

Anaesthesia for castration of piglets: Comparison between intranasal and intramuscular application of ketamine, clomazepam and azaperone

S. M. Axiak¹, N. Jäggin¹, S. Wenger¹, M. G. Doherr², U. Schatzmann¹

¹Division of Anaesthesiology and ²Division of Clinical Veterinary Research, Department of Clinical Veterinary Medicine, University of Bern

Summary

The aim of this study was to compare the effect of an anaesthetic combination given either intramuscularly (IM) or intranasally (IN) for castration of piglets. Forty piglets aged 4 to 7 days were randomly assigned to receive a mixture of ketamine 15 mg kg⁻¹, clomazepam 1.5 mg kg⁻¹ and azaperone 1.0 mg kg⁻¹, IN or IM, 10 minutes prior to castration. Physiological parameters were measured. Castration was videotaped for evaluation by 3 independent observers using a scoring system. Reaction and vocalization to the skin incision and cutting of spermatic cord was evaluated and scored (0 = no reaction, 16 = strong reaction). The IN group had a significantly higher ($P < 0.01$) castration score, compared to the IM group. There was an association between castration score and room temperature in the IN group (with temperatures below 18 °C associated with a higher castration scores ($P < 0.001$)). Heart rate was significantly higher 10 minutes after castration in the IN group ($P < 0.05$). Respiratory rate was significantly higher in the IM group at time points -5, -1, 10, 20 and 30 ($P < 0.05$). The IN group was walking significantly ($P < 0.0001$) faster than the IM group. In conclusion, this combination provides effective anaesthesia for routine castration of newborn piglets when administered IM. IN administration provided shorter recovery times but had significantly higher castration scores.

Keywords: anaesthesia, castration, intramuscular, intranasal, piglets

Kurznarkose zur Kastration von neugeborenen Ferkeln: Vergleich zwischen intranasaler und intramuskulärer Applikation von Ketamin, Clomazepam und Azaperon

Ziel dieser Studie war es, eine Kombination aus Ketamin, Azaperon und Clomazepam intranasal oder intramuskulär Kastrationsferkeln zur Narkoseeinführung zu verabreichen und ihre Wirkung vergleichen. 40 Ferkel im Alter zwischen 4–7 Tagen erhielten 15 mg/kg KGW Ketamine, 1.5 mg/kg KGW Clomazepam und 1 mg/kg KGW Azaperon intranasal (IN) oder intramuskulär (IM) zehn Minuten vor der Kastration. Physiologische Parameter wurden aufgezeichnet.

Die Kastration wurde gefilmt und von drei unabhängigen Beobachtern mittels einem Punktesystem (Kastrationsscore) beurteilt, wobei bei den Hautschnitten und der Durchtrennung der Samenstränge jeweils Lautäußerung und Abwehrbewegung protokolliert wurde (0 = keine Reaktion, 16 = starke Reaktion). Die Gruppe IN verzeichnete signifikant höhere Kastrationsscores als die IM Gruppe ($P < 0.01$). Zwischen dem Kastrationsscore und der Raumtemperatur war eine signifikante Korrelation (bei Raumtemperatur $< 18^{\circ}\text{C}$ höhere Kastrationsscores) in der Gruppe IN. Die Herzfrequenz war signifikant höher in der Gruppe IM 10 Minuten nach der Kastration ($P < 0.05$) und die Atemfrequenz war zu den Zeitpunkten -5, -1, 10, 20 und 30 signifikant höher in der IN Gruppe ($P < 0.05$). Die Aufwachphase war kürzer in der IN Gruppe ($P < 0.0001$). Die Kombination erzeugt eine gute Anästhesie zur Ferkelkastration bei IM Verabreichung, wogegen die IN Gruppe kürzere Aufwachphasen aufwies, aber auch signifikant höhere Kastrationsscores.

Schlüsselwörter: Anästhesie, Kastration, intramuskulär, intranasal, Ferkel

Introduction

Anaesthesia and analgesia for piglet castration is an animal welfare imperative and is currently required by law in Norway and pain elimination will be necessary

according to Swiss law by 2009. The technique used should result in significant reduction or elimination of pain and stress for the piglets and should also be short

acting, economical, ecologic, residue free, easy to use and have a large therapeutic range. Several investigations have been undertaken to find an ideal method. Intramuscular ketamine and azaperone is effective but prolonged recovery remains a problem (Kmiec, 2005). Local anaesthetic techniques are performed routinely in Norway since 2002, but do not completely block the nociceptive response (Haga and Ranheim, 2005). Inhaled carbon dioxide provides reliable unconsciousness, but unwanted side effects including hyperventilation, agitation and gasping make this technique unacceptable (Kohler et al., 1998). Isoflurane, via a special double mask to reduce pollution of the environment and exposure to the staff, has been shown to be a fast, safe and practical method (Walker et al., 2004). However, handling, equipment costs and exposure concerns have to date limited its acceptance. Intranasal delivery systems are widely used today in human paediatric medicine to deliver medication in a pain- and stress-free manner. Intranasal ketamine and midazolam, in combination, have been used successfully for sedation of children (Louon and Reddy, 1994). An intranasal system would be "needle-less" making it more desirable for on the farm use, as needle injury to both administrator and piglet can be avoided.

The objectives of this study were 1) to compare the use of intranasal versus intramuscular administration techniques and 2) evaluate cardiovascular effects, degree of nociception, body temperature change and recovery time when ketamine, clomazepam and azaperone are used in combination for castration of four to seven day old piglets.

Animals, Material and Methods

Animals

All experiments were performed at the same commercial Bio-Suisse organic swine facility over a 6-month period from July 2005 to January 2006. Forty purebred Large White male piglets, aged 4 to 7 days, from 10 different litters were included in the study. Numbers are presented as medians with upper and lower 95% confidence intervals (CI). The median body weight of all animals was 2.24 (2.1; 2.65) kg and the median age was 5 (5; 6) days. All animals were deemed healthy based on clinical examination, had normal testicular anatomy and no concurrent treatments. The Committee for Animal Experimentation of the Kanton Bern of Switzerland approved the study.

Experimental Design

A randomized and blinded experimental study design, using matched pairs for litter and weight, was used. Ketamine 15 mg kg⁻¹, clomazepam 1.5 mg kg⁻¹

and azaperone 1.0 mg kg⁻¹ were administered in combination either intramuscularly (IM) or intranasally (IN) prior to the castration of the piglets. Just prior to the experiment, the male piglets were sorted and weighed unfasted. Pairs assigned were of the same litter and had less than 10% difference in body weight. Each pair received anaesthesia on the same day, sequentially. The first member of each pair was randomly assigned by a computer generated random number chart to receive either the IM or IN administration route, while the second member of each pair received the other.

Anaesthesia

Ketamine (Ketamin-HCl-Lösung 173 mg ml⁻¹; Dr. E. Graeb AG, Bern, Switzerland), clomazepam (Clomazepam-Lösung 30 mg ml⁻¹; Dr. E. Graeb AG, Bern, Switzerland) and azaperone (Stresnil® 40 mg ml; Janssen Pharmaceutica, Beerse, Belgium) were combined in saline to give a final concentration that yielded ketamine 15 mg kg⁻¹, clomazepam 1.5 mg kg⁻¹ and azaperone 1 mg kg⁻¹ when dosed at 0.2 ml kg⁻¹. The drugs were mixed less than 12 hours prior to the start of the experiments and stored at room temperature.

Administration of drugs commenced 10 minutes prior to castration. IM administration was performed with a 1 ml syringe (Injekt - F®; Braun, Melsungen, Germany) and a 0.6 × 25 mm needle (Sterican®; Braun, Melsungen, Germany) into the right neck muscle. A human nasal spray device, which dispensed 0.1 ml per spray, (AccuPump®, Saint-Gobain Calmar GmbH, Hemer, Germany) was used for IN administration into both nostrils. For administration, the piglets were held in a sternal position by the investigator with the head fixed by hand at a 45° angle. Post-administration piglets were placed into a heated straw box for observation. Five minutes after administration, piglets were assessed for relaxation and recumbency. If recumbency was not achieved by 10 minutes after administration, the animals were redosed with half of the original volume and left undisturbed for 10 more minutes. Number of animals requiring redosing was recorded.

Castration

Castration was performed 10 minutes after the last administration of anaesthetic agents by the same investigator. Animals were placed in dorsal recumbency and the hind legs were fixed cranially with a velcro strap. The electrocardiogram was monitored throughout the procedure using a standard base-apex lead configuration (Datex S5®, Datex-Ohmeda, Finland). The scrotum was washed with a dilute chlorhexidine scrub (Lifoscrub®, B-Braun-Medical AG, Emmenbrücke, Switzerland) and the castration was performed with a scalpel blade (Packagone #10 sterile sin-

gle use scalpel, Lance Paragon LTD, Sheffield, England). A small skin incision was made in the scrotum directly over each testicle. Pressure was applied to each testicle, until it emerged from the incision. The testicle was then gently pulled from the incision and the spermatic cord and vessels were cut. The entire castration was recorded on video for later castration scoring. Antibacterial spray (Chlor-tetracyclin Spray, Werner Stricker AG, Zollikofen, Switzerland) was then applied to the wound and the piglets were immediately placed back on straw underneath heat lamps and were disturbed only to record measurements.

Measurements

Three different blinded individuals judged the reaction of the piglets to the castration using a scoring system previously described by Wenger et al. (2002). A score from 0 to 4 (Tab. 1) was assigned four times for each castration, one for the reaction to each skin incision and cord transection. These scores were then added together and the scores of the 3 judges averaged to obtain one final score (0 to 16). A low score is associated with no movement and anaesthesia and a high score with vocalization and struggling. Heart rate (HR) and respiratory rate (RR) were determined by palpation and observation of thoracic wall excursions and were recorded prior to manipulation (timepoint (TP) -10); 5 (TP -5) and 1 (TP -1) minute prior to castration; during castration (TP 0) and 10 (TP +10), 20 (TP +20), 30 (TP +30) and 60 (TP +60) minutes after castration. Rectal temperature was recorded at TP -10, +30 and +60 with a rectal digital thermometer (Microlife MT 1961, Migros, Zürich, Switzerland). Percent oxygen saturation (SpO₂) using a pulse oximetry probe (Datex S5[®], Datex-Ohmeda, Finland) placed on the base of the tail and was recorded at timepoints -5, -1, 0, +10 and +20. Systolic blood pressure (SBP) was measured using a Doppler blood pressure probe (Ultrasonic Doppler Flow Detector, Parks Medical Electronics, Inc., Aloha, OR) placed on the left radial artery at timepoints -1, 0 and +10. Room temperature was determined with a digital thermometer (MTR102, OregonScientific, Oregon, USA).

Table 1: Numerical scoring system for assessment of castration.

Score	Criteria
0	No reaction or vocalization
1	Movement of one limb, no vocalization
2	Movement of two limbs, no vocalization
3	Movement of all limbs with or without vocalization
4	Strong movements of all limbs and vocalization

Recovery

Sarmazenil (Sarmasol[®] 1 mg ml⁻¹, Dr. E. Gräub AG, Bern, Switzerland) at a dose of 0.2 mg kg⁻¹ was administered, using the same route as for the prior agents, 30 minutes after castration for antagonization of climazolam. Time to walking from drug administration was recorded when the piglets were able to stand on their own and walk without falling and with minimal ataxia. Time to walking was judged by the same observer. Piglets were returned to the sow when walking and all measurements were recorded.

Statistical Analysis

Descriptive and comparative statistical analyses for all data were performed using NCSS software (www.ncss.com, Kaysville, UT). Cardiovascular data (HR, RR, SBP, SpO₂), castration score, rectal temperature change and time to walking were compared between groups using a paired Wilcoxon Signed-Rank Test for difference in medians, with the pairs defined by matching. A Wilcoxon Rank-Sum test for difference in medians was used to evaluate the castration scores at different room temperatures within each anaesthesia group. The alpha level for statistical significance was set to 0.05.

Results

As data was not normally distributed, results are reported as medians with upper and lower 95% confidence intervals (CI). Twenty pairs were analyzed for the study. There are several individuals with missing cardiovascular data due to inability to get accurate measurements because of movement or equipment malfunction. Table 2 lists the number of animals analyzed for each data point. There were no deaths during the study period. Most animals achieved recumbency 4–5 minutes after receiving the anaesthetic agents, except for 5 animals in the IN group that required additional dosing to achieve recumbency. The actual time to castration from the induction time was significantly higher ($P = 0.015$) in the IN group (median 13 minutes, 95% CI 11; 16) compared to 11 (10; 12) minutes for the IM group because of the 5 animals in the IN group that required additional anaesthesia. The median administration volume per piglet was 0.4 (0.4; 0.5) ml of both the initial anaesthetic agents and also the sarmazenil for reversal. The IN group had a significantly higher ($P=0.0070$) castration score (7.7 (0.7; 10) compared to the IM group (1 (0.3; 5) (Fig. 1). Room temperature over the study period was over a wide range as we performed the study over a 6 month period 21.5°C (10.1; 21.5). When both groups were sub-divided according to the actual room temperature categories, a marked associ-

ation between castration score and room temperature was detected in the IN group. Room temperatures below 18°C were associated with significantly higher castration scores (12.9 (10; 16) than temperatures above 18°C (4.3 (0; 9.3) (Fig. 2, upper graph). Two of 5 IN animals that required redosing were in the high room temperature group and 3 in the low. This association was not present in the IM group although the scores were uniformly lower with higher room temperatures (Fig. 2, lower graph).

There were no significant differences between groups at all time points for SpO₂ or SBP (Tab. 2). HR was significantly higher 10 minutes after castration in the IN group (180 (165; 208) compared to the IM group (165 (155; 193) (P=0.013). RR was significantly higher in the IM group at time points -5, -1, 10, 20 and 30 (Tab. 2). The decrease in rectal temperature 60 minutes after castration was significantly more (P=0.0011) in the IM group (2.74 °C (1.9; 3.47) compared to the IN group (1.5°C (0.6; 1.7). Timing of administration of the reversal agent sarmazenil was similar in both groups: 34.5 (32; 41) minutes in the IM group and 37 (35; 46) minutes in the IN group. The

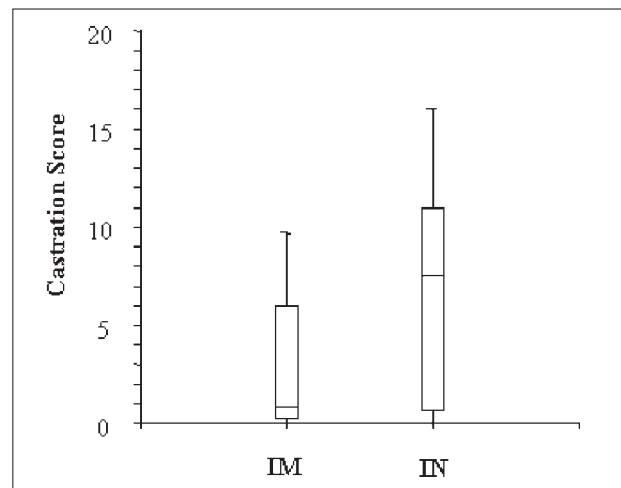


Figure 1: Castration score of piglets anesthetized with ketamine, clinzolam, and azaperone either intramuscularly (IM) or intranasally (IN). Castration scores were significantly higher (*P=0.007) in the IN group when compared to the IM group.

IN group was walking 50.5 (46; 58) minutes after induction which was significantly faster than the IM group 80.5 (66; 132) minutes (P = 0.0001).

Table 2: Cardiovascular variables and rectal temperature just prior to (time -10) and following administration of ketamine 15 mg kg⁻¹, clinzolam 1.5 mg kg⁻¹ and azaperone 1.0 mg kg⁻¹ to piglets either intramuscularly (IM) or intranasally (IN)^{1,2,3}.

Group	Parameter ⁴	Time points in minutes relative to castration (time 0)								
		-10	-5	-1	0	10	20	30	60	
IM	HR	240 (228; 252)	206 (174; 214)	182 (154; 200)	189 (157; 200)	165 (155; 193)*	178 (162; 198)	211 (192; 252)	235 (228; 258)	
	RR	80 (70; 96)	99 (84; 132)***	90 (90; 102)*	82 (78; 100)	98 (90; 120)*	90 (78; 120)**	100 (70; 108)**	75 (66; 80)	
	SpO ₂	---	95 (93; 96)	93 (88; 97)	95 (87; 97)	95 (91; 97)	97.5 (95; 99)	---	---	
	SBP	---	---	82 (70; 95)	90 (81; 108)	66 (60; 77)	---	---	---	
	Temp	39.3 (39.0; 39.4)	---	---	---	---	---	36.2 (35.8; 36.9)*	36.5 (35.7; 37.8)**	
IN	HR	251 (234; 270)	196.5 (176; 206)	178.5 (162; 187)	181 (171; 191)	180 (165; 208)*	190 (168; 206)	231 (189; 240)	240 (234; 270)	
	RR	66 (54; 100)	72 (60; 80)***	72 (70; 100)*	84 (72; 96)	76 (66; 100)*	72 (60; 80)**	71 (60; 72)**	74 (54; 90)	
	SpO ₂	---	94 (85; 95)	91.5 (89; 95)	94 (92; 98)	95.5 (92; 97)	96.5 (93; 98)	---	---	
	SBP	---	---	76 (67; 86)	78 (65; 100)	76 (51; 79)	---	---	---	
	Temp	39.3 (39.0; 39.4)	---	---	---	---	---	36.7 (35.9; 37.4)*	37.9 (37.5; 38.3)**	

¹ Values are reported as medians with upper and lower 95% confidence intervals in parentheses

² Observations: 20 piglets in the intramuscular administration group and 20 in the intranasal group unless indicated differently by [brackets]

³ IM = intramuscular administration group; IN = intranasal administration group

⁴ HR = heart rate (minute⁻¹); RR = respiratory rate (minute⁻¹); SpO₂ = hemoglobin oxygen saturation (%); SBP = systolic blood pressure (mm Hg), Temp = rectal temperature (°C)

* Indicates significant difference between the medians of the IM and IN groups (P < 0.05) based on pairing

** Indicates significant difference between the medians of the IM and IN groups (P < 0.01) based on pairing

*** Indicates significant difference between the medians of the IM and IN groups (P < 0.001) based on pairing

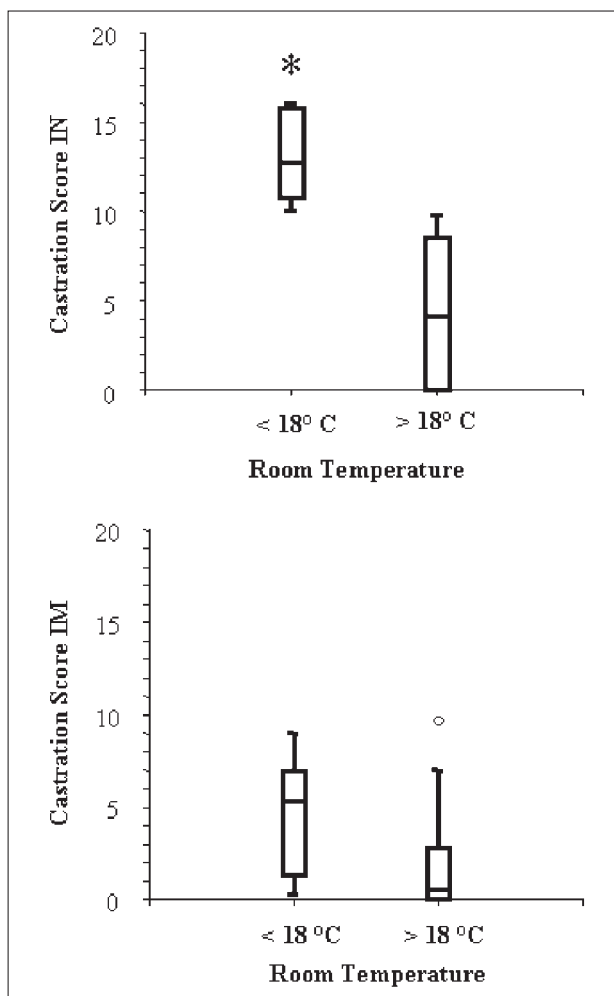


Figure 2: Castration score of the intranasal group (IN) (top panel) and intramuscular group (IM) (bottom panel) taking into account room temperature at the time of anaesthesia and castration. The IN group had a significantly better ($*P=0.0006$) castration score when the room temperature was greater than 18°C . There was no significant difference between temperature divisions in the IM group but there was less variability in the score (0.7 (0; 3.3) when the temperature was greater than 18°C than when it was less than 18°C (5.5 (0.3; 9)). Thirteen pairs were analyzed in the high temperature group and 6 pairs in the low temperature group.

Discussion

In the current study, administration of ketamine, clonazepam and azaperone in combination provided a consistent and reliable anaesthesia for castration of newborn piglets when administered IM. IN administration provided advantages including minor temperature loss and shorter recovery times, but had significantly higher castration scores, indicating that the anaesthesia was less effective. All of the scores that were 10 or greater (on a scale of 16) were associated with room temperatures of less than 18°C , therefore further study could prove the IN technique to be more reliable under controlled environmental conditions. Veterinarians have limited access to anaesthetic agents suitable for anaesthetizing piglets, as few of these drugs have specified meat withdrawal times. Ke-

tamine and azaperone are 2 agents, which are approved for use in swine in Switzerland and in the European Union. Ketamine is a dissociative anaesthetic that provokes sedation, immobility and analgesia but can cause muscle rigidity and tremors in swine when used alone. No such side effects were apparent with the combination of a benzodiazepine (clonazepam) and a butyrophenone derivative (azaperone).

Azaperone causes tranquilization and sedation in swine and has also been used to control aggressiveness when regrouping weanling or feeder pigs. It causes slight respiratory stimulation and is known to reduce the arterial blood pressure due to vasodilation after intramuscular injection in pigs (Clarke 1969). Its duration of action can be as long as 2–3 hours. In our study, the IM group had a significantly higher RR at several time points, decreased rectal temperature and longer recovery when compared to the IN group. Possibly this could be explained by poor IN absorption of azaperone, making the side effects of azaperone more prominent in the IM group: increased respiration, heat loss due to vasodilation and longer duration of action leading to a longer recovery time. The combination of ketamine and azaperone intramuscularly for castration of newborn piglets was studied extensively (Kmiec, 2005), but was associated with undesirable side effects. In a pilot study, (S. Axiak, unpublished data), clonazepam was added to reduce the required doses of ketamine and azaperone and potentiate their effects. Clonazepam is a benzodiazepine tranquilizer marketed in Switzerland. It is very similar to the benzodiazepine midazolam, which has been found to be effective in swine for induction of anaesthesia in combination with ketamine and azaperone (Clutton et al., 1997). In the study by Kmiec (2005), a dose combination of 2 mg kg^{-1} azaperone and 25 mg kg^{-1} ketamine IM was found to be most effective in the initial trial, which compared 6 different dosing regimens. Recovery time in the 2 mg kg^{-1} azaperone 25 mg kg^{-1} ketamine group ranged between 198 and 234 minutes. The recovery time defined in Kmiec's study was from the raising of the head until first independent suckle on the teat. Our study defined the "recovery" period to be from induction of anaesthesia to full consciousness and walking. Despite this difference, it is evident that the present recovery times were much shorter; 50.5 (46; 58) minutes after induction for the IN group and 80.5 (66; 132) minutes for the IM group. This can be attributed to the lower dosages required of ketamine and azaperone and the addition of clonazepam, which is reversible by sarmazenil. In pilot studies (Axiak, unpublished data), we found that the recovery times were excessive without reversal of the clonazepam and it was our goal to achieve the shortest possible recovery with these agents. Further studies are warranted though, comparing the recovery times with and without sarmazenil, as the cost and additional handling

with sarmazenil could limit the usefulness of this technique in practice.

When compared though to isoflurane anaesthesia, the recovery times are much longer. Piglets were standing with a mean of 126 seconds after discontinuation of isoflurane (Walker et al., 2004). Piglets nurse approximately one time an hour (McGlone and Hellman, 1988), and it can be estimated that two nursings are missed due to the prolonged recovery from the combination of ketamine, clonazepam and azaperone. Longevity studies (i.e. weight at weaning, morbidity and mortality) would need to be studied to determine the significance of this.

The most clinically relevant discrepancy between the two groups was the difference in the castration score. The IN group had a higher castration score indicating that the anaesthesia was less effective in this group and some of these animals showed strong movements. There are several possible explanations for this. In humans, a nasal cycle occurs as a phenomenon in which the nose goes through regular periods of congestion and decongestion. During periods of congestion the nose has decreased mucociliary clearance and this in turn can have an effect on drug absorption (Soane, et al., 2001). The nasal cycle has been documented in swine by Campbell and Kern (1981). Other factors that can effect the effectiveness of the intranasal administration technique are: viscosity of the drug delivered, the ability of the nasal spray device to generate an aerosol, the pump design and the actuation force of the administrator on the pump (Dayal et al., 2004). Large volumes administered too quickly can lead to swallowing of the drug and then subsequent delayed uptake from the gastrointestinal system (Visweswaraiyah et al., 2002). Finally sneezing, a symptom that was observed in this study in all piglets can also decrease the amount of drug available. Further study using increased dosing in the intranasal group is warranted, taking these facts into account. Although the scores were better in the IM group, the median score was 1, indicating that most animals showed a slight reaction, whereas data from the isoflurane studies indicate that isoflurane provided more reliable anaesthesia as 15 of 24 piglets showed no reaction at all (Walker et al., 2004). Likely this is because isoflurane can be administered "to effect" and this is not possible with an IM injection.

Another and probable cause of the discrepancies between the two groups is simply that the solution was too cold. All of the scores above 10 were associated with room temperatures less than 18°C. There are several reasons why temperature could affect the usefulness of this technique. First, cold temperatures (i.e. the air temperature and the solution) cause vasoconstriction. Landis et al. (2003) reported that intranasal fluid nebulization induced a sympathetic mediated, transient vasoconstrictor response at a solution tempera-

ture of 22°C. When the fluid was warmed to 37°C this response was abolished. Although in our study, solution temperature was not measured, room temperature was. Likely, the solution temperatures mirrored the room temperature as the agents were left out at room temperature. Further study of IN administration of these agents warmed to body temperature is warranted. We hypothesize that consistently lower castration scores will then be obtained. In our study, temperature had no effect on the castration score of the IM group. In a study by Clutton et al. (1998) effect of drug temperature on intramuscular ketamine and azaperone sedation in pigs was studied at three different temperature groups ranging from 6 to 40.5°C. Mean time to recumbency was shortest with the warmest injections but not statistically significant.

The observed difference in temperature loss and recovery times between the IM and IN group in this study may be due to absorption and elimination characteristics of the administration route. Likely the drugs were absorbed and distributed much faster from the IN route. In a study in pigs, it was shown that IN administration of titrated progesterone resulted in an increased concentration in the blood supplying the brain than in other arterial blood, indicating a local vascular transfer from the nasal mucosa to the arterial blood of the brain (Skipor et al., 2003). In children, ketamine and norketamine plasma concentrations were studied after venous, nasal and rectal administration of ketamine at a dose of 9 mg kg⁻¹ and IN administration induced a more rapid and greater plasma concentration when compared to rectal administration (Malinovsky et al. 1996). Norketamine also appeared later with the IN route indicating a lack of first pass metabolism and an almost two-fold greater bioavailability. In contrast, another study, which compared IN and IM administration of midazolam in children, found no significant differences between the two methods in the onset and degree of sedation and response of the children to venipuncture (de Santos et al., 1991). The cardiovascular variables were similar in both groups, no major side effects were observed and no deaths occurred. IM administration was reliable and IN administration was inconsistent, but all of the scores in the IN group that were 10 or greater (on a scale of 16) were associated with room temperatures of less than 18°C, therefore further study could prove the IN technique to be more reliable with a solution warmed to body temperature.

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Anesthésie pour la castration des porcelets: comparaison entre l'administration intranasale et intramusculaire de kétamine, climazolam et azapérone

Le but de cette étude est de comparer les effets de l'administration de kétamine, azapérone et climazolam par voie intra-nasale (IN) ou intramusculaire (IM) pour la castration de porcelets. Quarante porcelets âgés de 4 à 7 jours sont désignés au hasard pour recevoir un mélange de kétamine (15mg kg⁻¹), climazolam (1.5mg kg⁻¹) et azapérone (1.0mg kg⁻¹), IN ou IM, 10 minutes avant la castration. Les paramètres vitaux sont mesurés. Les observations sont faites à intervalles réguliers de 10 minutes avant la castration jusqu'à 60 minutes après l'opération. L'opération de castration est enregistrée sur vidéo pour évaluation des réactions douloureuses par 3 observateurs indépendants. Les réactions et vocalisations du porcelet lors de l'incision cutanée et section du cordon spermatique sont évaluées et notées (0 = pas de réaction, 16 = forte réaction) pour obtenir un score de douleur. Le groupe IN a obtenu un score significativement plus élevé ($P < 0.01$) que le groupe IM. Il y avait une corrélation entre le score de castration et la température de la salle dans le groupe IN (des températures en dessous de 18°C sont associées avec des scores plus élevés, $P < 0.001$). La fréquence cardiaque était significativement plus élevée 10 minutes après la castration dans le groupe IN ($P < 0.05$). La fréquence respiratoire était significativement plus élevée dans le groupe IM aux temps -5, -1, 10, 20 et 30 minutes ($P < 0.05$). Le groupe IN s'est relevé significativement ($P < 0.0001$) plus vite que le groupe IM. En conclusion, kétamine, climazolam et azapérone produisent une anesthésie efficace pour la castration des porcelets si administrée IM. L'administration IN donne des temps de réveils plus courts mais augmente le score de douleur.

Anestesia per la castrazione dei suinetti: valutazione comparativa di ketamina, climazolam e azaperone somministrati per via intramuscolare o intranasale

Quaranta suinetti tra i quattro e i sette giorni di età sono stati anestetizzati con una combinazione di 15 mg kg⁻¹ di ketamina, 1.5 mg kg⁻¹ di climazolam e 1.0 mg kg⁻¹ di azaperone somministrata dieci minuti prima della castrazione. La via di somministrazione IN o IM è stata decisa in base a un criterio di assegnazione casuale a ciascun suinetto. I parametri fisiologici sono stati misurati 10, 5 e 1 minuto prima della castrazione, durante la procedura e 10, 20, 30 e 60 minuti dopo il suo completamento. L'operazione è stata filmata per consentire l'assegnazione da parte di tre osservatori indipendenti di un punteggio alla reazione e vocalizzazione degli animali all'incisione cutanea e alla resezione di ciascun funicolo spermatico (0 = nessuna reazione, 16 = reazione marcata). Il gruppo IN ha ottenuto un punteggio statisticamente superiore ($P < 0.01$) rispetto al gruppo IM. Nel gruppo IN si è notata una correlazione tra punteggio ottenuto e temperatura ambientale (temperature inferiori a 18°C associate a punteggi più alti e quindi reazioni più marcate ($P < 0.001$)). La frequenza cardiaca è apparsa statisticamente più elevata dieci minuti dopo la castrazione nel gruppo IN ($P < 0.05$). La frequenza respiratoria è apparsa statisticamente più elevata nel gruppo IM ai minuti 5 e 1 prima della castrazione e 10, 20 e 30 dopo la castrazione ($P < 0.05$). Nel gruppo IN è stata osservata una ripresa della capacità di deambulazione statisticamente più rapida ($P < 0.0001$) che nel gruppo IM. In conclusione, la combinazione di ketamina, climazolam e azaperone fornisce un'anestesia adeguata per la castrazione di routine di suinetti quando somministrata per via IM. La somministrazione IN è seguita da tempi di risveglio più brevi ma è associata a punteggi più alti che riflettono una reazione più marcata alla stimolazione chirurgica.

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Corresponding author

Dr. S. M. Axiak, present address: Division of Anesthesiology, Department of Clinical Veterinary Medicine, Vetsuisse Faculty, University of Bern, Länggassstrasse 128, CH-3012 Bern. Tel: +41-31-631-2315; Fax: +41-31-631-2275
Email: shannon.gerber@kkh.unibe.ch

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