Investigation of ovulation induction in alpacas with acupuncture

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Abstract
The hypothesis that acupuncture induces ovulation was tested in alpacas. Four alpacas, eight
to 14 years old, were used in a cross-over design to compare gonadotropin-releasing hormone and
acupuncture for ovulation induction during two follicular wave cycles. Alpacas with uterine
edema and an ovarian follicle of eight to ten mm in diameter as detected by trans-rectal
ultrasonography were treated with gonadotropin-releasing hormone or acupuncture. Ovulation
was confirmed using ultrasonography to detect the presence of a corpus luteum on the ovary. All
alpacas received 250 ug cloprostenol intramuscularly seven days after induction of ovulation and
were subjected to the second treatment on the next follicular wave (one to two weeks later).

Acupuncture consisted of stimulating the acupoints by injecting cyanocobalamin at the
bladder and stomach acupoints and Yan-chi. Blood samples were collected by jugular
venipuncture from each animal before treatment and seven days after treatment. Serum
progesterone concentrations >2ng/ml were considered evidence of ovulation and development of
a corpus luteum.

Ovulation was induced by gonadotropin-releasing hormone in all alpacas as evidenced by
detection of a corpus luteum with ultrasonography and a concomitant rise in serum progesterone.
None of the alpacas ovulated following acupuncture treatment. Various reasons are possible for
the failure of acupuncture to induce ovulation in the present study. Other acupuncture
approaches, including selection of different acupuncture points/or stimulating methods need to be
investigated in order to determine the usefulness of this technique in camelids.

Keywords: Acupuncture, ovulation induction, alpaca

Introduction
Acupuncture has been used to induce ovulation in many species, including induced ovulators
such as rabbits. However, there is no published information on induction of ovulation in alpacas
using acupuncture. A pilot study was conducted to test the hypothesis that acupuncture induces
ovulation in alpacas.

Materials and methods
Four alpacas, eight to 14 years old, were used in a cross-over experimental design to compare
two treatments, gonadotropin-releasing hormone (GnRH) and acupuncture for ovulation
induction during two follicular wave cycles (Table 1). Ovulation was confirmed after treatment
by trans-rectal ultrasonography (US) and an increase in serum progesterone (P4) concentration.
Serum progesterone concentrations >2ng/ml were considered as evidence that ovulation had
occurred.

Alpacas with uterine edema and an ovarian follicle eight to ten mm in diameter were treated
with 50 ug GnRH (Cystorelin®, Merial Duluth, GA) IM to induce ovulation. A blood sample was
collected by venipuncture from each animal before and after treatment. Sera were stored at -20 °C
until assayed for progesterone concentrations. Seven days after treatment, ovulation was
confirmed by demonstrating the presence of a corpus luteum (CL) on the ovary by trans-rectal
US. At that time, 250 ug cloprostenol (Estrumate®, Intervet/Schering-Plough Animal Health,
Millsboro, DE) was administered to induce regression of the CL. One to two weeks after
cloprostenol treatment, the alpacas were examined with trans-rectal US. Those with a mature
follicle and uterine edema were treated with acupuncture to induce ovulation. Acupuncture
consisted of stimulating the acupoints by injection of 3000 ug cyanocobalamin (VEDCO, St
Joseph, MO) at the bladder (BL) and stomach (ST) meridians (BL-22, BL-51, BL-23, BL-52, ST-25), and Yan-chi. The acupuncture points used in this study are related to reproductive function and used to treat various causes of infertility.

Results and discussion
All alpacas treated with GnRH were stimulated to ovulate as evidenced by presence of a CL and an increase in serum P4. However, alpacas did not ovulate after acupuncture treatment. In two of the four alpacas, the acupuncture treatment was repeated after one week; but ovulation did not occur (Table 1).

The general theory of acupuncture is based on the premise that there are patterns of energy flow (qi) through the body which are essential for normal body function. Disruption of the energy flow is believed to be responsible for disease. According to Traditional Chinese Veterinary Medicine (TCVM), qi flows through 20 meridians (12 regular, 8 extraordinary) or numerous interconnecting acupoints. In TCVM, the kidney is believed to control function of the uterus and ovaries. Kidney jing (essence) controls the germination and growth of ovarian follicles and kidney qi provides the motive force for ovulation. According to TCVM concepts, the kidneys store the essence and dominate reproduction. On the bladder meridian, the BL acupoints around the kidney, especially BL-23 and BL-52 tonify kidney reproductive functions. Yan-chi is a potent acupoint for treating infertility.1

Various reasons are possible for the failure of acupuncture to induce ovulation. Alpacas are induced ovulators and may require ovulation-inducing factor present in the seminal plasma of males. The role of seminal plasma in ovulation induction in Bactrian camels has been thoroughly investigated by Chinese scientists.2 In alpacas, the involvement of semen in ovulation induction has been reported.3 A surge in plasma luteinizing hormone concentration after treatment of alpacas with GnRH or seminal plasma has been reported.4 Gonadotropin-releasing hormone induced ovulation in our study; however, the acupuncture points selected may not have stimulated the pituitary gland sufficiently to cause ovulation. Another possibility would be our inability to accurately locate the acupoints as no other reports are available on acupoint stimulation in camelid reproduction. Variations in acupoints among different species and the method of stimulating those points may be the keys for success. Electro-acupuncture has successfully stimulated ovulation in rabbits,5 horses6 and humans,7 whereas in our study aquapuncture was utilized.

Acupuncture, an ancient Chinese system of diagnosis and treatment, is relatively new in the United States and Europe. Various forms of acupuncture, often in combination with herbal medicine have been used in China for over 1,000 years.8 The popularity of acupuncture in modern veterinary practice is increasing and some animal owners favor complementary medical modalities and consider them to be natural and holistic. However, the practice of TCVM is governed by traditional doctrines and principles. Historically, science has followed human observations and the use of naturally available substances. For example, many antibiotics and other pharmaceuticals are based upon substances available in nature. However, for global acceptance of TCVM concepts, the outcome of treatment modalities needs to be explained by physiologic mechanisms.

Acupuncture has been shown to cause a significant increase in beta-endorphin levels during treatment, which lasts for up to 24 hours. Beta-endorphin is derived from its precursor protein proopiomelanocortin, which is present in abundant amounts in neuronal cells of the arcuate nucleus of the hypothalamus, the pituitary, the medulla, and in peripheral tissues including the intestines and ovaries. The role of neuropeptides, including beta-endorphin, in the regulation of GnRH secretion has been reported.5 Induction of ovulation in alpacas and other camelids would be beneficial to treating ovarian hemorrhagic follicles and to temporarily postpone breeding.
Acknowledgements

The authors appreciate the manuscript review and suggestions offered by Dr. Huisheng Xie, Department of Large Animal Clinical Sciences, University of Florida, Gainesville, FL.

References


Table 1: Transrectal ultrasonographical findings of ovarian structures, treatment protocols (GnRH, cloprostenol, acupuncture) in four alpacas

<table>
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<tr>
<th>Alpaca name</th>
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<th>Blood progesterone ng/ml</th>
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F= Follicle, CL= Corpus luteum, GnRH= Gonadotropin-releasing hormone,