQUI OF LLAMA

Ayala Vargas C.

In the High Land region of Bolivia, they live around of 70,000 families, are involved in the production of about three million heads of South American Camelids (SC), with an average fresh meat production of 13,884.19 MT/year and 682.26 MT/year of charqui (meat salted and dried in the sun), and also the production of viscera for human consumption. The CS breeding guarantees the livelihood of these populations, but it is not less than a decade since CS meat in Bolivia is legally marketed, disinformation of its nutritional characteristics and attribution of innumerable zoonotic diseases were causes of great economic losses, although historically, their consumption of fresh and processed meat (Charqui), for hundreds of years has guaranteed the health, nutrition and development of great cultures in the Andes. The present article is summary of several research papers that helped to verify the vital importance of CS meat. The rate of growth in llama begins with birth weight with a range of 8 - 12 kg of live weight (LW), at weaning reach an average of 30 to 35 kg of LW, and at 21 months old a range of 63-72 kg for males and 58-64.5 kg for females, there were no significant difference between castrated and whole males. The maximum adjusted weight gain was 129.11 g/d and 114.65 g/d for whole and castrated llamas respectively in pasture native. The optimum age of slaughter was determined between 18 months and 21 months, taked into account the percentage balance of protein with live weight, and a finishing period of 45 and 60 days. The correlation between the biometric measurements (thoracic perimeter, trunk length, ankle width and height at the withers) had a high correlation, thoracic perimeter and live weight (r=0.94), between live weight and warm carcass (R = 0.97), between live weight and cold carcass (r=0.97) except for height at the cross and neck length with a low correlation of r=0.59. The correlation between LW with height at cross and width of hips was r=0.74 and r=0.87 respectively at different ages. The allometric growth in I phase I showed full development in the anterior and posterior extremities, characteristic of young animals, in II phase the loin and rib showed a greater longitudinal growth, towards 25 months the increase in weight tended to be distributed in greater measured in the loins and neck. The trend of weight growth of the whole digestive system in reference to the live weight of the animal, as could be estimated a very high correlation (r=0.86), so the average weight of the gastrointestinal tract at 13 months were 2790 gr and reached an average value of 5600 gr at 31 months of age, with 2810 gr the increase during the growth period. The correlation between the live weight and the skin was very high (r=0.88); however, the correlation with head weight was very low (r=0.27), like blood, (r=0.17). Carcass yield on average was 57.48% and 53.54% in hot and cold carcass respectively, in 15 to 25 months of age carcass. The subjective classification of the carcass (1-5) by fat cover showed that most carcasses (63%) were classified in intermediate class 2.5 (class 2 and class 3) followed by intermediate class 1.5 with 17 %. The measurements in carcass (Carcass Length, Thoracic Perimeter, Neck Length, and Leg Length) showed a high to very high correlation with the variable weights of thick spine, leg, arm and neck. The long neck and back loin variables had a low correlation r=0.5. Weights of commercial cuts (thick loin, thin loin, leg, arm and neck) had a high to very high correlation with the biometric measurements, the weight of the rib cut had a very low correlation coefficient with respect to the biometric measures. The value of protein content of carcass varied between 24.3% and 25.2% for whole and castrated, respectively. The pH value was 5.5 after 24 hours after slaughter. The cadaveric stiffness was completely established between 16 to 20 hours. The maturation of the meat concluded at the same time as the cadaveric stiffness after 32 to 42 hours. The moisture content was inversely proportional to the

fat content. The ash content rated 1.2%. The cholesterol content in llama meat was on average 42.16 mg/100g for animals. The viscera are an important nutritional alternative that is consumed in High Land, which reports a range of fat content of 3.44 to 8.34%, proteins from 19.50 to 21.84%, cholesterol 147.3 to 328.40 mg/100 gr, and an energy input of 95.29 to 365 cal/100 gr. Etymologically the word "Charqui" comes from the Aimara language, which means "dry", the ancient technique of meat conservation in the High Land, consists of dehydrating lean meat saturated with salt, exposed to the sun and frost (-5 ° C), in areas ventilated, for a period of 7-15 days, allowing the gradual and controlled dehydration of the surface of the tissues. Their durability was not determined, but experiences indicated that in cold environments and low humidity a durability could reach up to 20 years, compared with the modern techniques of meat conservation, this process is very similar to lyophilization, but at lower costs in comparison this and other methods of conservation. The charqui of viscera is very common in the Andes, which showed the following values, fats from 10.2% to 14, 67%, proteins from 60.03% to 64.23%, cholesterol from 135.1 to 342.5 mg/100 gr, and a contribution energy from 165.6 to 405.7 cal/100 gr. The innovation in the charqui process was made in polyethylene tunnels, reducing drying time from 15 days to less than a week. The use of this solar dryer allowed a better hygienic sanitary quality of the charqui. Carcass yield to Charqui was 34% with a fat content of 5.96% and protein 60.27%, considered a high nutritional quality. Microbiological analyzes in cfu/g, indicated the sanitary quality of the product, where the amounts of salt, drying time, were factors that minimize the microbial development in the production of charqui. The ratio of the number of bacteria in fresh meat as in Charqui, were smaller than allowed, in fresh meat had more amount of mesófilos; Which reduced considerably in charqui, also at the point of not observing colonies development. Mesofilos, according to the IBNORCA standards were permitted values of this bacteria in fresh meat were $1.00E+^{06}$ while in charque was $1.00E+^{03}$, in both cases the number of bacteria was less than allowed. Molds and yeasts were the cause of odors and strange scents in the same way the decoloration of the surface. It was observed that the heat exposure technique "neutralizes" the proliferation of yeast and mold colonies. The content of Staphylococcus aureus, in fresh meat was priceless, but during the elaboration of charqui it had a proliferation of $1x10E^2$ UCF/g; but still the value was in the range of what is accepted. The total number of Coliforms and Clostridium perfingens, in laboratory results demonstrated the non existence of these microorganisms neither in the fresh meat nor charqui. The indicator of Escherichia coli, in fresh meat samples as in steak samples showed the absence of this microorganism of fecal contamination. In all cases were observed absence of Salmonella. The charqui process showed that the product was innocuous, without the presence of pathogenic microorganisms at the levels allowed for processed products, so it can be pointed out that the technique used eliminated all types of pathogen, similar to a freeze-drying, avoiding all type of risk contamination.

PROTEOMIC METHOD FOR DETERMINATION OF ANIMAL HAIR FIBRES

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The market of high quality textiles requires suitable analytical methods for the determination of their fiber composition to guarantee that no falsification occurs, especially when cheaper fibers, like wool and yak, are blended with expensive fibers, like cashmere. The traditional microscopic techniques are subjective depending on the expertise of the operator and often are affected by chemical treatments to which the fibers have been submitted during textile processing. Several methods have been studied to improve the objectivity and accuracy of the results of the animal fiber blend identification, like methods based on the extraction and analysis of DNA (Tang et al., 2014) or based on specie-specific monoclonal antibodies (Tonetti et al., 2012). Nevertheless, the results obtained are often affected by chemical treatment such as bleaching, dyeing and depigmentation. The method based on electrospray (ESI) mass spectrometry (MS) combined with liquid chromatography (LC) follows a proteomic approach to assess molecular markers for species identification (Paolella et al., 2013). Keratin from sheep, cashmere goat and yak are similar but not identical, because in some specific parts there are amino acidic variants that can been used as specific peptide-marker to distinguish each animal fibers. Therefore, keratin proteins are extracted from fibers, digested by trypsin enzyme and the peptides released are analyzed with LC/ESI-MS, monitoring only the specific marker-peptides: their specificity have been also confirmed by the identification of amino acidic sequences by different LC-MS/MS analysis. Furthermore, these markers can be successful used not only for qualitative analysis of wool, cashmere and yak blends, but also for quantitative ones, with a limit of detection of 3%.
The proteomic method was recently applied to other animal hair fibers, such as Camel, Lama, Alpaca, Vicuna and Guanaco, in order to identify new molecular markers to discriminate Camelidae from Bovidae. Preliminary results showed that there are specific molecular markers for Camelidae and for Bovidae, suitable both for qualitative and quantitative analysis. This proteomic method continues to prove to be an objective and accurate method for animal hair fibers analysis, unaffected by chemical treatment and applicable to sample from various stages of textile processing.

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CORRELATION BETWEEN DIAMETER OF FIBER, MEDULATION AND ANCESTRALITY IN ALPACAS

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The selection in alpacas is given by the fineness of fiber, characteristic of great importance for the textile industry. However, it has been possible to observe fine animals with presence of marrow in the fiber. In the present work, we evaluated the correlation between fiber fineness, the percentage of marrow and the correlation with its vicuña ancestor (*Vicugna vicugna*). The complete region was evaluated of the D-loop and the Cytochrome b region in 50 alpacas. The overall average for fiber diameter was $20.26 \pm 2.69\mu$. Between the fiber diameter and the percentage of medulation, the correlation was 0.8322; Which is a positive correlation, this indicates that as the percentage of medulation increases, the fiber diameter will also increase, this would reflect in some way the degree of improvement of the herd of alpacas. The *median-joining network* topology of the D-loop and the Cytochrome b it showed two haplogroups to determine ancestor. Regarding the correlation between the percentage of medulation and vicuña ancestor, we found a negative correlation, whereas there was a positive correlation between the percentage of medulation and guanaco ancestor. These results allow us to indicate the ancestry of alpacas by evaluating percentage of medulation and corroborating with molecular genetics in the laboratory.

THE USE OF NEAR INFRARED (NIR) REFLECTANCE SPECTROSCOPY TO PREDICT CLEAN CONTENT YIELD IN GREASY MOHAIR SAMPLES.

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One experiment was conducted in order to test the utility of near-infrared spectroscopy (NIRS) to predict i) clean mohair content and ii) mean fibre diameter (MFD) in Angora goat fleece. A total of 397 mohair fleece samples were collected in 2016 within the framework of the French selection scheme including performance recording, fleece assessment and fibre measurements. Fleece samples were measured for clean mohair content and MFD by OFDA methodolgy, then scanned in a Petri dish using a NIRS portable instrument (LabSpec ® 5000; ASD Inc, Boulder, USA) by reflectance in the VIS and NIR regions (350 to 2500 nm). Partial least square (PLS) regression was used to develop a number of calibration models between the spectral and reference data. Different mathematical treatments were used during model development. The methods studied were partial least squares regression (PLS) and first-derivative pretreatment + PLS. Cross validation was used to assess the performance and avoid overfitting of the models. NIR prediction of MFD gave a low R^2 (<0.70) whatever the calibration models. By using the first derivative of the raw spectra in the NIR region (800 to 2500 nm), the calibration models gave a coefficient of determination in calibration (R^2) of 0.81 for clean mohair content with a low relative error (3.5%). It is concluded that NIR reflectance spectroscopy can be used to predict clean mohair content with a good precision allowing a large reduced cost of fibre measurements.

EFFECTS OF YEAR AND SAMPLING SITE ON MEAN FIBRE DIAMETER OF ALASHAN CASHMERE GOAT

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Fourteen female Alashan white cashmere goats were investigated for fibre finesses (diameter) and coefficient of variation of fineness (CV). The investigation focused on the same animals combed at 1, 3 and 4 years of age and fibres were collected from 10 different body areas. A statistically significant effect was observed for both year of collection and body areas. The present paper suggests that the fibres of one-year old animals should be kept distinct from older ones, likewise fibres from upper part of the body should be separated from the others.

POSTERS

EFECTO DE LA PRECIPITACIÓN PLUVIAL EN LA SEJA DE SELVA Y LA ZONA ALTO ANDINA DE LA REGIÓN PUNO SOBRE LA PRODUCCIÓN GANADERA DE ALTURA.

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El cambio climático se define como una modificación identificable y persistente del estado del clima por variabilidad natural o por efecto de la actividad humana. La zona altoandina se encuentra por encima de los 4,000 msnm (piso puna) abarca el mayor porcentaje de la superficie y se caracteriza por su alta vulnerabilidad a fenómenos climáticos adversos. La precipitación pluvial en la ceja de selva tomando como referencia al mes de agosto en promedio es de 76.3 mm incrementándose en los meses de lluvia y la zona altoandina en promedio es de 18.5 mm y de forma irregular. El año 2016 se caracterizó por una severa sequía que no superó los 350 mm de precipitación pluvial, el seguimiento de 15 unidades productivas de comunidades campesinas nos permitió determinar que el número de afecciones dentro del hato (animales enfermos y muertos) llego hasta 11.34 % en los adultos y 35.12% en las crías en comparación con año un normal (2012) y esta se debió a la escases de pastos y agua que afectó a las madres lactantes y en gestación. El porcentaje de abortos en alpacas llegó hasta 33.5% y en llamas hasta 18.21% en comparación al promedio general en adultos que no supera el 2% en un año normal. La aparición de enfermedades infecciosas en alpacas crías llegó hasta un 27.70% en diarreas y en los adultos hasta un 24.50% como la fiebre de las alpacas. Se concluye que una baja precipitación pluvial tiene un efecto negativo sobre la producción y productividad de las alpacas y llamas en la zona alto andina, no siendo manifiesto en la zona de ceja de selva.

EVALUATION OF POPULATION AND SOCIAL COMPOSITION OF VICUNAS (VICUGNA VICUGNA) IN DIFFERENT ENVIRONMENT SITES OF THE LAGUNA BLANCA BIOSPHERE RESERVE (CATAMARCA, ARGENTINA).

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The wild vicuna is an important resource for the Laguna Blanca Reserve, where capture and shearing for the sustainable use of its fiber is practiced. The objective of this study was to evaluate population variables of the vicunas in eight different vegetation communities of the reserve. Vicuna counts were conducted by direct observation in communities of shrub steppes (2), herbaceous steppes (2), and waterfowl meadows (marshes) (4) during April 2013. Relative abundance (I) (observations/time), percentages of family group (% FG), single males (% SM) and number of offspring (No. Off.) were determined. Regarding FG, we determined Family Group Size (FGS) and Male: Female: offspring) ratio. The FG% and FGS were assessed on the basis of statistical evidence (Student's T-test) of non-compliance with the FG standard $\geq$60 and FGS$\geq$6. MFOr was assessed on the basis of statistical evidence (χ^2 goodness test) of non-compliance with MFOr standard $\neq$ 1: 4: 2. The largest number of vicunas was recorded in the steppes (shrubs and herbaceous) (113) as well as the No. Off. (19). In the environments of herbaceous steppes, greater %FG was observed, and in the bushes steppes greater % SM. Good values of I in herbaceous and shrub steppes were obtained, and in marsh environments no vicunas were reported. It is concluded that environments shaped by shrubs and herbaceous steppes meet at least two of the three population attributes. In marshes, despite being the best communities, they did not meet any attributes. The absence of vicunas may be due to the presence of domestic livestock in these sites.
Keywords: Wild Camelids, Puna, Biosfere, reserve

PCR-RFLP METHOD FOR TESTING ASIP EXON 4 MUTATIONS IN LLAMAS

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The basic coat colors of mammals are determined by the relative proportion of two types of pigments, eumelanin and pheomelanin. The *agouti* signaling protein (ASIP) plays a crucial role in melanogenesis, by increasing the production of pheomelanin and decreasing the eumelanin synthesis by blocking the signaling pathway of the melanocortin receptor 1 (MC1R).In several species, loss of function mutations of the ASIP gene are responsible for the black coat color. The polymorphisms of ASIP exon 4, c.325_381del and c.292C> T, have been previously associated with eumelanic phenotypes in llamas (Daverio et al., 2016) and also in alpacas (Chandramohan et al., 2013). The objective of this work was to develop an alternative method to DNA sequencing for genotyping both polymorphisms. Fifty one llama DNA samples, including controls of known sequence were analyzed. PCR products spanning ASIP exon 4 were digested with the enzyme Bvel, that recognizes the c.292C>T mutation, followed by electrophoresis in 8% polyacrylamide gels to simultaneously detect the SNP and the deletion. Analysis of the band patterns presented complete concordance between sequencing and PCR-RFLP genotypes. Genotyping results from the samples showed that all dark llamas (n=13) were homozygous for the deletion, homozygous for the c.292C> T polymorphism or heterozygous for both, while none of those combinations were observed in the pheomelanic animals here analyzed (n=20). The results of this work support the findings of previous studies and also show the usefulness of the PCR-RFLP technique as a relatively fast, simple and cost-effective method to determine the exon 4 ASIP variants in llamas.

Chandramohan B., Renieri C., La Manna V., La Terza A., (2013). The alpaca agouti gene: genomic locus, transcripts and causative mutations of eumelanic and pheomelanic coat color. Gene 521 (2), 303–310.
Daverio M.S., Rigalt F., Romero S.R., Vidal-Rioja L., Di Rocco F., (2016) Polymorphisms in MC1R and ASIP genes and its association with coat color phenotypes in llamas (*Lama glama*). Small Ruminant Research, 144: 83-89.

ESTIMACIÓN DE LA HEREDABILIDAD DE SEIS CARACTERES DE CALIDAD DE FIBRA DE ALPACAS HUACAYA DEL INIA PUNO

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El objetivo fue estimar las heredabilidades de seis caracteres de calidad de fibra de alpacas Huacaya a la primera esquila del banco de germoplasma del Instituto Nacional de Innovación Agraria, ubicado en el departamento de puno a una altitud de 4200 metros en la zona agroecológica de puna seca. La base de datos constó de 9114 registros de fibra y fueron analizados con el analizador óptico del diámetro de fibra (OFDA, IWTO-47-95) en el laboratorio de fibras del IVITA Maranganí. Para estimar los componentes de varianza del diámetro de fibra, desviación estándar del diámetro de fibra, factor de confort, coeficiente de variabilidad del diámetro de fibra, longitud de mecha y peso vellón se utilizó el modelo animal unicaracter $y = Xb + Zu + e$, donde y es el vector de observaciones, b es el vector de efectos fijos (sexo, color y mes-año de esquila) la edad en días se consideró como covariable lineal, u es el vector que representa el efecto genético aditivo, e es el vector de residuales; X y Z son las matrices de incidencia de efectos fijos y aleatorios respectivamente. Los componentes de varianza fueron estimados por el método de Máxima Verosimilitud Restringida (REML) utilizando el programa VCE versión 6.0.2. La heredabilidad estimada para el Diámetro de fibra fue de alta magnitud 0.540±0.087; para el resto de caracteres fue de media magnitud siendo para la Desviación estándar 0.311±0.089, Factor de confort 0.278±0.077, Coeficiente de variabilidad 0.291±0.089, Peso vellón 0.158±0.027 y Longitud de mecha 0.268±0.081. Se concluye que es posible obtener una buena respuesta a la selección para los seis caracteres de calidad de fibra en alpacas Huacaya.

INTERACTION OF ASP AND MC1R IN BLACK AND BROWN ALPACA

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Alpaca coat colour is a relevant feature both for breeders than textile industries. *Agouti* (ASP) and *Extension* (MC1R) are genes known to be involved in coat colour through pigmentation pathways by regulating type, amount and distribution of eumelanin and pheomelanin pigments in melanocytes. In alpaca genotype of ASP and MC1R genes have already been analysed distinctly, but their epistatic interaction have not been evaluated. In this study have been assessed their segregation more insights on black and brown phenotypes. In several mammals MC1R is epistatic over ASP, id est recessive allele in *Agouti* (a) and dominant allele in *Extension* locus (E) produces black phenotype. That is confirmed in alpaca where black coat has aH/aΔ57 and aH/ahT genotype on agouti and E/E or E/e genotype on MC1R locus. Otherwise ASP and MC1R in Brown/Red Brown, have a dominant profile at least in one allele as A/A, A/ahT on *Agouti* and E/e on *Extension*. Genotype and phenotype comparison clears that receptor and ligand are in concordance to produce pheomelanin and eumelanin in alpaca. Segregation analysis of 12 alpaca families genotyped by coat color, confirm the dominance of brown over black and could be helpful for coat colour classification and genotyping.

ALPACA FGF5: HYPOTHETICAL POST-TRASCRIPTIONAL READTHROUGH REGULATION IN SKIN BIOPSIES

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Two different phenotypes are described in alpaca, identified as Suri and Huacaya which differ for the type of the fleece. The Huacaya fleece is characterised by compact, soft and highly crimped fibres while the suri fleece is longer, straight, less-crimped and lustrous. In our study, the Fibroblast growth factor 5 (FGF5) was investigated as a possible candidate gene for hair length in alpaca (*Vicugna pacos*). Total RNA purified from alpaca Suri and Huacaya skin biopsies, was reverse transcribed to cDNA using oligo dT priming and subsequently amplified by using *FGF5* specific primers. Further, the resulting amplicons were cloned and sequenced. As previously identified in others mammals, our results also show that the alpaca FGF5 gene, give rise to a short (FGF5S) and a long (FGF5) isoform. Interestingly, in the long isoform, we observed a point mutation (i.e. a transition C>T at position 499 downstream of the ATG codon) able to generate a Premature Stop Codon (PSC). The highly conserved nucleotide and aminoacid sequence after PSC suggested, and western blot analysis confirmed, a Readthroug event (RT). The analysis of mRNA sequence revealed motifs and characteristics that correlate with mRNA that undergoing RT (i.e. the higher "leakyness" of UGA Stop Codon, leakyness" due to the position -1, -2 in respetc the UGA PSC with purines and +4 with pyrimidines, presence of suzesky sequences, pseudoknots in 3'UTR and tandem repeat Stop Codon after the canonical TAA, presence of long intron in the gene and long 3'UTR). To the best of our knowledge this is the first case of readtrhough event on PSC reported for FGF5 gene.

EFFECT OF THE BROWN COAT-CODING GENE (TYRP-1) ON WOOL AND SKIN COLOR OF ŻELAŹNIEŃSKA AND WRZOSÓWKA SHEEP.

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The aim of the study was to assess relationship between frequency of alleles and genotypes of brown coat-coding gene (TYPR-1) and color of wool and skin measured objectively. In order to better illustrate color differences two breeds were examined: white colored – Żelaźnieńska sheep and colorful (mostly grey) Wrzosówka sheep. The study was conducted on randomly chosen ewes (Żelaźnieńska sheep – 93; Wrzosówka sheep - 133) during the shearing. Color of wool and skin was examined using device Chroma Mater CR-400. Color was measured using the system CIE L*a*b*. L* expresses clarity and varies from 0 (black) to 100 (white). a* varies from -60 to +60: -a* goes from green and +a* goes towards red. b* varies from -60 to +60 : -b* goes towards blue and +b* towards yellow. Color of wool and skin measurements were done on the right side of sheep at last rib. DNA was isolated from blood leukocytes. Sample genotyping was performed with KASPar® system (www.kbioscience.co.uk), which uses a single nucleotide polymorphism (SNP) and three genotypes were found: CC, CT and TT. Significant and highly significant differences in all color measurements of wool (Żelaźnieńska vs. Wrzosówka: L*: 75,64 vs. 46,09 $P \leq 0.01$; a*: 0,67 vs. 2,33 $P \leq 0.01$; b*: 5,84 vs. 2,75 $P \leq 0.01$) and skin (Żelaźnieńska vs. Wrzosówka: L*: 70,03 vs. 54,26 $P \leq 0.01$; a*: 4,53 vs. 3,98 $P \leq 0.05$; b*: 6,18 vs. 3,17 $P \leq 0.01$) between tested breeds were found, which should be connected with different wool color in each breed. Differences in color values of wool depending on TYRP-1 gene genotypes were observed only for Wrzosówka sheep. The measurement of L* color parameter made on wool was highly significantly higher in the case of CC and CT genotypes compared to TT genotype (respectively 47,25 vs 48,27 vs 38,10; $P \leq 0.01$). However, in the measurement of a* color parameter the situation was opposite and homozygote TT had higher values compared to CC and CT genotypes (respectively 3,58 vs 2,17 vs 1,92; $P \leq 0.01$). No differences between all skin color parameters for both breeds were found. The results of studies on wool color, depending on genotype of the TYRP-1 gene in Wrzosówka sheep, make possibilities to conduct breeding work in order to develop standards for coat color for this breed.

SELECTION STRATEGIES FOR FIBER QUALITY IN ALASHAN CASHMERE GOAT

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Over the last ten years, many authors have attempted to study various genetic patterns and how they relate to improved cashmere fiber production. Unfortunately, the way the sector is currently structured hinders any "on the filed" attempts to apply modern quantitative and molecular techniques to improve fiber characteristics through selection. The process is complicated by the fact that cashmere fiber quality is normally assessed when the animal is approximately a year old. The study investigates the prediction of cashmere quality in adult Alashan cashmere goats from measurements on young animals. Ten fleece samples were collected from 12 kids until 14 months of age (1441 records). Fiber quality, determined by OFDA, was measured monthly. The statistical analysis indicates that the kid random effect is highly significant ($P \leq 0.0001$) throughout the test period and thus confirms a genetic effect on cashmere fleece characteristics; the age effect was also found to be consistently significant. The measured traits showed an increasing trend of mean values up to the 5th -7th month. The fiber girth stabilises by the fifth month reaching a thickness of 14.46 μm. All studied traits show a strong correlation with fiber quality beyond the fifth month. Furthermore, although adult fleece quality can be predicted beyond the fifth month of age, this usually coincides with the warm summer period and hence is an unsuitable season for the evaluation of fleece. Under such situations it may be recommended to postpone the evaluation beyond the age at eight months during the cooler months.

VARIABILITY OF FIBER QUALITY ON CHINESE ALASHAN LEFT BANNER WHITE CASHMERE GOAT.

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The hereditability and the phenotypic and genetic correlations of down weight (DW), down fiber diameter (DFD), and coefficient of variation of the down fiber diameter (CVDFD) of Chinese Alashan Left Banner White cashmere goat were estimated on 1375 one year old animals, born in 2009 , 2011 and 2013 and bred at the Station for Livestock Improvement of Alashan (Left Banner, Inner Mongolia, P.R. China). For all traits, significant effects were for sex, age and sex-age interaction. Phenotypic correlation calculated by Pearson's coefficient showed that DFD is significantly and positively correlated with both CVDFD (0.29 ± 0.07) and DW (0.20 ± 0.05). The phenotypic correlation between CVDFD and DW was significant and negative (- 0.11 ± 0.06). The genetic correlations between DW and CVDFD and between DFD and CVDFD were both highly significant and positive (0.63 ± 0.16 and 0.39 ± 0.1, respectively) while the DW showed a negative genetic correlation with DFD (-0.27 ± 0.2). The heritability for DFD and CVDFD was high, 0.41 ± 0.08 and 0.52 ± 0.06 respectively. Heritability for the DW was low (0.12 ± 0.03).

RELATIONSHIP BETWEEN CLASSES ASSIGNED BY VISUAL APPRAISAL AND A SELECTION INDEX IN FUNCTION OF LIVE WEIGHT, FLEECE WEIGHT AND FIBER DIAMETER IN HUACAYA ALPACAS FROM PASCO

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Visual appraisal evaluation is a common practice in highland livestock production of alpacas in Peru. An alternative is the selection based on selection indexes based on performance tests. The aim of this study was to evaluate the relationship between the classes assigned by visual appraisal with a selection index based on live weight, fleece weight and fineness in white Huacaya alpaca fiber. 1823 alpacas were evaluated, in which females and males were 1083 and 740 respectively. Index coefficients were estimated for the productive characteristics of live weight (10.41), fleece weight (0.60) and fiber diameter (-11.65), using market prices for alpaca fiber at the producer level by 2014 (MINAGRI 2016). This selection index has an estimated genetic progress for live weight of 1,047 kg, for fleece weight 0.050 kg and fiber diameter -0.71 microns. A linear additive model did the comparison of this index with the selective classes, where live weight is included as a covariable. Statistical differences (p-value <0.05) were found between selective class, shear number and source. Selective classes S, A and B show statistically equal means and selective class C shows statistical differences with the other averages for the selection index. When applying a selection index the weighting to each of these characteristics is governed by the economic value obtained, so it is shown that the selective classes S, A and B have no difference between their averages of the index score.

DRINKING BEHAVIOUR IN LLAMAS (*Lama glama*) AND THEIR RESPONSES TO SALINE DRINKING WATER

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Due to global climatic changes, salinization of ground water and soil is an increasing worldwide phenomenon, thus creating new threats for farm animal production. Although sodium chloride salt (NaCl) is essential for regulating body water content, muscle and nerve functions and nutrient absorption, excessive long term salt intake may affect feed and water intake of animals or even cause severe health problems. Sheep have been shown to tolerate high salt concentrations between 5% to 20% in their diet (Digby *et al*., 2011). However, there is a different sensitivity to ingestion of salt either from food or drinking water (Masters *et al*., 2005). Knowledge on water intake in South American camelids is very limited. There are anecdotal reports on Guanacos, the wild ancestor of the llamas, drinking saline water (Darwin, 1844). No studies are available on taste responses and thresholds for taste discrimination for sodium chloride in drinking water in llamas. The aim of our study was to investigate the individual sensitivity of lamas (*Lama glama*) towards sodium chloride (NaCl) in drinking water. The study involved 6 female non-pregnant llamas kept in individual pens with outdoor run. A two choice preference test (Goatcher and Church, 1970) was used. After the control phase, when only fresh water was supplied in two buckets, water with ascending salt concentrations (0.25, 0.5, 0.75, 1.0, 1.25 or 1.5%) was offered in one container and unsalted tap water in the other. The position of the salted water was changed at random to counterbalance position effects. This procedure allowed to determine the individual salt sensitivity. In addition, video recordings of individual drinking behavior were made and the diurnal rhythm of water intake was evaluated.

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DIGESTIBILITY OF BEAN PULP GRANULATED IN RABBITS

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Granulated beet pulp is a by-product of the sugar industry for use in feeding rabbits. The objective of this work was to determine the digestibility and energy value of granulated beet pulp from different sources in Spain in weaned rabbits, by the method of substitution by total fecal collection; For which, 87 rabbits were distributed in 6 groups for 6 feedingstuffs (1 control feed and 5 feedingstuffs with 20% inclusion of the beet pulp), with individualized feeding and consumption ad libitum. The results indicate that the digestibility of the granulated beet pulp in rabbits was similar ($p > 0.05$) in dry matter ($76.0 \pm 6.3\%$) and organic matter ($76.7 \pm 5.8\%$), with a higher tendency for Olmedo pulp; In contrast, the digestibility of the fiber fractions (FDN and FDA) showed difference ($p < 0.0001$), with the best response for the same pulp. Protein digestibility and digestible protein content were also similar ($p > 0.05$), with $62.3 \pm 6.3\%$) and $5.2 \pm 0.6\%$, respectively; In a similar way, the digestible energy content, with an average of 12.8 ± 0.8 KJ / g of dry matter and an efficiency of use of 0.72 ± 0.05 in relation to the gross energy. From the results it is confirmed that the granulated beet pulp has good digestibility and an important source of digestible energy for rabbits.

APELIN, A NEW ADIPOKINE ACTING ON HAIR FOLLICLE: AN IMMUNOHISTOCHEMICAL STUDY ON OVINE SKIN.

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Apelin (AP) is a novel peptide belonging to the family of adipokines (1). Adipose tissue is a source of plasma AP and the secretion by this tissue is regulated by several factors including fasting and refeeding. Apelin specific receptor (APJ) shows a widespread tissue distribution and accordingly many physiological roles were described for AP. In this work, the expression of AP and APJ were investigated in the ovine skin by immunohistochemical technique in order to point out the presence of structures that might be locally responsive to the action of AP. The analyses performed evidenced a clear and intense immunostaining for APJ in the ovine skin, while AP expression cannot be observed. The receptor was localized in the hair follicles (HFs), while other structures of the skin appeared to be negative. APJ expression involved the outer root sheath and extended throughout follicular wall, from the infundibulum to the bulb. AP is a recently discovered molecule and, at present, there are not surveys describing it in the skin of any animal species including humans. The strong expression of APJ in the HF, suggests an important role of AP that probably acts on this organ through an endocrine mechanism. The identification of APJ in ovine skin is a preliminary study that introduces the study of AP in the skin and represents the beginning of a comparative survey that could contribute to the improvement of fiber quality. 1) Pitkin S.L., Maguire J.J., Bonner T.I., Davenpor A.P. (2010) Pharmacological Review 62:331–342.

ICAR - GUIDELINE FOR THE ANIMAL FIBRE PRODUCTION IN ALPACA AND CASHMERE AND NEW RULES FOR THE ORGANIZATION OF THE FIBRE AND FLEECE COLLECTION CENTERS.

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ICAR opened in the 2007 a working group on animal for fibre. The working group established at first on alpaca fibre production and afterwards on Cashmere goat production, in both guidelines on standards and guidelines on methods of alpaca and Cashmere goat identification and guidelines for alpaca and cashmere shearing /combing, management, fibre harvesting and grading. Next step of ICAR Animal Fibre Working Group will be to define guidelines on the identification of the objective and criteria of selection in Alpaca breeding and open new guidelines on the definition of the animal fibre collection centers. The collection centers will be plan firstly for European wool production and subsequently for alpaca in Latin -America and cashmere production in China.

TECHNOLOGICAL CHARACTHERISTICS OF WHITE AND COLOROURED HUACAYA ALPACA FIBRE IN APURIMAC, PERÚ

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The objective of this study was to characterize the different technological traits of alpaca fiber produced in the Apurimac region to document its present profile and to provide information for future improvements. There were analyzed 145 fiber samples from white and colored alpacas from five communities. The effect of sex, age, color and locally on fiber diameter (FD), standard deviation fiber diameter (SDFD), comfort factor (CF) and curvature index (CI) and the relationship between them were analyzed to determine the factors that should be considered when designing a breeding program for Huacaya alpaca in Apurímac, Peru. Statistical difference was found by sex, age, color and localy to the technological characteristics of FD, CF and CI. For SDDF age was not significant. The FD increase with age ($p<0.05$) and females are finer than males, were 22.79 and 23.79 μm respectively ($p<0.05$). There were statistical differences ($p<0.05$) between dark color fiber (26.69 μm), and the light color (23.81 μm) and white (22.30 μm). The CF was 87.41% in males and 91.23% in females ($p<0.05$), decreasing with age ($p<0.05$). The CF was different among colors ($p<0.05$) being dark with the less CF (75.94%). For CI females were 38.23% and males 33.76% ($p<0.05$), decreasing with age ($p<0.05$). There were statistical differences ($p<0.05$) between dark color fiber (29.26%), and the light color (34.98%) and white (38.29%). There were statistical differences among the five localities ($p<0.05$) for all the technological traits. We concluded that the quality of white and colored Huacaya alpaca fiber produced in the region of Apurimac have a good potential to be improved.

THE PRICKLING ISSUE IN FABRICS MADE OF CAMELID FIBERS. POSSIBLE MECHANICAL OR GENETIC SOLUTIONS.

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This lecture intends to analyze the physical attributes that determine the comfort of fabrics made of South American Camelid fibers (Lama and Alpaca), the effect on their value and their possible mechanical and/or genetic modifications. While emphasis has always been on mean fiber diameter -in order to determine fiber quality- fiber frequency exceeding 30 microns has a key role in quality. This is essential for light fabrics, where the effect of prickle plays a critical part in consumer´s choice. Yet the problem lies in the slow selection response. Dehairing provides an immediate solution, though excessive fiber breakage should be addressed (Wang et al., 2008). It is concluded that the textile fiber quality of South American Camelids is promissory if the presence of objectionable fibers is solved, resulting in a tolerable frequency for consumers (<3%). This process could be explored via genetic selection (Frank et al., 2011) or applying dehairing technology (Frank et al.,2017). This implies a true paradigm shift with regard to the classic textile processing of Alpaca and Lama fibers. This would enhance the fiber softness to touch, together with other important features that would render the fiber price more competitive.

Wang L, Singh A., Wang X., 2008. Dehairing Australian alpaca fibres with a cashmere dehairing machine. Journal of the Textile Institute, vol. 99 (6): 539-544.
Frank E.N., Molina B.G., Hick M.H.V., Caruso L.M., 2011. Determinación de la varianza genética de los componentes del diámetro de la fibra de camélidos en relación a los tipos de vellón. En: XXII Reunión ALPA, Montevideo, Uruguay. 24-26 octubre de 2011. Arch. Latinoam. Prod. Anim.,19(Supl.1):3
Frank E.N., Frondizi Seghetti D.G., Hick M.V.H., Castillo M.F., Burgos A., Cruz A., 2017. Dehairing of alpaca fibres top with AM2 dehairing technology. This Symposium.

DETERMINATION OF THE OPTIMAL NUMBER OF RUNS USING AM2 DEHAIRING TECHNOLOGY IN FIBERS OF PATAGONIAN GOATS (PATAGONIAN CASHMERE).

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AM2 dehairing technology reduces the objectionable fibers content of shorn fleeces. Nonetheless, it reduces fiber length and the final yield is affected by the successive runs through the dehairing machine, though it allows to specify the number of passes required for each lot (Singh, 2003; Frank et al., 2009). The aim of this work is to establish the number of passes that the machine should make until optimal performance is reached from an objectionable fibers content, fiber length, fiber diameter and yields to dehairing perspective. Work was carried out on fiber sheared from north Patagonian goats, whose fleece was scoured and dehaired until the process seemed final from a visual assessment. From each run, samples were extracted for processing at the laboratory. Measurements comprised: yield to dehairing (%Y), objectionable fiber content (w/w) (FOC), average fiber length (FL) and average fiber diameter (FD). The variables obtained were fitted with a polynomial model and the first derivative of the function was calculated. The value of the variable for the run with the minimum value was estimated, and the value of the variables from an expected optimal value were calculated with the same function. The lowest %Y was obtained in run 10, the minimum FOC in run 6, the lowest FL in run 7 (2.6 cm) and the lowest FD in run 5 (18.1 microns). It is concluded that, if 4 runs are assumed to be optimal to obtain less than 1% of objectionable fibers, a %Y: 35 - 37 %, FOC: 0.2 %, FL: 3.5 cm and FD: 18.3 μm would be obtained.

Frank E.N., Hick M.V.H., Prieto A., Castillo M.F., 2009. Efectos del descerdado sobre la calidad de la fibra obtenida de camélidos sudamericanos y cabra criolla patagónica.. En: 32º Cong. Arg. Prod. Anim. (resumen). Revista Argentina de Producción Animal Vol 29 Supl. 1: 134-135.
Singh, A. A study on dehairing of Australian cashmere fibres. Ms Ing. Thesis, Deakin, Aust.

DEHAIRING OF ALPACA FIBRES TOP WITH AM2 DEHAIRING TECHNOLOGY.

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Many classes of alpaca fibres contain a certain amount of coarse fibres, which are strong and stiff, and cause discomfort to the end users of alpaca fibre products. It is therefore desirable to separate the coarse alpaca fibres from the fine ones, as it should be done with llama fiber. With the AM2 dehairing technology developed in Argentina, various tests of Llama and Alpaca fiber (Frank *et al.*,2009) were performed as well as in Australia (Wang et al., 2008). In all cases, samples of raw fleeces were used. The possibility of using worsted (combed and intersected) arose some time ago. This paper reports trial results on alpaca dehairing using an AM2 technology dehairing machine. The diameters of alpaca fleece, dehaired alpaca fibres and removed alpaca fibres were analyzed; and the fibre lengths before and after dehairing were compared. In this dehairing assay, input included: Alpaca tape top 22 microns average fineness; 30% CV of fineness; Objectionable fiber w/w: 4.88%; N°/weight: 0.32; Fiber of>30 μm: 9.1%. Average fiber length (Barbe): 111.8 mm. One dehairing Product/Down (VI) was obtained: average fineness 21.9μm; 24% CV of fineness; Objectionable fiber w / w: 2.2%; N°/weight: 0.16; Fiber of>30 μm: 3.6% Average fiber length (Barbe): 83.0 mm; Hateur: 75.2mm (reduction length: 6.9 - 21.2%). Yield at end dehairing was 83.5%. The product can be processed with the worsted system (combing).

Frank E.N., Hick M.V.H., Prieto A., Castillo M.F 2009. Efectos del descerdado sobre la calidad de la fibra obtenida de camélidos sudamericanos y cabra criolla patagónica.. En: 32º Cong. Arg. Prod. Anim. (resumen). Revista Argentina de Producción Animal Vol 29 Supl. 1: 134-135.
Wang L, Singh A., Wang X., 2008. Dehairing Australian alpaca fibres with a cashmere dehairing machine. Journal of the Textile Institute, vol. 99 (6): 539-544.

MODELACIÓN DE CURVAS DE CRECIMIENTO DE LLAMAS Q'ARA UTILIZANDO MODELOS DE CRECIMIENTO NO LINEALES

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El objetivo de este estudio fue describir la curva de crecimiento de llamas Q'ara machos y hembras para lo cual se han utilizado seis modelos de crecimiento no lineales (Brody, Gompertz, Von Bertalanffy, Logístico, Exponencial negativo y Richards). Se analizaron datos de pesos corporales individuales de 15303 y 18085 llamas machos y hembras de la variedad Q'ara. Los datos fueron obtenidos de la estación experimental Quimsachata, del Instituto Nacional de Innovación Agraria (INIA) localizado en el distrito de Santa Lucía, provincia de Lampa, departamento de Puno, Perú. Los parámetros de los modelos fueron estimados por el método iterativo de *Gauss Newton* por medio del procedimiento NLIN del programa estadístico SAS®. Para saber si un modelo tiene un buen ajuste se usó los siguientes estadísticos: Coeficiente de determinación ajustado (R^2ajustado); Cuadrado medio del error (RMS); Raíz del cuadrado medio del error (RMSE); Criterio de información de Akaike (AIC) y el Criterio de información Bayesiana (AIB). Se concluye que el modelo de crecimiento no lineal de Brody es el que mejor describe la curva de crecimiento de llamas Q'ara machos y para las hembras el mejor modelo es el de Richards.

GENETIC BASIS OF EARLY ACTIVATION OF HAIR FOLLICLE IN CASHMERE GOAT: AN APPROACH WITH CANDIDATE GENES.

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The cashmere hair follicle perpetually goes through three stages: growth (anagen), involution (catagen), and rest (telogen). Photoperiod is the main proximate factor in the control of seasonal coat change in Cashmere goats. Stem cells play a crucial role in the hair follicle growth. Different types of stem cells are present in hair follicle: bulge stem cells, secondary hair germ, adipose stem cells (ADSCs), epidermal stem cells. Platelet-derived growth factor (PDGF) is secreted from ADSCs and it is involved in the hair growth In this work we have studied the goat PDGFA and sequenced the full length transcript obtained a long and short isoforms. Using the RT-PCR we have identified the expression of some molecular signals, including PDGFA, that according to the literature are implicated in the hair growth. Our data may confirm that some genes especially as CD34, BMP2 and PDGFA can activate hair follicle stem cells in particular those of bulge region.

PRELIMINARY COMPARATIVE ANALYSIS AND LOCALIZATION OF *BOS TAURUS* SNPS ON *VICUGNA PACOS* CHROMOSOME 10 (VPA10)

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Current genomic information on alpaca (*Vicugna pacos*) is incipient. To increase the number of SNPs we used the Illumina (Bovine Hd Genotyping - 777kSNP) DNA chip to genotype 40 female Huacaya alpacas and identified a total of 10314 potentially similar SNPs between cattle and alpaca. To determine if our strategy has validity and confirm similarity and chromosomal location of SNPs in alpaca we have made use of the genome database of the Vicugna_pacos-2.0.1 alpaca (ABRR00000000.2; NCBI) and the chromosomal location of 230 molecular markers and ZooFISH generated by Avila et al (2014) and Balmus et al (2007) respectively. Positive SNPs in alpaca were compared to sequences from the 4195 scaffolds (KB632434: KB635807; NCBI) with the Megablast software. For preliminary validation of our strategy we selected all the SNPs located on BTA29 that were positive in the alpaca and compared the sequences of those SNPs with the alpaca scaffolds sequences associated with markers found on chromosomes 10 (VPA10) and 33 (VPA33) (Avila et al, 2014). The latter supported by ZooFISH analyzes indicating that BTA29 is equivalent to VPA10 and PVA33 according to Balmus et al (2007). These comparisons identified 42 bovine PNSs co-localized in VPA10 and zero PNSs in VPA33. These preliminary studies indicate that it will be possible to identify an adequate number of conserved SNPs between bovine and alpaca that will allow enriching the genomic information of the alpaca. This strategy demonstrates an alternative to be applied to species with little or no genomic information.

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