

Breed Standards...?

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I preface this presentation with some acknowledgements and caveats that are essential. Firstly, I acknowledge the tremendous contributions that Professor Horst Leipold (deceased) made for the veterinary profession during his tenure at Kansas State University. In addition, Drs. Murray Fowler (UCD professor emeritus) and George Saperstein (Tufts University) have made this camelid subject of special interest during their careers. I also acknowledge that I personally have no recognized expertise on the subject but have developed the opinion that of all the species that I have worked with during my veterinary career, camelids (both llamas and alpacas) have the highest incidence of newborn with congenital/genetic problems. The major caveat for this discussion has to do with our inability to determine with assuredness that many of the conditions to be mentioned are truly genetic in origin. Breeding trials to date have proven to be suggestive at best with some of the more prevalent conditions suggesting somewhat complicated inheritance. During his numerous presentations, Dr Leipold would be asked to reflect on the genetic nature of certain conditions in a given species. Failing to have absolute proof, he said "If the incidence of the condition seems unusually high as compared to other species, chances are it is genetic". I also have quoted him as regards to the oft repeated question "Just because this breeding pair produced a congenital abnormality, do we have to quit breeding them?" His answer was that "Any breeding pair might produce a congenital abnormality but if either or both are again involved in producing the same abnormality chances are it is genetic and culling should be considered." The other caveat we must keep in mind is the fact that for certain abnormalities in other species, a teratogenic effect (outside influence) has been incriminated.

I will therefore upfront express that I have great reservations that breed standards should be implemented in the New World Camelids...following are my opinionated reasons:

Two historical situations have to be considered if we agree that the incidence of defects in llamas and alpacas seems high. Firstly, because of the near annihilation of the South American Camelid (SAC) population by the invading Spaniards, a marked reduction of genetic diversity ensued.

Subsequently, importation of small groups of SACs to North America further contributed to unknowing "inbreeding". A further factor that in my opinion is taking place today is phenotypic inbreeding prompted by the show ring or fiber pursuit resulting in further increasing chances of undesirable gene pairing to produce abnormalities.

Reported incidence of the various congenital conditions in camelids remains understandably incomplete. Unless a veterinarian has been involved to make the diagnosis, especially the most compromising conditions will be "swept under the carpet". In addition, unless a detailed necropsy is performed, only the most glaring defect of several will have been observed. The point being that fairly commonly more than one defect can be demonstrated. I also have found it interesting that some alpaca breeders have the opinion that alpacas have less congenital problems than do llamas. That might well be true if we are dealing with

numbers of reported defects as compared to % of the population. I would be of the opinion that the % incidence of congenital defects in both llamas and alpacas is unfortunately comparable.

Because of the relatively high North American occurrence of congenital defects, one of the naïve assumptions and claims for importation of South American llamas and alpacas was to bring in new genes. However, the selection of these imports was hardly based on detailed pedigrees demonstrating they were free of having produced offspring with congenital defects. To the credit of many alpaca imports, there was a screening effort to eliminate phenotypic undesirable traits of animals processed. In my experience as well as other colleagues, in spite of the imports, the incidence of defects continues to be notably high.

Based on Dr. Leipold's research dealing mostly with llamas, Dr. Fowler's literature searches and colleague responses to

System:	Occurrence	Comments
Muscular		
Umbilical hernia	Common	Genetic and possibly acquired
Inguinal Hernia	Rare	Genetic and possibly acquired
Diaphragmatic	Rare	Likely acquired but...??
Schistosomas reflexus	Rare	Unknown/combined with arthrogryposis
Reproductive		
Female:		
Segmental aplasia	Common	Genetic/and occurring at all tubular levels
Uterus unicornis	Occasional	Genetic/most commonly missing rt. horn
Double cervix	Occasional	Genetic
Cervical agenesis	Rare	Likely genetic...?
Imperforate hymen	Occasional	Genetic/should be thin tissue
Ovarian hypoplasia	Occasional	Genetic
Ovarian aplasia	Rare	Genetic
Free Martin	Occasional	Associated with mixed sex twins usually resulting in agenesis of female tract
Intersex	Occasional	Likely genetic but...?
Male:		
Hypogonadism	Common	Genetic
Ectopic testicle	Occasional	Genetic/located along prepuce
Cryptorchidism	Occasional	Genetic
Crooked penis	Rare	Genetics...?/may be acquired
Penile hypoplasia	Rare	Genetic
Persistent frenulum	Occasional	genetic...?
Hydrocele	Occasional	genetic...?
Skeletal		
Limbs:		
Angular deformities	Common	Genetic/nutritional/uterine positioning..?
Patellar luxation	Occasional	Genetic if en utero/dystocia induced...?
Carpal ankylosis	Rare	Genetics/uterine positioning..?

Arthrogyposis	Rare	Genetics/teratogenic...?
Scoliosis	Rare	Unknown
Talus rotation	Occasional	Genetics
Polydactyla	Occasional	Genetics
Syndactyla	Occasional	Genetics
Tail agenesis	Occasional	Genetics
Crooked tail	Occasional	Genetics
Hemivertebra	Rare	Genetics..?
Contracted tendons	Occasional	Unknown/nutrition/uterine positioning..?
Tendon Laxity	Occasional	Unknown/nutrition/prematurity..?
Head and Face:		
Choanal Atresia	Common	Genetic based on high incidence
Campylognathia	Common	Genetic and related to CA..? (wry face)
Cyclopia	Rare	Teratogenic/genetic...?
Cleft palate	Occasional	Genetic
Jaw/-nathisms	Common	Genetic
Ret. deciduous teeth	Common	genetic...?
Nervous		
Arhinencephaly	Common	Genetic/assoc. with CA
Cerebellar hypoplasia	Rare	Genetics/BVD...???
Hydrocephalus	Rare	Genetics...?
Intention tremor	Rare	CNS anoxia/BVD...?
Hypermetria	Rare	CNS anoxia/BVD...?
Digestive		
Atresia ani	Occasional	Genetic/teratogenic...?
Atresia coli	Rare	Genetic/teratogenic...?
Megaesophagus	Occasional	Likely acquired but...?
Integumentary		
Ichthyosis	Rare	Genetic/conjunctivitis
Epitheliogenesis imperfecta	Rare	Genetic
Crooked toenails	Occasional	Genetic
Supernumerary teats	Occasional	Genetic
Teat agenesis	Occasional	Genetic
Cardiovascular		
Ventricular septal	Common	Genetic
Atrial septal	Occasional	Unknown
Ductus arteriosus	Occasional	Unknown
Tetralogy of Fallot	Rare	Unknown
Persistent rt. aortic arch	Rare	Unknown
Transp. of great vessels	Rare	Unknown
Urinary		
Cystic kidney	Occasional	genetic...?
Renal agenesis	Occasional	Genetic/assoc. with gonadal agenesis
Persistent urachus	Occasional	Likely acquired but...?
Eyes		
Cataracts	Occasional	Genetics if at birth
Entropion	Rare	Genetics...?
Ectropion	Rare	Unknown
Blue eyes	Common	Genetics/assoc. with deafness
Blindness	Occasional	Dysmaturity or Unknown
Blk. naso-lacrimal duct	Common	Genetics if at birth but???
Ears		
Gopher ears	Occasional	Genetic/frozen??
Crossbred ears	Occasional	Huarizo
Body as a whole		
Dwarfs	Rare but increasing	Genetic

previous surveys, this information has been assembled. The following table is based on my opinion conceding that yours is equally considerable. You will note that most all body systems are represented in this tabulation. Some of the conditions caused en utero death while others were either life threatening to the newborn, caused weak growth performance, resulted in conformational or facial/skeletal disfiguring, affected subsequent reproductive performance, accounted for sudden death later in life and in some cases encouraged breeders to perpetuate a unique trait. Designation of occurrence is based on the relative occurrence compared to all congenital conditions that have been observed. Comments as to likely cause are based upon personal opinion as well as more importantly knowledge from other species.

Perhaps I have been harsh in giving my opinion that many of the foregoing defects have a genetic basis for origin. I again base it on the likely extremely narrow gene pool. When faced with a client asking what to do with breeding stock that are implicated as carriers of a presumed genetic condition such as choanal atresia, I strongly suggest removing them from the gene pool. However according to South American colleagues, they continue to observe the same incidence of defects in spite of slaughter culling of presumed carriers. The bottom line is that until there exist reliable means of detecting unaffected but carrier breeding stock, little progress will be made in eliminating these conditions. Hopefully the current program of mapping the alpaca genome will facilitate progress in that direction.

Please be realistic in your deliberations with regard to breed standards. Other species even without narrow gene pools have gone down the wrong path with adverse effects. Don't further select till you truly know what you are doing!

Supplemental Reading:

Leipold H.W. et al: Congenital Defects in the Llama. In L.W. Johnson, (ed.) Update on Llama Medicine The Veterinary Clinics of North America Food Animal Practice, Philadelphia, W.B. Saunders, 10(2): 401-420, 1994. ISSN 0749-0720

Fowler, M.E.: Congenital/Hereditary Conditions. In M.E. Fowler: Medicine and Surgery of South American Camelids, Ames, Iowa State University Press, pp..337-365, 1989. ISBN 0-8138-0397-7

Fowler, M.E.: Genetics and Congenital/Hereditary Defects. In Eric Hoffman and Murray Fowler: The Alpaca Book, Clay Press Inc., pp 160-169, 1995. ISBN 0-9646618-0-2