Effect of the Prolactin Inhibitor Cabergoline and the Gonadotropin Releasing-Hormone Agonist Deslorelin in the Suppression of Plasma Prolactin Concentrations and Egg Laying Quail

Ruckle et. al

Abstract: Egg binding and excessive laying frequently affect avian patients, and in many cases the treatment includes suppression of egg production. Currently, for the suppression of egg production in avian patients, a gonadotropin-releasing hormone agonist, in the form of a

deslorelin implant, is often used. However, the commercially available deslorelin implants have an undesired delayed onset, as well as a potential brief increase in gonadotropin secretion after administration (‘‘flare-up’’ effect) that can lead to oviposition before the actual suppression of gonadotropins. The objective of this study was to investigate whether the prolactin inhibitor cabergoline suppresses ovulation and whether it could be used to bridge the time until the onset of effect by the deslorelin implant. We measured the effect of cabergoline (30 lg/kg PO q24h 3 14 days), deslorelin implants (4.7 mg SC), and a combination of both on egg laying and plasma prolactin concentrations in 37 quail (Coturnix japonica) over 6 weeks. Quail were divided into 4 groups: group DesCab (deslorelin implant and cabergoline oral; n 1⁄4 9); group DesPlac (deslorelin implant and placebo oral; n 1⁄4 9); group PlacCab (placebo implant and cabergoline oral; n 1⁄4 9); and group PlacPlac (placebo implant and placebo oral; n 1⁄4 10). Regular egg laying stopped in 100% (9/9) of birds in group DesCab and 78% (7/ 9) of birds in group DesPlac within 5 days of placing the deslorelin implant. No bird ceased egg production in group PlacCab (0/9), and 10% of birds ceased egg production intermittently in group PlacPlac (1/10). Treatment with the deslorelin implant (P , .001) and with cabergoline (P 1⁄4 .04) had a significant (negative) influence on plasma prolactin concentrations compared with the baseline. The interaction of deslorelin and cabergoline treatment, as well as time after initiation of treatment, did not have a significant effect on plasma prolactin concentrations. These results show that daily oral cabergoline has no significant influence on egg laying and only a minor biologically nonsignificant effect on lowering the relative plasma prolactin concentrations in quail.

* Deslorelin implant has proven to stop ovulation in a variety of species
* GnRH downregulated leading to decline in LH and FSH which can cause a “flare-up effect” after placing the deslorelin implant
  + This delayed onset can be critical in ill birds being treated for egg binding
* Cabergoline (dopamine D2 receptor agonist inhibits prolactin) is easy and affordable and could bridge the “flare-up period”
  + However a study in zebra finch found that cabergoline had no effect on plasma prolactin concentrations
  + Unknown function of prolactin in birds with contradictory reports
* 40 quail divided into 4 groups with 3 different phases (acclimation- i.e. monitoring quail and egg production, medication- administration- quail chosen to group randomly, discontinuation- no oral medications were given, quail and egg production watched) over 6 weeks
* Plasma Prolactin measured via double antibody radioimmunoassay for quail
* Two animals died in study- unrelated; one animal determined male
* Oral cabergoline (dose of 30 ug/kg q24h) in japanese quail had no significant effect on egg laying or interference with oviposition
  + It did not stimulate egg production
* Deslorelin implants lead to discontinuation of oviposition in 88.9% of animals within 5 days after implantation
* 2 quail - in DesPlac group- which continued to lay eggs (tx failure- seen in other studies as well)
  + Suspect Japanese quail are more prone to deslorelin implant tx failure than other avian species
  + Unknown why failure occurs: not effective dose vs encapsulated by calcified tissue vs GnRH degrades faster vs differences in mammalian and avian GnRH (avian have 3 forms of GnRH)
* Could not determine if cabergoline tx would have any effect on reducing the tx failure rate of deslorelin implants
* Abnormal eggs were laid the first 6 days after implantation, and increased egg production 2 days after implantation (DesCab and DesPlac groups)
* Significant influence of cabergoline tx on lowering the reactive prolactin concentrations
  + Prolactin can be influenced by stress, anesthesia, and varying light exposure
  + Cabergoline is also meant for mammals (rapid excretion vs bioavailability)
  + Lowest prolactin levels were found in non laying, molting females compared to laying birds
  + GnRH may stimulate prolactin release (seen in rats/humans)
* Deslorelin implants have been associated with molting in birds

Take Away: Cabergoline (at this dose 30 ug/kg PO q12h x14 days) cannot be recommended for suppression of egg laying in quail or as a bridging medication after the implant of deslorelin. Cabergoline also did not result in prolactin inhibition in quail.

Four Different Surgical Approaches to Vasectomies in Male Texas Bobwhite Quail (Colinus virginianus texanus) and Northern Bobwhite Quail (Colinus virginianus)

Stephanie K. Lamb, Glenn H. Olsen, and Anthony Pilny

Abstract: Vasectomies render a male sterile and have been used for various management purposes, including conservation efforts. This report evaluated 4 different surgical approaches (external approach, internal approach with dissection, internal approach with cautery, and internal approach caudally) to per- form 177 vasectomies in Texas bobwhite (Colinus virginianus texanus; n 1⁄4 171) and northern bobwhite quail (Colinus virginianus; n 1⁄4 6) in a field setting. Birds were not randomized into groups for the differ- ent approaches. Survival was recorded in 83% (147/177) of the birds. The most common cause of death was hemorrhage from the common iliac vein due to damage during the surgical procedure. Other causes for death included transection of the ureter, parasitism, euthanasia, and undetermined causes. The approach that had the highest survival rate (89.8%, 132/147) was the internal approach with cautery, and based on these results the authors recommend this approach for vasectomies in Texas and northern bobwhite quail.

* Vasectomy: helpful in avian so to not remove the testical, transection of the vas deferens
* External Approach: visualization of cloacal promontories (which are only present during breeding season- when vas deferens is enlarged, because this is the most caudal part). Incised the bulge of the promontorie, then the seminal glomera (enlarged vas deferens segment) was found and severed
  + Unable to ID the vas deferens for any of the quail in this group- suspect this species does not develop a cloacal promontory unlike budgies and several passerine species
* Internal Approach with dissection: went through lateral body wall, dissected down into the peritoneal cavity, using surgical loupes to find and ID the testes and vas deferens. Vas deferens was lifted off the base of the testis and transected. There are two incisions (go in on both sides)
  + 5 birds died (0% survivors) hemorrhage to common iliac vv.
* Internal Approach with cautery: Same as above except monopolar electrocautery was used to cut and cauterize the vas deferens at attachment to testicle Sometimes the other side was able to found and transected via the same site.
  + 89.7%- those that died- died due to hemorrhage mostly
* Internal Approach caudally: Base of tail musculature was palpated along with the most caudal point of pubic bone. Skin was incised through the points in a vertical line. Muscles were dissected through to get to intestinal peritoneal cavity- immediately seen was the vas deferens which was grasped and transected- 3-5 mm of vas deferens was removed from the site. Needed two incision sites (one on each side)
  + 33% survival: ureter was transected (66.7% of the time) along with the vas deferens at 1 or both surgical sites
* Birds undergoing internal approach with cautery were statistically more likely to survive (significant)
  + HOWEVER- there was not a significant difference between the internal approach with cautery and the internal approach with dissection in Texas bobwhite quail- which a significant difference has been seen in pigeons
* In separate study of endoscopy guided in pigeons (mortality rate was 6%); but endoscopy was not available for this study
* Vasectomy failures have been reported in birds and cauterizing the end of the transected vas deferens may prevent this- not evaluated in this study due to birds needing to be released

**Induction of General Anesthesia With Alfaxalone in the Domestic Chicken.** A Mastakov, J Henning, R de Gier, R Doneley. JAMS, 35(3):269-279 (2021). - review by LMumm

Abstract: Alfaxalone is a safe and effective anesthetic drug for the induction of general anesthesia in many nonavian companion animal species; however, its efficacy has not been fully evaluated in birds. In premedicated trials, the chickens were sedated with butorphanol 2 mg/kg intramuscularly and midazolam 0.5 mg/kg intramuscularly, 15 minutes before intravenous administration of alfaxalone. The chickens were classified as anesthetized if endotracheal intubation was achieved without eliciting a cough reflex, provoking no patient resistance, and with minimal glottis movement within 15 seconds after the administration of alfaxalone. Qualitative and quantitative data were recorded, including duration of anesthesia, quality of induction, quality of recovery, reflexes, time to sternal recumbency, time to standing, and time to normal behaviors. Survival analysis was used to analyze the association between alfaxalone dosage and premedication with time-related variables. Out of the evaluated doses, the lowest intravenous alfaxalone dose required to achieve anesthetic induction and endotracheal intubation in unpremedicated and premedicated chickens was 7.5 and 4 mg/kg, respectively. The duration of anesthesia for all dose rates within the study ranged from 51 seconds to 4 minutes 45 seconds. Premedication generally improved the quality of induction and recovery, but significantly (P < .001) increased the time required for the chickens to stand after being anesthetized and to return to normal behaviors. Most chickens exhibited varying degrees of hyperactivity on anesthetic induction and recovery. No postinduction apnea or deaths of the subject birds occurred during this investigation.

Background:

* **Alfaxalone = synthetic neuroactive steroid**
* **Acts centrally on GABA** (gamma aminobutyric acid) receptor subtype A resulting in neuronal cell hyperpolarization and inhibition of action potential propagation
* High therapeutic index, minimal CV depression, rapid/smooth induction in dogs/cats, noncumulative, nonirritant, can be administered multiple routes (SC, IM, IV, IO)

A close-up of a medical report

Description automatically generated

Objective: determine effective dose of IV alfaxalone for induction of general anesthesia and intubation in unpremedicated and premedicated domestic chickens.

* n=10 chickens; each underwent 5 alfaxalone trials (2 without pre-med, 3 with pre-med); 48 hours between individual trials
* Pre-med protocol = butorphanol 2 mg/kg + midazolam 0.5 mg/kg IM 15 min before alfaxalone
* Chickens deemed successfully anesthetized if able to intubate without cough, resistance, and minimal glottis movement within 15 seconds of alfaxalone administration

Key Points:

* **Higher dose of IV alfaxalone (7.5 mg/kg IV vs. 4 mg/kg) was needed without premed for successful induction of anesthesia adequate for intubation in chickens**
* **Pre-medication is recommended for IV alfaxalone anesthetic induction in chickens**
* Pre-med improved quality of induction and quality of recovery, but prolonged recovery
* Hyperactivity in every chicken to some degree (muscle tremors, wing flapping, rigid extension of limbs and opisthotonos)
  + Most resolved once entire alfaxalone dose was administered
  + Premed reduced hyperactivity (severity, frequency, duration) but did not prevent
* Compared to previous studies→ rose flamingos 2 mg/kg, domestic chickens 10-15 mg/kg, and mute swans 10 mg/kg but differences in study design and suspected interspecies variation
  + Suggests elimination half life of alfaxalone may be substantially shorter in domestic chicken and metabolized at faster rate
* **Alfaxalone anesthesia is safe for chickens (no post-induction apnea or deaths)**

**Effects of Intramuscular Alfaxalone and Midazolam Compared With Midazolam and Butorphanol in Rhode Island Red Hens (*Gallus gallus domesticus*).** KA Knutson, OA Petritz, A Thomson, J Robertson, JA Balko. JAMS 36(3):287-294 (2022). - review by LMumm

Abstract: Chickens (Gallus gallus domesticus) often undergo veterinary procedures requiring sedation; however, there is little published research evaluating the efficacy of sedation protocols in this species. The objective of this study was to assess the effects of intramuscular alfaxalone and midazolam compared with intramuscular butorphanol and midazolam in chickens. In a complete crossover study, 11 healthy adult hens were randomly administered midazolam 2.5 mg/kg IM combined with either alfaxalone 15 mg/kg IM (AM, n = 11) or butorphanol 3 mg/kg IM (BM, n = 11), with a 35-day washout period between groups. Time to first effects, recumbency, standing, and recovery were recorded. Physiologic parameters and sedation scores were recorded every 5 minutes by 2 blinded investigators. Fifteen minutes after injection, positioning for sham whole body radiographs was attempted. At 30 minutes, flumazenil 0.05 mg/kg IM was administered to all hens. Peak total sedation score was significantly higher for AM compared with BM (P < 0.001). Mean ± SD or median (range) time to initial effects, recumbency, standing, and recovery in AM and BM were 1.9 ± 0.6 and 2.6 ± 0.9 (P = 0.02), 3.5 (1.6–7.6) and 4.8 (2.2–13.0) (P = 0.10), 40.3 (28.0–77.8) and 33.2 (5.2–41.3) (P = 0.15), and 71.2 (45.7–202.3) and 39.9 (35.9–45.9) minutes (P = 0.05), respectively. Radiographic positioning was successful in 6 of 11 (54.5%) and 0 of 11 (0%) birds in the AM and BM groups at 15 minutes, respectively. Heart and respiratory rates remained within acceptable clinical limits for all birds. Intramuscular AM resulted in significantly faster onset of sedative effects, significantly longer duration of recumbency, significantly higher peak sedation, and improved success of radiographic positioning compared with intramuscular BM. Intramuscular AM produces clinically effective sedation in chickens without clinically significant cardiorespiratory effects.

Background:

* **Alfaxalone = synthetic neuroactive steroid**
* **Acts centrally on GABA** (gamma aminobutyric acid) receptor to produce sedation/anesthesia
* Dose-dependent effect, rapid onset, versatile routes of admin, minimal CV depression
* Not reversible

Objective: compare intramuscular AM (alfax 15 mg/kg + midaz 1.5 mg/kg) vs. BM (torb 3 mg/kg + midaz 2.5 mg/kg) in chickens

* n=11 chickens, complete crossover with 35 day washout
* Recorded sedation scores and attempted 2-views rads; reversed with flumazenil

Key Points:

* All birds became recumbent and all birds maintained response to noxious stimuli
* Neither protocol had apnea or clinically significant cardiorespiratory effects
* **AM had significantly faster onset of sedation, longer duration of recumbency, (longer recovery), higher peak sedation score, and increased success of radiographic positioning**
  + Some (36%) had hyperexcitability and/or opisthotonos
  + Rads: successful for both views in 55% at 15 minutes and in 45% at 25 minutes
* BM had lower HR and RR (not clinically significant), less successful rads, but faster recovery
  + Rads: not attempted at 15 minutes due to inability to auscult without stimulation, but in 64% at 25 minutes (with the other 36% successfully positioned for one view)

**TLDR: alfaxalone-midazolam IM can produce clinically effective sedation in chickens without clinically significant cardiorespiratory effects**

**Comparison of Sedative Effects of Alfaxalone-Ketamine and Alfaxalone-Midazolam Administered Intramuscularly in Chickens.** S Chang, CB Legg-St. Pierre, B Ambros. JAMS, 36(1):21-27 (2022).

- review by LMumm

Abstract: The objective of this study was to compare the sedative effects of intramuscular alfaxalone combined with either ketamine or midazolam in chickens (Gallus gallus domesticus). A prospective, randomized blinded crossover study design with a 7-day washout period was used. Nine adult layer hens received alfaxalone 15 mg/kg with ketamine 5 mg/kg IM (treatment AK) or alfaxalone 15 mg/kg with midazolam 1 mg/kg IM (treatment AM). Time to lateral recumbency, time to loss of righting reflex, induction quality, duration of loss of righting reflex, time to sternal recumbency or vigorous response to stimulation, and time to standing were recorded. Muscle tone, response to noxious stimulation, heart rate, respiratory rate, and oxygen saturation were monitored once the righting reflex was absent. Induction and recovery times were not different between treatments. Lateral recumbency was induced in 8 of 9 birds receiving AK compared to 6 of 9 birds receiving AM. Righting reflex was absent in 7 of 9 and 5 of 9 chickens administered AK and AM, respectively. Median time to loss of righting reflex for AK and AM were 5.5 (4.3–9.3) minutes and 9.1 (4.8–15.0) minutes, respectively (P = .88). Median duration of loss of righting reflex was 21.6 (16.0–36.9) minutes for AK and 21.1 (11.9–26.4) minutes for AM (P = .38). Alfaxalone-ketamine resulted in moderate excitation during induction. Further investigations are warranted to investigate the effects of alfaxalone and midazolam or ketamine at different doses.

Background:

* **Alfaxalone = synthetic neuroactive steroid**
  + **Binds to GABA (gamma aminobutyric acid) subtype A** receptor in the CNS to produce sedation/anesthesia via variable routes of admin (SQ, IM, IV)
* **Ketamine = dissociative** anesthetic, commonly used in birds in combo with other agents

Objective: compare sedative effects of intramuscular AK (alfax 15 mg/kg + ket 5 mg/kg) vs. AM (alfax 15 mg/kg + midaz 1 mg/kg) in chickens

* n=9 hens, complete crossover study with 7-day washout
* Recorded induction and recovery parameters

Key Points:

* **More birds receiving AK compared to AM achieved lateral recumbency (8/9 vs 6/9) and loss of righting reflex (7/9 vs 5/9)**
  + AK birds also had shorter time to loss of righting reflex (5.5 min vs. 9.1 min), and longer duration of loss of righting reflex (21.6 min vs. 21.1 min)
* **AK had more reliable sedation but poor quality of induction**
  + Moderate excitation during induction - authors claim this poses risk of injury to chickens
* Birds remained responsive to noxious stimuli with both treatments thus should only use for noninvasive procedures
* Significant decrease in HR observed with both treatments, but no apnea in any birds
  + No difference in HR and RR between AK and AM
* No difference in induction and recovery times between AK and AM

**TLDR: IM alfaxalone (15 mg/kg) with ketamine (5 mg/kg) or midazolam (1 mg/kg) can achieve lateral recumbency/loss of righting reflex however higher alfax dosages should be investigated to achieve better reliability of sedation**

*AJVR* 2023 84(9):ajvr.22.12.0222

[**Adult chicken hens (*Gallus gallus*) have measurable circulating plasma symmetric dimethylarginine via liquid chromatography-tandem mass spectrometry**](https://doi.org/10.2460/ajvr.22.12.0222)

Kane LP, Keller KA, Murphy R, Coyne M, Drake C, Obare E

**Objective:**To investigate whether chickens (*Gallus gallus*) have measurable plasma symmetric dimethylarginine (SDMA) and to establish the diagnostic utility of the commercially available immunoassay (IA) for measurement of SDMA.

**Animals:**245 chicken hens.

**Methods:**Blood samples were assessed for renal-focused biochemistry analytes. Plasma SDMA was determined using liquid chromatography-tandem mass spectrometry (LC-MS/MS/MS) and a high-throughput IA. A Passing-Bablok regression was used to compare the results of IA to LC-MS/MS/MS and reference intervals SDMA values were calculated.

**Results:**The reference interval for plasma SDMA measured by LC-MS/MS/MS is 5.58 to 10.62 μg/dL (range of values, 5 to 15 μg/dL). The concentration of SDMA measured by IA ranged from 1 to 12 μg/dL with a median of 7 μg/dL. Concentrations measured by SDMA-IA demonstrated a low correlation to the SDMA LC-MS/MS reference method. A Passing-Bablok linear regression analysis had a slope of 1.67 (95% CI, 1.35 to 2.14), an intercept of -5.76 (95% CI, -9.90 to -3.35), and a Kendall τ correlation of 0.39.

**Clinical relevance:**SDMA circulates in chicken plasma and should be investigated as a potential renal biomarker in future studies. Because SDMA-IA exhibits a low correlation to the reference method (LC-MS/MS) future assessments of SDMA in chickens should utilize LC-MS/MS assays and compare them to the reference interval created here.

**Key Points:**

* SDMA
  + An amino acid that is produced via breakdown of proteins by most cells in the body
  + Freely filtered by glomerular filtration and eliminated primarily through renal clearance
  + SDMA has differed amongst breeds in mammalian species
* UNKNOWN if SDMA is a renal-specific marker for avian species because structurally and physically different
  + Few nephrons have loop of Henle
  + Uricotelic nature
  + Presence of renal portal system
* SDMA by immunoassay underestimated SDMA vs. gold standard
* Reference interval based on gold standard is similar to canine and feline (5.6-10.2 ug/dL)
* May not want to use immunoassay for avian species
* Presence of lipids, hemoglobin and asymmetric dimethylarginine may interfere with commercially available SDMA-IA

**Related Articles:**

van Zanten TC, Xie S. EVALUATION OF SYMMETRIC DIMETHYLARGININE AS AN ENDOGENOUS MARKER OF RENAL DISEASE IN GREATER FLAMINGOS (*PHOENICOPTERUS ROSEUS*). *J Zoo Wildl Med*. 2023;53(4):644-653

*JAMS* 2022 36(2):128-139

[**Clinicopathologic, Gross Necropsy, and Histopathologic Effects of High-Dose, Repeated Meloxicam Administration in Rhode Island Red Chickens (*Gallus gallus domesticus*)**](https://doi.org/10.1647/20-00070)

Houck EL, Petritz OA, Chen LR, Fletcher OJ, Thomson AE, Flammer K

**ABSTRACT:** Meloxicam is a commonly prescribed non-steroidal anti-inflammatory drug for backyard poultry that has demonstrated pharmacodynamic efficacy at a single high dose of 5 mg/ kg. This study characterized the adverse effects of meloxicam administered in chickens at an approximate dose of 5 mg/kg orally twice daily for 5 days. Twenty-one adult Rhode Island Red hens (*Gallus gallus domesticus*), judged to be healthy based on an external physical examination, complete blood count (CBC), and plasma biochemistry panel, were recruited for this study. The subject birds were randomly assigned to a treatment (n = 11) or control group (n = 10) and received a 15-mg tablet of meloxicam or a nonmedicated feed pellet, respectively, orally twice daily. Physical examinations and body weight measurements were performed daily, and observation for clinical signs occurred twice daily. Following completion of the 5-day treatment course, an external physical examination, blood collection for a CBC and plasma biochemistry panel, euthanasia, necropsy, and measurement of meloxicam tissue residues were performed. During the treatment course, 1 hen from the treatment group died with peracute clinical signs, 2 hens from the treatment group died suddenly with no clinical signs, and 1 hen from the treatment group became acutely lethargic and was euthanized. Within the meloxicam group, 7 out of 11 hens had gross and histologic evidence of varying levels of renal acute tubular injury and gout. Plasma uric acid concentrations were above the species reference intervals in all affected hens in the treatment group that were still available for testing. The control group had no evidence of renal injury or gout based on postmortem examinations. Based on the results of this study, repeated oral dosing of meloxicam in chickens at 5 mg/kg twice daily is not recommended.

**Background:**

* Various studies have investigated meloxicam PK in chickens
* 1 mg/kg PO BID most commonly recommended, but up to 5mg/kg SQ has been given

**Key Points:**

* In the meloxicam group, 3/11 hens died and 1/11 was euthanized before the end of study
  + Total mortality of 4/11 (36%)
  + Either displayed sudden lethargy or no overt clinical disease signs
* 4/11 of the hens in the meloxicam group had hyperuricemia
  + Plasma uric acid concentrations increased significantly with acute tubular injury score but was not significantly different between the meloxicam and control groups
* Gross necropsy findings in the meloxicam group included renomegaly (54%), renal gout (45%), visceral gout (36%), and articular gout (18%)
* Histopathology: renal gout, moderate or severe acute tubular injury, visceral gout
  + Histologic ATI score significantly differed between the meloxicam and control groups and between hens with premature mortality compared with those who completed the study
* All four hens that died prematurely had renomegaly, renal gout, visceral gout, and severe ATI
* Not all hens in the meloxicam group developed ATI, possible that differences in renal metabolic capacity that were present but not detectable on the biochemical analysis caused this inter-individual variability
* Hematologic changes noted in these hens are not believed to be clinically relevant
* Uric acid was useful to confirm severe ATI and overt renal failure, but not be a sensitive indicator
  + Hyperuricemia only after significant renal pathology, may increase with other processes (e.g. ovulation)
* Mechanism nephrotoxicity in birds differ from renal vasoconstriction mechanisms in mammals
  + *In vitro* studies demonstrated that both meloxicam and diclofenac are toxic to chicken renal tubular epithelium by increasing reactive oxygen species and interfering with the p-amino-hippuric acid channels
* No significant clinical, clinicopathologic, histopathologic effects noted in American kestrels at 20mg/kg BID x 7d

**TLDR:**

* Repeated dosing of 5 mg/kg meloxicam has the potential to induce peracute renal and visceral gout and subsequent mortality from meloxicam induced acute tubular injury and is NOT recommended in chickens
* Meloxicam induced renal toxicity led to 40% mortality in chickens in this study
* Clinical signs of illness, changes in body weight, and changes in clinicopathologic data were not sensitive indicators of ATI in hens given meloxicam at the toxic dose used in this study.

**Related Articles:**

Souza MJ, Gerhardt LE, Shannon L, et al. Breed differences in the pharmacokinetics of orally administered meloxicam in domestic chickens (*Gallus domesticus*). *J Am Vet Med Assoc*. 2021;259(1):84-87

*JAMS* 2022 36(2):187-191

[**Clinicopathologic Findings in Chickens (*Gallus gallus domesticus*) Administered Amikacin Through Intravenous Regional Limb Perfusion**](https://doi.org/10.1647/21-00013)

Clarke LL, Ratliff C, Mans C

**ABSTRACT:** Regional limb perfusion (RLP) has been used to treat cases of distal limb infections in avian species. Potentially nephrotoxic drugs, such as amikacin, may increase the risk of nephrotoxicity with RLP because of the presence of the renal portal system and direct venous blood flow from the pelvic limbs to the kidneys. In a randomized, blinded, placebo-controlled study, the safety of repeated amikacin administration (20 mg/kg q24h for 3 doses) via RLP was evaluated in healthy female chickens (*Gallus gallus domesticus*; n = 8 treatment, n = 8 saline control group). Plasma uric acid concentrations were not significantly elevated in treated birds compared with the control group at any time point following RLP. One week following the final RLP, birds were necropsied and the kidneys evaluated grossly and histologically. There was no significant difference in renal pathology scores between treated and control birds or between kidneys ipsilateral to the perfused limb and contralateral kidneys. This study concludes that RLP of amikacin at high doses produced no discernable renal pathology in healthy euhydrated chickens.

**Background:**

* Regional limb perfusion (RLP) is commonly used with amikacin
* Potentially nephrotoxic drugs, such as amikacin, may increase the risk of nephrotoxicity with RLP because of the presence of the renal portal system and direct venous blood flow from the pelvic limbs to the kidneys
* The objective of this study was to evaluate the safety of amikacin administered by RLP in healthy chickens following repeated administration at the published dose of 20 mg/kg
* Healthy female chickens, n=8 amikacin, n=8 saline
* RLP w/ amikacin 20 mg/kg q24h for 3 doses
* UA measured before the first RLP, 24 hours after the third RLP, and 7 days after the third RLP
* All chickens were necropsied 7 days after the last RLP

**Key Points:**

* Plasma uric acid concentrations increased over time in both groups and did not differ significantly between control and treatment groups at any time point before or after RLP
  + The difference in values between the time points was also not considered clinically relevant, and all uric acid concentrations remained within published reference intervals at all time points
* None of the birds had grossly appreciable pathology at the postmortem examinations.
* There were no significant differences in histologic renal pathology scores between the 2 groups or between the left and right kidneys within each group

**TLDR:** RLP of amikacin at high doses produced no discernable renal pathology in healthy euhydrated chickens

**Related Articles:**

Ratliff CM, Zaffarano BA. Therapeutic Use of Regional Limb Perfusion in a Chicken. *J Avian Med Surg*. 2017;31(1):29-32

Journal of Avian Medicine and Surgery, 35(1): 60-67, 2021

**Comparison of anesthetic efficacy of lidocaine and bupivacaine in spinal anesthesia in chickens.**

Khamisabadi, Ali, Siamak Kazemi-Darabadi, and Ghasem Akbari

**Abstract:**

Lidocaine is used for epidural and spinal anesthesia in various animal species. The ideal drug for epidural and spinal anesthesia should have a long effective duration in addition to a fast onset of action, and adequate analgesia and muscle relaxation. Despite the delayed onset of action, bupivacaine provides a longer duration of anesthesia than lidocaine. The purpose of this study was to **compare the onset to effect and duration of action between lidocaine and bupivacaine for spinal anesthesia in broiler chickens**. Thirty-two, 8-week-old, female Ross broiler chickens were randomly divided into 4 groups of 8: 1) 2 mg/kg lidocaine (L); 2) 0.1 mg/kg bupivacaine (B0.1); 3) 0.25 mg/kg bupivacaine (B0.25); and 4) 0.5 mg/kg bupivacaine (B0.5). After aseptic preparation, a **23-gauge spinal needle** was inserted into the **synsacrococcygeal space** of the chickens with correct needle placement confirmed by a sudden loss of resistance. Spinal anesthesia was performed with the aforementioned doses of lidocaine and bupivacaine. The respiratory rate and cloacal temperature were measured every 10 minutes in each chicken until the anesthetic effect was no longer present. The onset to effect and the duration of action were calculated for each bird based on the **pinch test** at predetermined time intervals. The results are demonstrated as mean ± SD. The **onset of action for bupivacaine (9 ± 1.41, 4.33 ± 1.15, and 3.33 ± 1.23 minutes in B0.1, B0.25, and B0.5 groups, respectively) was significantly delayed compared with that of lidocaine (1.37 ± 0.52 minutes).** **The duration of action of B0.5 (54 ± 6.08 minutes) was significantly longer than that of any other group** (17.87 ± 3.18, 11 ± 1.41, and 18 ± 4.36 min in L, B0.1, and B0.25 groups, respectively). The results showed that **a spinal injection of 0.5 mg/kg bupivacaine produces approximately 55 minutes of spinal anesthesia** in these broiler chickens, which is much longer than the 18 minutes of anesthesia provided by 2 mg/kg lidocaine. Considering the various disease conditions that affect the cloacal area of birds, one can use each of these anesthetic drugs for either short-term or long-term spinal anesthesia in chickens and possibly other avian species.

**Key Points:**

* Egg retention, dystocia, salpingohysterectomy, cloacopexy, and cloacoplasty may benefit from regional anesthesia
* The spinal cord has 3 meningeal layers: pia mater, arachnoid, and dura mater. There is no epidural space caudal to the thoracic region of the coelom due to attachment of the vertebral periosteum to the dura mater. The arachnoid space is well developed in the synsacral spinal cord. Epidural injection not possible in lumbosacral area, but spinal injection is easy to perform.
* Anesthetic effect was assessed with the pinch test by thumb forceps in pericloacal skin
* No adverse effects observed. Four cases (50%) in the B0.5 group experienced ventral recumbency, an indication that the locomotor nerves of the feet were affected. All chickens that experienced ventral recumbency stood once the anesthetic effect was no longer present.
* Spinal injection in all groups, except group B0.1, decreased the cloacal temperature over time. In the lidocaine group, the respiratory rate significantly increased after 20 minutes (*P* < .001). Conversely, in the B0.25 and B0.5 groups, there was a downward trend to their respiratory rate; however, these changes were not statistically significant.

**Take-Home Message:**

* Subarachnoid injection of 2 mg/kg lidocaine or 0.5 mg/kg bupivacaine produced effective anesthesia in the caudal coelomic area of chickens for approximately 20 and 55 minutes, respectively.

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**Effect of hooding on physiological parameters during manual restraint in Rhode Island Red Hybrid Hens (*Gallus gallus domesticus)*.**

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**Abstract:**

Manual handling of chickens is required for many veterinary, research, and breeding procedures. This study aimed to assess the **changes in physiological parameters** over time during **manual restraint of chickens**, as well as the **effect of hooding on these parameters**. **Heart rate, heart rate variability, respiratory rate, and body temperature** were measured every 3 minutes for 15 minutes during manual restraint in 13 adult laying hens (*Gallus gallus domesticus*). **Heart rate variability was significantly higher in hooded hens than in nonhooded hens** (*P*= 0.003) but was not significant over time. **Hooded hens were also found to have significantly lower heart rate (*P* = 0.043) and respiratory rate (*P* = 0.042)** compared to nonhooded hens. **Heart rate and respiratory rate significantly decreased over time, independent of the use of the hood** (*P* = 0.008; *P* = 0.01, respectively). **Temperature was found to increase significantly (*P* = 0.001) over time for both groups**. Overall, hooding increased heart rate variability, a factor associated with a lower stress level, and decreased heart rate and respiratory rate. In conclusion, these data suggest that **the use of the hood reduces stress levels in birds** during manual restraint. Therefore, the **use of the hood is encouraged for short (less than 15 minutes) painless procedures**, such as physical examination or radiographic acquisition.

**Key Points:**

* Physiological parameters, such as heart rate (HR), heart rate variability (HRV), respiratory rate (RR), and body temperature (T), are reliable indicators of acute stress in birds during handling
* The SA node initiates each heartbeat and, in isolation, generates a regularly spaced heartbeat. Heart rhythm is modulated by the parasympathetic nervous system (PNS) and sympathetic nervous system (SNS). The PNS reduces HR and the SNS increases HR. Heart rate variability provides an estimate of PNS and SNS activity. HRV decreases in stressful situations and increases in relaxed situations.
* Hooded hens were found to have a significantly lower HR and RR when compared with the nonhooded group. HR and RR also decreased significantly for both groups over the 15-minute restraint period. HRV was significantly higher in hooded hens when compared with nonhooded hens but did not show significant variability over time. Cloacal Ts significantly increased over time in the hens from the present study independent of hooding.
* Results suggest that hooding reduces the stress related to manual restraint in chickens. This is probably due to the enhanced PNS response induced by the use of the hood, which leads to a reduced HR and a more passive response to manual restraint

**Take-Home Message:**

* The finding of a significantly higher HRV complemented by significantly lower HRs and suggests that the use of the hood reduces stress in birds during 15 minutes of manual restraint and may be used for painless procedures such as physical examination or radiograph acquisition.