Ciência Rural, Santa Maria, v.51:10, e20200511, 2021 http://doi.org/10.1590/0103-8478cr20200511
ISSNe 1678-4596
CLINIC AND SURGERY

Postoperative analgesic effects of Reiki therapy in bitches undergoing ovariohysterectomy

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ABSTRACT: *This study aimed to evaluate the effects of Reiki therapy on postoperative pain in bitches undergoing elective minimally invasive ovariohysterectomy (OVH). Thirty bitches were randomly assigned to three groups: Control, Placebo, or Reiki. All dogs received methadone as preanesthetic medication (PAM), meloxicam in the preoperative period, propofol for anesthetic induction, and isoflurane for anesthetic maintenance. Immediately after OVH, the dogs in the Reiki were submitted to a single session of Reiki therapy, dogs in the Placebo received simulated Reiki therapy from a non-therapist, and dogs in the Control received no treatment. All dogs were evaluated for pain using short-form Glasgow composite measure pain scale (CMPS-SF) and visual analog scale (VAS) before (M0) and 2 (M2), 4 (M4), 8 (M8), 12 (M12), and 24 hours (M24) after administration of PAM. Comparing the CMPS-SF scores between the groups, at M2 Reiki scores were lower than those of the Placebo and at M4 those in the Reiki were lower than those of the Control or Placebo groups. Comparing the VAS scores, at M4 and M8, Reiki scores were lower than those of the Control or Placebo groups. Additional analgesia (morphine 0.2 mg.kg^{-1} intramuscularly) was administered to three bitches in Control and to four bitches of the Placebo. Reiki did not require additional opioid analgesia in the postoperative period. It was concluded that Reiki therapy provided analgesic effect and contributed to improve postoperative comfort of bitches submitted to elective OVH.*
Key words: *pain, surgery, dogs, complementary therapy.*

Efeito analgésico pós-operatório da terapia Reiki em cadelas submetidas a ovariohisterectomia

RESUMO: *Este estudo teve o objetivo de avaliar os efeitos da terapia Reiki na dor do período pós-operatório de cadelas submetidas à ovariohisterectomia (OVH) eletiva pelo método minimamente invasivo com gancho. Para isso, foram utilizadas 30 cadelas alocadas aleatoriamente em três grupos experimentais: Controle, Placebo e Reiki. Todos os animais receberam metadona como medicação pré-anestésica (MPA), meloxicam, propofol na indução anestésica e isofluorano na manutenção anestésica. Imediatamente após a OVH, os animais do Reiki foram submetidos a uma única sessão de Reiki, os animais do Placebo receberam uma simulação da terapia Reiki por um indivíduo não terapeuta e os animais do Controle não receberam nenhum tratamento. Os animais foram avaliados por meio da forma curta da escala de dor de Glasgow (CMPS-SF) e da escala visual analógica (EVA) antes da administração da MPA (M0) e 2h (M2), 4h (M4), 8h (M8), 12h (M12) e 24h (M24) após a MPA. Comparando-se os valores obtidos pela CMPS-SF, em M2, os valores do Reiki foram menores que do Placebo e, em M4, os valores do Reiki foram menores que do Controle e do Placebo. Observando-se os dados obtidos com a EVA, em M4 e M8, os valores do Reiki foram menores que do Controle e do Placebo. Foi administrada analgesia adicional (0,2 mg.kg^{-1} de morfina por via intramuscular) em três animais do Controle e em quatro animais do Placebo. Os animais do Reiki não necessitaram de analgesia adicional no período pós-operatório. Concluiu-se que a terapia Reiki contribuiu com a analgesia e o conforto pós-operatório de cadelas submetidas à OVH eletiva.*
Palavras-chave: *dor, cirurgia, cães, terapia complementar.*

INTRODUCTION

Ovariohysterectomy (OVH) in dogs and cats is one of the most frequent surgical procedures performed in veterinary practice and is used for population control and prevention and treatment of ovarian and uterine diseases (DA SILVEIRA et al., 2013). Postoperative pain management is a fundamental requirement in bitches that undergone OVH and is usually achieved with the use of anti-inflammatory drugs and/or opioids. However, these drugs can potentially cause deleterious effects

Received 06.02.20 Approved 02.01.21 Returned by the author 04.08.21
CR-2020-0511.R2

such as sedation, salivation, vomiting, and cardiac and respiratory alterations. Additionally, they are contraindicated for some patients, especially those with concurrent renal and gastrointestinal disorders (PASCOE, 2000; SELMI et al., 2009; NENADOVIC et al., 2017).

In addition to traditional pharmacological treatment, other therapies have proven effective in controlling postoperative pain in canine patients submitted to OVH, including acupuncture, pharmacopuncture, and electroacupuncture (GROPPETTI et al., 2011; CASSU et al., 2012; LUNA et al., 2015). In humans, another complementary therapy called Reiki has proven effective in reducing postoperative pain in women undergoing cesarean section (MIDILLI & ESER, 2015; MIDILLI & GUNDUZOGLU, 2016). Reiki is a complementary bioenergetic therapy that originated in Japan in the early 20th century. It involves physical contact by a therapist's hands to channel vital energy to the patient, promoting energy balance, physical, emotional, mental, and spiritual well-being. In addition, such therapy may collaborate in the process of self-healing and decreasing the signs of pain in the treated individual (VITALE, 2007).

It is postulated that complementary therapies, such as Reiki, may assist with analgesia and comfort of dogs postoperatively, promoting better recovery and potentially reducing the requirement for pharmacological analgesia. To the author's knowledge, the analgesic effect of Reiki therapy has never been investigated in the veterinary field. Therefore, this study aimed to evaluate the analgesic effectiveness of Reiki therapy in the postoperative period of bitches submitted to elective OVH.

MATERIALS AND METHODS

The study included 30 clinically healthy, non-pregnant, docile adult bitches, weighing between 4.8 and 12.6 kg and aged between one and seven years. The animals were submitted to a screening process one week before the experimental phase, which consisted of clinical examination, behavior check, laboratory tests (blood count and serum urea, creatinine and alanine aminotransferase) and abdominal ultrasound. All dogs were from a household with a definitive owner.

The dogs were admitted to the veterinary hospital the day before the surgical procedure. They were housed in individual cages in a quiet and air-conditioned individual room for 24 hours before surgery in order to acclimatize with the study site and team members. During this period, the dogs were fed *ad libitum* until the beginning of preoperative fasting, which were 8 and 4 hours for food and water, respectively.

On the day of the surgical procedure, all dogs were evaluated using two pain assessment scales, the short-form Glasgow composite measure pain scale (CMPS-SF – REID et al., 2007) and the visual analog scale (VAS – SRITHUNYARAT et al., 2016). Each dog was assessed by two trained observers blinded to the protocol. Pain assessors made their assessment individually, one that a time, in these sequence: 1) observed the animals in the cage for 5 minutes; 2) opened the cage and observed the behavior and how the bitches walked in the room; 3) noted the VAS score; 4) palpated near the surgical wound and on the flanks and observed animals' behavior; 5) noted the CMPS-SF score.

Immediately after this evaluation, the following parameters were measured for each dog: heart rate using a stethoscope, systolic blood pressure by portable vascular Doppler (DV 610B – Medmega indústria de equipamentos médicos Ltda, Brazil), respiratory rate by visual observation, and body temperature, evaluated by the insertion of a digital thermometer via rectal. To standardize the assessment of systolic blood pressure, the animals were placed in the left lateral position and kept calm. A cuff of 40% of the circumference of the right thoracic limb was used and the first measurement was discarded. A total of five measurements were repeated and for statistical purposes, the average value of these scores was used as reference (BROWN et al., 2007).

After this first evaluation (M0), each dog received 0.3 $mg.kg^{-1}$ of methadone (Mytedom®, Cristália, Brazil) as preanesthetic medication (PAM) intramuscularly. Twenty minutes after PAM, they were transferred to the operating room where intravenous fluid therapy (5 $mL.kg.h^{-1}$) of Ringer's lactate solution was commenced. Concurrently, 30 $mg.kg^{-1}$ of cephalothin sodium (Cefalotina sódica, Biochimico Ind. Farm. Ltda, Brazil) and 0.2 $mg.kg^{-1}$ of meloxicam (Elo-Xicam injetável 0,2%®, Chemitec, Brazil) was administered intravenously.

Thirty minutes after PAM, anesthesia was induced with 4 $mg.kg^{-1}$ propofol (Propovan®, Cristália Prod. Quím. Farm. Ltda., Brazil) intravenously, followed by intubation with an endotracheal tube. Anesthesia was maintained by inhalation with isoflurane (Isoflurano®, Instituto Biochimico Ind. Farm. Ltda, Brazil) diluted in 100% oxygen with the level adjusted using a calibrated vaporizer.

Throughout the surgical procedure, ocular positioning and ocular-protective reflexes

were monitored in order to determine the degree of sedation in the trans-operative period and the level of isoflurane requirement (REGALIN et al., 2017). In addition, heart and respiratory rates, esophageal temperature, systolic, diastolic and mean arterial pressures, and oxygen saturation in hemoglobin were monitored using a multiparametric monitor (MR 1200 VET®, RZ Equipamentos Veterinários, Brazil). Temperature was maintained between 36 and 37 ºC using a thermal mattress.

OVH was initiated after the anesthetic surgical plane was achieved (about 15 minutes) and performed by the minimally invasive hook technique through a 1 to 2 cm single, ventral abdominal incision. For standardization, the same team performed all surgeries and each procedure was completed in 15 minutes. Intravenous fentanyl (2.5 $\mu g.kg^{-1}$ - Fentanest®, Cristália Prod. Quím. Farm. Ltda., Brazil) was administered to dogs that exhibited a more than 20% increase in at least two of three parameters (heart rate, systolic blood pressure, or respiratory rate) measured after the anesthetic surgical plane was achieved.

After extubation, dogs were taken individually to a room and placed on a table. At this time they were randomly allocated to one of three experimental groups: ten dogs received no treatment (Control), 10 received simulated Reiki therapy (Placebo) and 10 received Reiki therapy (Reiki). Control group dogs remained on the table for 16 minutes but were not submitted to any procedure. Placebo group dogs received physical contact from gloves connected to 50-centimeter wooden rods applied by a non-Reiki therapist individual for the same length of time and method of application as the Reiki group. The simulated therapy also included the same music that was played to the Reiki group. Reiki group dogs each received identical Reiki therapy for 16 minutes from a Level 3A Reiki master.

Postoperative pain was evaluated at 2 (M2), 4 (M4), 8 (M8), 12 (M12) and 24 hours (M24) after PAM by the same method as the preoperative (M0) assessment. For statistical purposes, the average score between the two evaluators was calculated. If a dog scored ≥ 6 on CMPS-SF or ≥ 30 mm on VAS, additional analgesia was administered (0.2 $mg.kg^{-1}$ of morphine intramuscularly – Dimorf®, Cristália, Brazil) and this dog continued to be evaluated at the following experimental times. At these evaluations, heart rate, systolic blood pressure, respiratory rate, and rectal temperature were also measured.

Data obtained from the pain scales and the physiological parameter measurements were verified for normality using the D'Agostino-Pearson test. Comparisons of pain scores among control, placebo, and Reiki groups were assessed with Kruskal-Wallis test followed by Dunn's multiple comparisons test. To compare physiological parameters data one-way analysis of variance (ANOVA) and Tukey's post-test were used. To compare results within the same group between the various time points, we compared the data from each of the post-PAM time points with M0. For these comparisons, one-way ANOVA for repeated measures test was performed. To compare the number of additional analgesia administrations in the trans-operative and postoperative periods in each group, the Chi-Square test was performed. The physiological parameters results were presented as mean ± standard deviation. Pain scores were present as median and minimum to maximum value. Differences were considered statistically significant when $P < 0.05$. All tests were performed using the free trial version of GraphPad Prism 8 software (GraphPad software, USA).

RESULTS AND DISCUSSION

At the transanesthetic period, the bitches had not yet received the experimental treatments. There were no transanesthetic or surgical complications. The animals that showed physiological changes were due to the increase in nociception at the time of uterine traction. There were no differences among groups in number of animals receiving single doses of fentanyl in this moment (P=0.659). Reiki, Control and Placebo received, respectively, 3, 4 and 5 *bolus* of additional analgesia.

Comparing the scores obtained by CMPS-SF (Figure 1) within the same group at all time points of pain assessment, the scores in the control or placebo groups from M2 to M12 were greater than M0. For the Reiki group, only the scores from M2 to M8 were greater than M0. Comparing the scores between groups at M4, those in the Reiki group were lower than those of the control ($P = 0.021$) or placebo ($P = 0.035$) groups [Figure 1]. For VAS scores (Figure 2) within the same group at the various time points of pain evaluation, scores in the control group from M2 to M24 were greater than M0. Scores in the placebo group from M2 to M12 were greater than M0. For the Reiki group, only the scores from M2 to M8 were greater than M0. Comparing the scores between groups at the same time point, at M4, Reiki group scores were lower than those of the control ($P = 0.046$) or placebo ($P = 0.012$) groups. At M8, Reiki group scores were lower than those of the control ($P = 0.015$) or placebo ($P = 0.014$) groups. Studies have shown that the periods of greatest pain for bitches undergoing

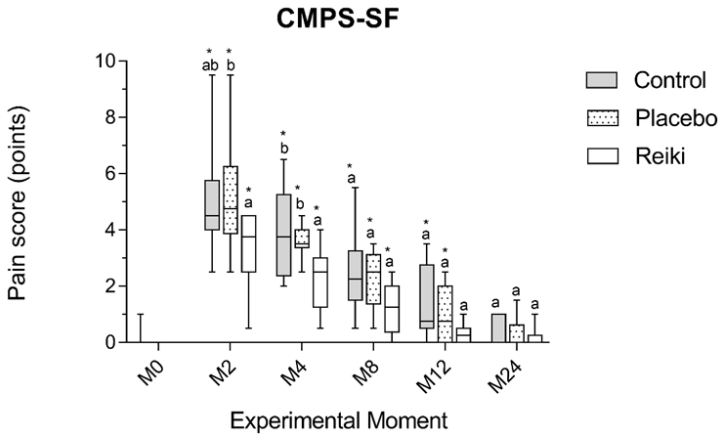

Figure 1 - Short-form Glasgow composite measure pain scale (CMPS-SF) scores of bitches undergoing elective ovariohysterectomy without any further treatment (Control), simulated Reiki therapy by a non-Reiki therapist (Placebo), or Reiki therapy (Reiki) before preanesthetic medication (M0), and 2 (M2), 4 (M4), 8 (M8), 12 (M12) and 24 hours (M24) after preanesthetic medication. N=10 for each group (the power of the statistical tests to this sample were >0.8). Box and whisker plots show median (central horizontal line), inter-quartile range (box boundaries) and minimum to maximum value (whiskers). Different letters indicate significant differences ($P < 0.05$) between the groups, with a < b. *Differed significantly from M0. The maximum score on this scale is 24.

OVH are experienced at one (NENADOVIC et al., 2017) and three (SRITHUNYARAT et al., 2016) hours after extubation. WATANABE et al. (2018) found that the pain scores of bitches were higher than baseline within four hours after surgery. Bitches from the Control and Placebo groups were the only ones to receive additional analgesia in the postoperative period (Table 1). The number of additional analgesia administrations for the Reiki was significantly lower than the other two groups ($P = 0.022$). In the Control*, five administrations of additional analgesia to three bitches were performed; one bitch received additional analgesia at M2, one at M4, and one at M2, M4, and M8. For the Placebo*, five administrations in four bitches were performed; three bitches received additional analgesia at M2, and one at M2 and M4. MIDILLI and ESER (2015) also observed that Reiki application reduced the need for and number of analgesics after cesarean in women.

The time points in this study when additional analgesia administrations were performed are very similar to those reported by other authors for additional analgesia administration in bitches undergoing traditional or minimally invasive OVH, which were up to six hours after extubation (GROPPETTI et al., 2011; LUNA et al., 2015; SHAH et al., 2018). Bitches that received additional analgesia accounted for 30% of Control and 40% of Placebo. SRITHUNYARAT et al. (2016) administered additional analgesia to 30% of bitches submitted to OVH that had received PAM with a combination of acepromazine (0.05 $mg.kg^{-1}$) and morphine (0.4 $mg.kg^{-1}$). SHAH et al. (2018) observed that 20% of bitches submitted to OVH and received PAM with 0.3 $mg.kg^{-1}$ of methadone required additional analgesia within 5 hours of surgery. MWANGI et al. (2018), in a review of drugs and analgesic techniques used in OVH, found that 25% of the bitches required additional analgesia. These results also show that some bitches who received opioids in PAM required additional analgesia, which is in agreement with the results found in the Control group of this manuscript.

The physiological parameters obtained in the postoperative period were not considered for the administration of additional analgesia in this period. However, we consider its evaluation important for a better characterization of the experimental groups. With respect to respiratory rate (Table 2), when the three groups were compared for each time point it was found that values for the Reiki group were lower

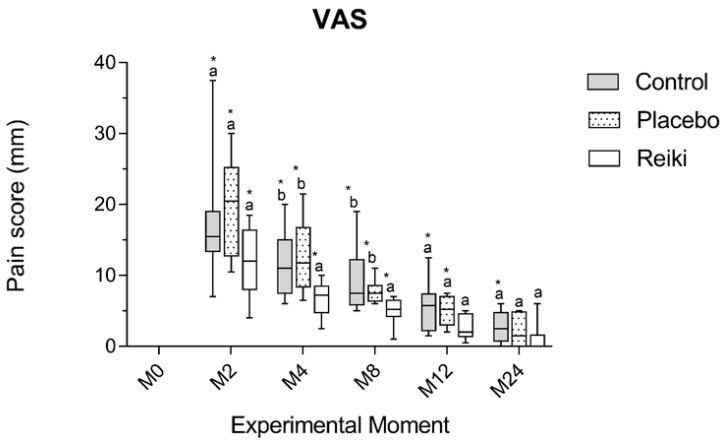

Figure 2 - Visual analog scale (VAS) pain scores of bitches undergoing elective ovariohysterectomy without any further treatment (Control), simulated Reiki therapy by a non-Reiki therapist (Placebo), or Reiki therapy (Reiki) before preanesthetic medication (M0), and 2 (M2), 4 (M4), 8 (M8), 12 (M12) and 24 hours (M24) after preanesthetic medication. N=10 for each group (the power of the statistical tests to this sample were >0.8). Box and whisker plots show median (central horizontal line), inter-quartile range (box boundaries) and minimum to maximum value (whiskers). Different letters indicate significant differences ($P < 0.05$) between the groups, with a < b. *Differed significantly from M0. Maximum score on this scale is 100 mm.

than those for the Placebo at M8 and M12 ($P = 0.028$ and 0.029, respectively), even if no Reiki animal received additional analgesia in the postoperative period. This effect may be due to a decrease in anxiety and stress secondary to Reiki therapy, as confinement and manipulation of the bitches in this study may have caused anxiety and stress, even after acclimatization. An anxiolytic and stress reduction effect after Reiki therapy in humans has been well documented in surgical (VITALE & O'CONNOR, 2006), hospitalized (VERGO et al., 2018), and oncologic (DEMIR et al., 2015) patients. MIDILLI and ESER (2015) reported that Reiki application reduced the value of anxiety and the respiratory rate after cesarean birth in women. In these patients, respiratory rate did not vary within groups throughout the evaluation time points.

Heart rate did not vary within or between groups (Table 2). There was an expectation that there would be significant variation of this parameter between the three experimental groups as reduction in heart rate has been observed in human patients treated with Reiki and submitted to surgical procedure (BALDWIN et al., 2017). MACKAY et al.

Table 1 - Number of additional analgesia administrations to bitches undergoing elective ovariohysterectomy without any further treatment (control), simulated Reiki therapy by a non-Reiki therapist (placebo), or Reiki therapy (Reiki), before preanesthetic medication (M0), and 2 (M2), 4 (M4), 8 (M8), 12 (M12) and 24 hours (M24) after preanesthetic medication. N=10 for each group. *Differed significantly from Reiki group ($P = 0.022$).

Group	Experimental Moment						
	M0	M2	M4	M8	M12	M24	Total
Control*	0	2	2	1	0	0	5
Placebo*	0	4	1	0	0	0	5
Reiki	0	0	0	0	0	0	0

Table 2 - Physiologic parameters of bitches undergoing elective ovariohysterectomy without any further treatment (Control), simulated Reiki therapy by a non-Reiki therapist (Placebo), or Reiki therapy (Reiki) before preanesthetic medication (M0), and 2 (M2), 4 (M4), 8 (M8), 12 (M12) and 24 hours (M24) after preanesthetic medication. N=10 for each group (the power of the statistical tests to this sample were >0.8). Different letters indicate significant differences ($P < 0.05$) between the groups, with a < b. *Differed significantly from M0. Results presented as mean and standard deviation.

Group	Experimental Moment					
	M0	M2	M4	M8	M12	M24
	Heart rate (beat/min)					
Control	125 ± 27	108 ± 21	116 ± 6	112 ± 24	107 ± 26	119 ± 25
Placebo	135 ± 30	128 ± 26	108 ± 31	114 ± 12	124 ± 24	123 ± 19
Reiki	125 ± 25	112 ±17	104 ± 24	116 ± 30	112 ± 24	118 ± 15
	Systolic blood pressure (mmHg)					
Control	136 ± 15	147 ± 20	142 ± 22	141 ± 17	140 ± 16	142 ± 19
Placebo	144 ± 20	143 ± 23	147 ± 24	145 ± 20	156 ± 20[b]	146 ± 11
Reiki	146 ± 21	146 ± 17	143 ± 18	141 ± 23	134 ± 21[a]	130±17
	Respiratory rate (breath/min)					
Control	35 ± 13	27 ± 3	27 ± 8	32 ± 10	32 ± 6	41 ± 11
Placebo	35 ± 6	34 ± 8	29 ± 8	40 ± 7	37 ± 11	40 ± 11
Reiki	33 ± 9	27 ± 10	27 ± 9	31 ± 6	27 ± 7	31 ± 6
	Rectal temperature (°C)					
Control	38.4 ± 0.6	36.8 ± 0.7*	37.1 ± 0.6*	37.6 ± 0.4*	38.0 ± 0.4	38.1 ± 0.5[a]
Placebo	38.4 ± 0.7	37.3 ± 0.6*	37.1 ± 0.8*	37.9 ± 0.7	37.9 ± 0.5	38.2 ± 0.4
Reiki	38.7 ± 0.8	37.5 ± 0.8*	37.6 ± 0.7*	38.0 ± 0.4	38.1 ± 0.5	38.5 ± 0.2[b]

(2004) reported a decrease in the heart rate of humans treated with Reiki and attributed this to increased activity of the parasympathetic nervous system, as the individuals presented with an increase in vagal tone and cardiac baroreflex sensitivity.

Systolic blood pressure did not vary within groups throughout the evaluation time points (Table 2). However, in the comparison between groups, systolic blood pressure in the Reiki was lower than that in the Placebo at M12 ($P = 0.040$). This may have occurred by an indirect effect through decreased anxiety and stress, or was a consequence of reduced pain in Reiki, as analysis of VAS scores demonstrated that in the Placebo, the score at M12 was higher than M0, whereas in the Reiki the score at M12 score was statistically equal to M0. Blood pressure could have been reduced also due to the administration of the additional opioid, but this was not observed in the present study, as the only group that showed a reduction in this parameter was Reiki.

In the evaluation of rectal temperature (Table 2), values in the Reiki were higher than in the Control ($P=0.038$) at M24 but not at M0, proving that the dogs in this group did not develop hyperthermia. It is believed that rectal temperature, which reduced after anesthesia in all groups, returned to its baseline value faster in the Reiki than in the Control. This is supported by the fact that in the Control, rectal temperatures from M2 to M8 were lower than M0, and only the temperatures at M12 and M24 were equal to M0. In the Reiki, only the temperatures at M2 and M4 were lower than M0, and the temperatures at M8 to M24 were equal to M0.

Although OVH minimally invasive techniques are shown to be less painful (DEVITT et al., 2005; REECE et al., 2012), all animals in this study were submitted to the same surgical technique. Therefore, this did not influence the results obtained and we were really able to observe greater postoperative comfort, both behavioral and in physiological parameters, in animals undergoing Reiki therapy. The administration of meloxicam in the preoperative period was done to simulate surgical routine situations, but even submitted to the same experimental conditions, we could observe the superiority of the Reiki group in the lower requirement of postoperative opioids in relation to the others.

CONCLUSION

Reiki therapy provided an analgesic effect and contributed to improved comfort, as well

as reduced opioid requirements in the postoperative period of bitches submitted to elective OVH.

ACKNOWLEDGEMENTS

Araucária Foundation, by the Social Inclusion Scholarship (PIBIS) for Research.

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001.

BIOETHICS AND BIOSSECURITY COMMITTEE APPROVAL

This study was approved by the Ethics Committee on the Use of Animals (CEUA) of the Federal University of Fronteira Sul (UFFS) with protocol number 9434120419.

DECLARATION OF CONFLICT OF INTEREST

The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

AUTHORS' CONTRIBUTIONS

All authors contributed equally for the conception and writing of the manuscript. All authors critically revised the manuscript and approved of the final version.

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