Canine Fox Terrier - Case Report
Characterization of Canine Patients

Impact of Rapid Thermoresistance
Hepatitis Treatment Regimen for Dogs

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Evaluating the Impact of Rapid Thermoresistance (RTT) on Membrane and Chromatin Features in Post-Thawed Bovine Semen

By Denise Martins Reis, Augusto Urzedo Pereira Queiroz, Chamberttan Souza Desidério, Amanda Pifano Neto Quintal, Marcelo Emílio Beletti, Bruno Augusto Nassif Travençolo, Guilherme Costa Venturini & André Belico de Vasconcelos

Abstract- This work aims to evaluate the effects of rapid thermoresistance on the morphofunctional aspects of membranes using flow cytometry, as well as the quality of sperm chromatin using the Toluidine Blue technique, both before and after the thermoresistance test. Six sets of frozen semen from ten bulls were used. The samples were thawed in a water bath at 36°C and separated into two aliquots. The first aliquot, control group (C), was kept in a test tube previously heated to 36°C with subsequent evaluations using microscopy, cytometry, and chromatin analyses. The second aliquot, experimental group (E), underwent the rapid thermoresistance test (RTT) in a water bath preheated at 46°C for 30 minutes with subsequent evaluations using microscopy, cytometry, and chromatin analyses. For statistical analysis, the paired T test, significance (P<0.05), was used.

Keywords: fertility, membranes, sperm cells, thermoresistance.

GJMR-G Classification: NLMC Code: QM
Evaluating the Impact of Rapid Thermoresistance (RTT) on Membrane and Chromatin Features in Post-Thawed Bovine Semen

Denise Martins Reis, Augusto Urzendo Pereira Queiroz, Chamberttan Souza Desidério, Amanda Pifano Neto Quintal, Marcelo Emílio Beletti, Bruno Augusto Nassif Travençolo, Guilherme Costa Venturini, André Belico de Vasconcelos

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In the flow cytometry evaluation, a significant difference was observed for all points analyzed (plasma membrane and acrosomal membrane). The results obtained with the Toluidine Blue technique, it can be observed that the RTT does not interfere with the chromatin structure, and this is probably due to the structure of mammal sperm DNA. It was concluded that the rapid thermoresistance test (RTT) alters the structures, mainly acrosomal structures, and has no interference in the chromatin compression structure, and should be considered, in association with other evaluation tests, a complementary parameter in the evaluation of bovine semen quality.

Keywords: fertility, membranes, sperm cells, thermoresistance.

I. INTRODUCTION

Artificial insemination with the use of genetically superior animals has been gaining prominence due to the excellent results in the commercialization of cryopreserved bovine semen. Thus, the concern with bull fertility is recurrent among rural producers, as well as scholars who dedicate themselves to sperm analysis to detect changes in sperm cells (Alquézar-Baeta et al. 2019).

The fertility potential of male cattle is determined through semen analysis in a set of evaluations. However, for this analysis to be more efficient, it is also necessary to evaluate the internal structure of the sperm in conjunction with the rapid thermoresistance test (RTT) (Alves et al. 2015). This can be used to evaluate the fertility of frozen semen, simulating a biological process. One of the possibilities to mimic this condition is to promote thermal stress, under controlled conditions, in a water bath, a situation close to the conditions to which it is exposed in the female genital tract (Cunha et al. 2012).

The potential study of RTT is to promote thermal stress in sperm, and in conjunction with flow cytometry and combined with the use of fluorophores, it allows evaluating the integrity of the plasma and acrosomal membrane, as well as the integrity of the DNA, after the induction of stress, providing pre- and post-heating parameters of post-thawed bull semen (Arruda et al. 2007). Also adding to the analysis, the Toluidine Blue (TB) technique has been widely used in the study of chromatin changes (Mello 1982).

Therefore, this research aims to evaluate the effects of rapid thermoresistance on the morphofunctional aspects of plasma and acrosomal membranes, as well as on the chromatin quality of post-thawed bull semen, both before and after the rapid thermoresistance test.

II. MATERIALS AND METHODS

a) Obtaining Bovine Semen Samples

Six batches of frozen semen from ten bulls were used, obtained from Sexing Technologies Repro I.C.M.G.A. Ltda. (Brindes) Use Authorization Protocol 135190833813983 08/11/2019 – CNPJ 23.694.902/001-70 – Indaiatuba – SP. Only samples containing at least 30% sperm with progressive motility were used in the study (CBRA Manual, 2013).

b) Sperm Preparation

To carry out the experiment, the samples were thawed in a water bath at 36.8°C (CBRA Manual, 2013) and separated into two aliquots. The first aliquot, control...
group (C), was kept in a test tube previously heated to 36.8°C and subsequently evaluated by microscopy, cytometry and chromatin analysis. The second aliquot, experimental group (E), was kept in a water bath at 46°C for 30 minutes to perform the rapid thermoresistance test (RTT) (Arruda et al. 2007, Cunha et al., 2012), followed by microscopy, cytometry and chromatin analyses. The experiment was carried out in triplicate and the evaluations were carried out by a single evaluator.

c) Sperm Evaluations

For the microscopic evaluations, a bright field microscope (Nikon eclipse e200) was used. 10 µL of the sample were added between the slide and coverslip, both before and after the thermoresistance test, and sperm motility and vigor were evaluated at 10x magnification, according to Brazilian College of Animal Reproduction (Manual CBRA, 2013).

In the cytometric evaluations, a flow cytometer (FACSC Alibur™) was used to detect the integrity parameters of the plasma (propidium iodide /1.5 mM) and acrosomal (Fitc-PNA/1.125 g/mL) membranes. A 560 nm short pass dichroic mirror, green fluorescence (FL1) was collected using a 515 meter545 nm bandpass filter. Red fluorescence (FL3) was collected through a 650 nm long-pass filter, after 640 nm filtering, long pass filter. The sheath/sample was placed on “low” and adjusted to a flow rate of 100 cells per second when analyzing a sample with a concentration of 1.25 x10^5 sperm/mL. Data acquisition from 15,000 cells was collected in list mode using BD Cell Quest Pro software version 4.0 (Becton Dickinson®, San Jose, CA, USA) as described by (Vasconcelos et al 2017).

For chromatin analysis, the protocol as reported by Beletti and collaborators (2005) was followed. For this, the smear technique was performed on the samples taken at the two moments (before and after the thermoresistance test). They were fixed with absolute alcohol: acetic acid: 3:1, for one minute and afterwards immersed in 70% alcohol for three minutes. With this, four slides of each sample were made, which were later kept in 4N hydrochloric acid for 25 minutes, followed by washing in distilled water. After this procedure, the slides were kept at room temperature (dry) followed by the addition of three to four drops of Toluidine blue and covered with a coverslip. For the analysis, a microscope (Leica DM500) coupled to an image capture system (Leica ICC50) with a 100X oil-immersion objective in an optical microscope coupled to the camera was used, from which 30 to 50 images were obtained of each prepared slide.

The images obtained were light blue in color when they presented normal chromatin condensation, a variation from light blue to dark blue when the chromatin was moderately decondensed and a variation from dark blue to violet when the chromatin was highly decondensed. In view of this, to avoid the subjectivity of the chromatin alteration evaluations, sperm head segmentation was used, developed in MATLAB and executed with Octave software. The system performs the reading of the sperm according to the color present (light blue to magenta), making it possible to define the chromatin compaction index (Beletti et al 2005).

Statistics

For statistical analysis, the program GraphPad prism 6.0 was used. Fisher’s and Student-Newman-Keuls tests were used to analyze progressive sperm motility, sperm with plasma and acrosomal membranes integrity and analyze chromatin expressed as means and standard deviation (SD) (three repetitions), test at 5% significance (P<0.05).

III. Results

The semen samples before the rapid thermoresistance test showed mean values of 37.5% for motility and 2.5 for vigor. These values were within the range established by the Brazilian College of Animal Reproduction, with references of 30% and 3 for motility and vigor, respectively. However, after the rapid thermoresistance test, a significant drop (P<0.05) in motility (16.5%) and vigor (1.6) was observed, with a reduction of approximately 56% and 36% for motility and vigor, respectively (Figure 1). According to Cunha et al. (2012), bovine semen after being subjected to rapid thermoresistance test (RTT) should show a decrease in straight, progressive sperm motility and sperm vigor.
Figure 1: Result of the mean and standard deviation of the total motility and vigor of bovine sperm samples, after thawing (36°C) Control Group (C) and after the rapid thermoresistance test (46°C/30min), Experimental Group (E) Statistical significance (P < 0.05)

For the flow cytometry analysis, the correspondence of red, IP (FL3 fotodetector), green and Fic-PNA (FL1 Fotodetector) fluorescence was observed. The sperm that fluoresced in red were classified as having non-intact plasma membranes and those that fluoresced in green had a reacted outer acrosomal membrane.

The results of the thermoresistance test the Control (C) and experimental (E) Groups. Q1 (IP positive) percentage of sperm with reactive plasma membrane; Q2 (IP positive/PNA positive) percentage of sperm with reactive plasma and acrosomal membranes; Q3 (PNA positive) percentage of sperm with intact plasma and acrosomal membranes; Q4 (IP negative/PNA negative). The program Cell Quest was used for this analysis (Figure 2).

Figure 2: Graphic representation of spot distribution of bovine sperm marking, post-thawing, from Control and Experimental groups, marked with: Q1 - Propidium iodide (PI); Q2 - double marking of propidium iodide (IP) and Fic-PNA; Q3 - Fic-PNA; Q4 without marking (viable sperm)

Before the thermoresistance test (Control Group), it was observed that the sperm were less reactive to the markings. Because of this condition, the values of the control group (pre-test) were higher than the cells from the experimental group (post-test) in regard to the plasma membrane Q1 (23.6% vs 17.3%) and the number of viable Q4 cells (51.6% vs 46.4%), respectively. For the Q2 double marking evaluation, higher percentages were observed for the experimental group (34.4%) when compared to the control group (23.4%); a result also observed in the Q3 group evaluations (1.4% vs 1.9%). In the flow cytometry analysis, a significant difference (P<0.05) was observed for all points analyzed for both the plasma membrane and the acrosomal membrane. (Figure 3).
Sperm membranes perform numerous functions that are related to cellular metabolism and the maintenance of motility and training in sperm. Therefore, the loss of membrane integrity, as seen in figure 2 and figure 3, indicates a change in the maintenance of cellular homeostasis, directly observed in the decrease in sperm motility (figure 1).

From the decompaction and heterogeneity analyses, all sperm were averaged, both before and after the thermoresistance test. As shown in Figure 4, it was observed that there was no significant difference (P > 0.05) regarding the two evaluated points.

Figure 3: Experimental analysis of the flow cytometry tests of the Control (C) and experimental (E) Groups. Q1 (IP positive) percentage of sperm with reactive plasma membrane; Q2 (IP positive /PNA positive) percentage of sperm with reactive plasma and acrosomal membranes; Q3 (PNA positive) percentage of sperm with intact plasma and acrosomal membranes; Q4 (IP negative/PNA negative) percentage of sperm with reactive acrosomal membrane. Statistical significance (P < 0.05).

Figure 4: Experimental analysis of chromatin heterogeneity and decompaction of Control (C) and Experimental (E) Groups. No statistical difference (P > 0.05).
Evaluating the Impact of Rapid Thermoresistance (RTT) on Membrane and Chromatin Features in Post-Thawed Bovine Semen

The result may be related to the physiological aspect of nuclear differentiation that occurs during spermatogenesis, as in the condensation of sperm chromatin, somatic DNA histones are replaced by protamines (P1), compacted structures (toroid or donut).

IV. Discussion

During fertilization, sperm capacitation, acrosomal reaction and fusion with the ovum are events that require functional and intact plasma and acrosomal membranes. The cryogenics process injures the sperm, decreasing their viability. Aware of the extreme need for sperm to maintain good viability in order to obtain high fertility in a herd, the use of techniques in the field of reproduction biotechnology has intensified, being identified as extremely important tools for genetic improvement programs and efficiency in the production of animal products (Coutinho et al 2010).

The importance of applying additional techniques to evaluate semen batches before commercialization is evident, as it contributes to the quality control of the ejaculate, thus resulting in a better fertility rate and herd productivity (Celeghini et al 2017).

In this study, the effects of the rapid thermoresistance on the morphofunctional aspects of plasma and acrosomal membranes were evaluated through flow cytometry, as well as through chromatin quality, using the Toluidine Blue technique.

Semen samples taken before the rapid thermoresistance test presented values with greater significance in relation to those taken after the rapid thermoresistance test (RTT), possibly due to the time and temperature at which the sperm were kept. This may have led to a drop in sperm viability with changes in membrane structures, mainly the acrosomal structure. This aspect was observed in the flow cytometry analysis since the sperm were more reactive to the plasma and acrosomal membrane markings after the RTT.

The hypothesis for this result is established since, with the temperature increase, there is a structural change in the membrane’s biochemical components, in addition to the promotion of an increase in the sperm’s metabolic rate. It is known that the membrane is flexible, composed of lipids and proteins, and that it possesses self-sealing characteristics and ion channels defined by transmembrane proteins, which selectively act on solutes through active and passive transport (Flesh & Gadella 2000). Thus, the temperature increase can somehow act on ATP-dependent ion channels, such as the sodium/potassium ATPase pump and calcium ion channels, promoting instability in both membranes, and rather, greater reactivity to markers, Q2 quadrant. (PI Positive/PNA Positive)

Another point that corroborates this discussion is that in the experimental group (post-thermoresistance test), quadrant Q3 (PNA positive) showed an increase in the number of reactive sperm, which indicated a possible spontaneous capacitation induced by temperature.

Sperm capacitation is a physiological process that can be induced by several factors, such as variation in hydrogen potential and in intracellular ionic concentration. In addition, it is possible, given the results of the present study, that this sperm capacitation could also be related to the temperature used in the RTT. This is because the temperature can change the fluidity of the plasma membrane, which would promote an increase in metabolism and consequently greater motility, though for a very short period due to the availability of nutrients and oxygen in the medium (Yanagimachi1994; Flesh F.M. & Gadella 2000).

However, according to the results obtained with the Toluidine Blue technique, it can be observed that RTT does not interfere with the chromatin structure. This is probably due to the DNA structure of mammalian sperm, which have a basic unit of protamine toroid. Thus, after the interaction of these protamines with the sperm chromatin, it becomes an inert and highly stable structure, mainly due to the interaction of the protamine’s amine residues with the phosphate groups of the DNA strands (Hamilton et al 2016), which could promote greater DNA stability regarding temperature changes.

V. Conclusion

It can be concluded that the rapid thermoresistance test (RTT) alters the structures, mainly the acrosomal structure, and does not interfere with the structure of chromatin compaction, and should be considered, in association with other evaluations, as a complementary parameter in evaluating bovine semen quality.

Acknowledgements

Universidade Federal de Uberlândia (UFU) for the support given during the research and the Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG) for granting the financial resources.

Declaration of Interest: The authors report no conflicts of interest. The authors alone are responsible for the content of the paper.

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Evaluating the Impact of Rapid Thermoresistance (RTT) on Membrane and Chromatin Features in Post-Thawed Bovine Semen


Characterization of Canine Patients with Heart Disease based on Age at the Pet`a Vet Veterinary Clinic in Guatemala City, Guatemala

By Esteph\'an Mendez De Leon, Carlos de Leon & Renzo Ricardo Ayala

Universidad San Carlos de Guatemala

Abstract- In this study, the clinical records of canine patients seen at the Pet`a Vet veterinary clinic in Guatemala between 2018 and 2020 were analyzed with the aim of investigating heart disease in dogs in the region. From a total of 1215 records reviewed, 825 cases of heart disease were identified, with chronic mitral valve disease being the most frequent. A higher incidence was observed in males and in Schnauzer breed dogs. In addition, the majority of diagnosed patients were found to be 9 years of age or older. These results provide valuable information on the epidemiology of canine heart disease in Guatemala, which may be useful to improve its diagnosis and clinical management.

Keywords: canine heart disease, chronic mitral valve disease, dogs, guatemala.

GJMR-G Classification: NLM: SF992.H4

Strictly as per the compliance and regulations of:
Characterization of Canine Patients with Heart Disease based on Age at the Pet`a Vet Veterinary Clinic in Guatemala City, Guatemala

Caracterización de Pacientes Caninos con Cardiopatías en Función de la Edad en la Clínica Veterinaria Pet`a Vet de Ciudad de Guatemala

Estefan Mendez De Leon, Carlos de Leon & Renzo Ricardo Ayala

Abstract- In this study, the clinical records of canine patients seen at the Pet`a Vet veterinary clinic in Guatemala between 2018 and 2020 were analyzed with the aim of investigating heart disease in dogs in the region. From a total of 1215 records reviewed, 825 cases of heart disease were identified, with chronic mitral valve disease being the most frequent. A higher incidence was observed in males and in Schnauzer breed dogs. In addition, the majority of diagnosed patients were found to be 9 years of age or older. These results provide valuable information on the epidemiology of canine heart disease in Guatemala, which may be useful to improve its diagnosis and clinical management.

Keywords: canine heart disease, chronic mitral valve disease, dogs, guatemala.

Resumen- En la clínica veterinaria Pet`a Vet, especializada en cardiología y neumología, situada en la ciudad de Guatemala, se llevó a cabo un análisis exhaustivo de las fichas clínicas de todos los pacientes atendidos entre 2018 y 2020, con el objetivo de recopilar información estadística sobre las enfermedades cardiacas en perros. Los datos obtenidos permitieron realizar una caracterización detallada de las cardiopatías en la población canina guatemalteca. De un total de 1215 fichas clínicas revisadas, se identificaron 825 casos de cardiopatías en perros, los que representan el 99% de los pacientes evaluados. La enfermedad cardíaca más común fue la enfermedad crónica de la válvula mitral, diagnosticada en el 66% de los casos. Además, se observó que aproximadamente 7 de cada 10 pacientes con sospecha de enfermedad cardíaca fueron confirmados con algún tipo de cardiopatía. En cuanto al sexo de los pacientes, se encontró que los machos presentaron una mayor incidencia, representando el 53% de los casos, mientras que las hembras constituyeron el 47%. Sin embargo, la diferencia entre sexos fue mínima. La raza con mayor prevalencia de cardiopatías fue el Schnauzer. Esta tendencia podría relacionarse con la popularidad de esta raza en la región. Además, se observó que al menos 9 de cada 10 pacientes diagnosticados con alguna cardiopatía pertenecían a una raza específica. Se evidenció una mayor frecuencia de cardiopatías en perros de edad avanzada, siendo los grupos de 9 a 12 años y 13 años en adelante los más afectados. De hecho, aproximadamente 7 de cada 10 pacientes diagnosticados con cardiopatía tenían 9 años o más. Estos hallazgos proporcionan una visión significativa sobre la epidemiología de las cardiopatías en la población canina de Guatemala, lo que puede contribuir a una mejor comprensión y manejo de estas enfermedades en la práctica clínica veterinaria.

Palabras clave: cardiopatías caninas, enfermedad crónica de la válvula mitral, perros, Guatemala.

Abstract- At the veterinary clinic Pet`a Vet, specializing in cardiology and pneumology, located in Guatemala City, an exhaustive analysis of the clinical records of all patients seen between 2018 and 2020 was carried out, with the aim of compiling statistical information on heart disease in dogs. From a total of 1215 clinical records reviewed, 825 cases of heart disease were identified, representing 99% of the patients evaluated. The most common heart disease was chronic mitral valve disease, diagnosed in 66% of the cases. In addition, it was observed that approximately 7 out of 10 patients with suspected heart disease were confirmed to have some type of heart disease. Regarding the sex of the patients, it was found that males presented a higher incidence, representing 53% of the cases, while females constituted 47%. However, the difference between sexes was minimal. The breed with the highest prevalence of heart disease was the Schnauzer. This trend could be related to the popularity of this breed in the region. In addition, it was observed that at least 9 out of 10 patients diagnosed with heart disease belonged to a specific breed. There was evidence of a higher frequency of heart disease in older dogs, with the groups aged 9 to 12 years and 13 years and older being the most affected. In fact, approximately 7 out of 10 patients diagnosed with heart disease were 9 years of age or older. These findings provide significant insight into the epidemiology of heart disease in the Guatemalan canine population, which may contribute to a better understanding and management of these diseases in veterinary clinical practice.

Keywords: canine heart disease, chronic mitral valve disease, dogs, guatemala.

I. Introducción

La cardiología veterinaria en Guatemala y en Centroamérica se configura como una disciplina especializada dentro del ámbito de la Medicina Veterinaria, orientada al estudio exhaustivo del sistema...
cardiovascular en animales. Para hacerlo, se fundamenta en las premisas y conocimientos adquiridos en distintas áreas del saber. Al abordar específicamente las cardiopatías en poblaciones caninas, se toma esencial identificar las patologías más recurrentes, considerando variables como la raza, la edad y el sexo, aspectos de gran relevancia debido a sus implicaciones tanto en la medicina preventiva como en las enfermedades asociadas a procesos infecciosos o degenerativos que puedan vincularse con el entorno. Las condiciones ambientales y los agentes etiológicos, variables según la región, ejercen un papel determinante en la aparición de las patologías cardíacas en las poblaciones caninas de Guatemala, lo que subraya la necesidad prioritaria de discernir su contribución en este contexto.

Diversos estudios de caracterización de enfermedades cardíacas en poblaciones caninas, llevados a cabo en distintas latitudes, han concluido que los pacientes de edad avanzada (7 años o más) presentan una mayor susceptibilidad a desarrollar estas enfermedades. Dentro de este grupo, los pacientes seniles exhiben una mayor propensión o riesgo a padecer enfermedades adquiridas, mientras que los jóvenes son más propensos a enfermedades congénitas. Además, se observa una predisposición a ciertas cardiopatías según el sexo del animal. Este tipo de tipificaciones en poblaciones caninas proporcionan al médico veterinario clínico una guía para identificar una etiología altamente probable (Pereira et al., 2014).

Actualmente, no se dispone de información local que describa la frecuencia de las cardiopatías en las poblaciones caninas según su edad en Guatemala. La ausencia de datos específicos para este país impide determinar si existen factores predisponentes que inciden en la prevalencia de cardiopatías específicas en las poblaciones caninas de la región. Entre estos posibles factores predisponentes podrían mencionarse la influencia genética y enfermedades parasitarias como la enfermedad del gusano del corazón. En el presente estudio, se clasificaron a los pacientes caninos con cardiopatías utilizando la clasificación del Colegio Americano de Medicina Interna Veterinaria (ACVIM, por sus siglas en inglés), en función de la enfermedad diagnosticada. Ante la carencia de estudios locales especializados en cardiología veterinaria, surge la necesidad de llevar a cabo investigaciones descriptivas en este campo.

El estudio actual puede sentar las bases para investigaciones posteriores más amplias que busquen explicar las características idiosincráticas o autóctonas de las cardiopatías en Guatemala. Es crucial generar información local sobre estas patologías. Ejemplos de otras caracterizaciones incluyen enfermedades dermatológicas y óseas, así como casos sospechosos de Distemper, que constituyen puntos de partida para el desarrollo de perspectivas futuras en medicina veterinaria preventiva y clínica cotidiana. Los resultados y conclusiones de este estudio pueden servir como fundamento teórico para investigaciones posteriores en medicina veterinaria con especialización en cardiopatías en perros.

II. Materiales y Métodos

a) Materiales

Recurso humano
- Médicos Veterinarios
- Personal de apoyo en Clínica
- Estudiante de investigación

Reursos físicos
- Hospital veterinario
- Fichas clínicas
- Registros médicos
- Computadora
- Hojas
- Programas de cómputo y análisis de datos

b) Métodos

En el Hospital Pet’ a Vet especializado en cardiología veterinaria en Guatemala, se llevó a cabo una recopilación exhaustiva de expedientes clínicos correspondientes al periodo comprendido entre 2018 y 2020. Esta recopilación se centró específicamente en pacientes caninos. Los datos obtenidos fueron posteriormente tabulados y analizados, tomando en consideración variables como la especie, el grupo etario, el sexo, la raza y el diagnóstico de cada paciente. Una vez completado el proceso de recopilación y tabulación, se realizó una minuciosa revisión comparativa con información proveniente de estudios previos y revisión bibliográfica.

Durante esta investigación retrospectiva, se recopiló información de tres años consecutivos (2018-2020), examinando los expedientes clínicos de pacientes caninos diagnosticados con cardiopatías y atendidos en el mencionado hospital especializado en cardiología veterinaria. Los pacientes fueron clasificados inicialmente por especie y posteriormente por grupos etarios. Una vez completada esta clasificación, se procedió al análisis detallado de los resultados y a su discusión en profundidad (Ver Cuadro No. 1).
c) **Antecedentes del Hospital**

El Hospital Veterinario Pet’a Vet cuenta con una trayectoria clínica de 15 años, destacándose por su especialización en Cardiología, Neumología y evaluación preanestésica veterinaria. Ofrece servicios de alta calidad destinados al cuidado y diagnóstico de los perros.

d) **Ubicación**

El presente estudio se llevó a cabo en el Hospital Veterinario Pet’a Vet, situado actualmente en la 2 calle B 13-44 zona 15, Tecún Uman.

e) **Grupos Etarios**

Para la recopilación de datos se agruparon las edades por grupos (Ver Tabla No. 1). Estos grupos etarios nos permitieron el análisis de las edades en las poblaciones caninas y así se pudo determinar el grupo etario que más frecuente manifestaba las enfermedades cardíacas, si en pacientes jóvenes o seniles. Algunos autores reportan en sus estudios que la mayor frecuencia de cardiopatías en edades avanzadas (Mucha, 2007) (Detweiler & Patterson, 1965) (Pereira et al., 2014).

III. **Resultados y Discusión**

Se examinaron un total de 1215 pacientes caninos sospechosos de padecer alguna enfermedad cardiaca desde enero de 2018 hasta diciembre de 2020. De estos, el 68% (825 casos) presentaron hallazgos compatibles con cardiopatía, mientras que el 32% restante (390 casos) mostraron resultados normales. Dentro de este último grupo de pacientes normales, se incluyeron evaluaciones preanestésicas. Es importante destacar que, de cada 10 pacientes sospechosos de una patología cardiaca, al menos 7 pudieron ser confirmados (Ver Figura No. 1).
En un estudio previo realizado por Calderón, se describe que solo un 2% (260 casos) de los pacientes caninos estudiados presentaban cardiopatía en comparación con la muestra general (Calderón et al., 2014).

![Diagrama 1: Cardiópatas vs normales. Elaboración propia, 2021](image1)

En el estudio se evidenció que el 99% de los casos de enfermedades cardíacas correspondían a perros, totalizando 816 casos. En términos generales, la mayoría de los pacientes caninos se situaban en el rango de edad de 9 a 12 años y mayores, tal como fue reportado previamente por Pereira (2014) en poblaciones caninas, lo cual se refleja en la Figura 2.

![Diagrama 2: Grupo etario de pacientes enfermos en general. Elaboración propia, 2021](image2)

En caninos menores de un año, según lo descrito por Patterson (1968), el 86% de los casos (18 ejemplares) presentan una raza definida, mientras que solo el 14% (3 casos) carece de definición racial. Por otro lado, en caninos de 9 a 12 años, tal como lo han señalado Detweiler y Patterson (1965), se observa un incremento en la prevalencia de cardiopatías caninas en consonancia con la edad. Este patrón ha sido corroborado por Calderón, Dávila y Gavidia en (2014), así como por Pereira (2014), quienes encontraron una casuística similar en sus estudios. Específicamente, los grupos de edad entre 9 y 12 años, y aquellos mayores de 12 años, exhibieron una mayor propensión a desarrollar enfermedades cardíacas en comparación con otros grupos etarios.

La Figura No. 3 muestra un aumento progresivo en la frecuencia de cardiopatías en caninos a medida que aumenta la edad.
En la población canina examinada, se identificaron ciertas tendencias relevantes en relación con las cardiopatías. Entre las razas estudiadas, el Schnauzer y el French Poodle mostraron la mayor incidencia de estas enfermedades, destacando el Schnauzer como la raza más afectada. Además, se observó que los machos presentaban una mayor predisposición a desarrollar cardiopatías en comparación con las hembras.

El análisis por grupos etarios reveló que los perros de 9 a 12 años tenían la frecuencia más alta de casos, seguidos por aquellos de 13 años o más, lo que sugiere un aumento en la prevalencia de cardiopatías con la edad. Las enfermedades más comunes fueron la enfermedad valvular mitral, seguida de la hipertensión pulmonar postcapilar asociada a valvulopatías y la cardiomiopatía fenotipo dilatada.

En cuanto a las cardiopatías congénitas, se encontró que representaban el 2.42% de los casos en perros, una cifra menor en comparación con el 11% observado en gatos. Basándose en datos de diferentes países, se sugiere realizar consultas cardiológicas para perros a partir de los 7 años de edad.

Se recomienda incrementar el número de casos clínicos examinados, especialmente en la población felina. Además, es esencial evitar la reproducción de razas con antecedentes de cardiopatías congénitas y hereditarias en perros. También se destaca la importancia de descartar la presencia de enfermedad renal crónica en perros con enfermedad crónica de la válvula mitral, según lo señalado por Martinelli (2016).

**References Références Referencias**


Evolution of Degenerative Myxomatous Mitral Valve Disease in Canine Fox Terrier - Case Report

By Keren Souza, Maryanne Santos & Carlos Carreli

Abstract- Degenerative mitral valve disease (DMVD) consists of progressive degeneration of the mitral valve that can occur either in isolation or in association with the tricuspid valve, leading to incomplete coaptation of its leaflets and subsequent valve regurgitation. It's the most common cardiac condition in small animals, accounting for about 75% of cases of heart disease in dogs, mainly affecting elderly small-breed dogs. Breeds with a genetic predisposition, such as Cavalier King Charles Spaniels and Bull Terriers, tend to develop the disease early. It can be classified into four stages: A, B, C, and D, with B having subdivisions (B1 and B2). Animals in stages A, B1, and B2 are asymptomatic, showing clinical signs only from stage C onwards. The report details the case of a 13-year-old Fox Terrier diagnosed at stage B2 of the disease, progressing to stage C within two years—a cardiologist conducted annual monitoring.

Keywords: degenerative myxomatous mitral valve disease, pimobendan, pulmonary edema.

GJMR-G Classification: NLMC Code:14.280.484, SF991
Evolution of Degenerative Myxomatous Mitral Valve Disease in Canine Fox Terrier - Case Report

Keren Souza, Maryanne Santos & Carlos Carrelli

**Simple Summary:** This work aims to report the case of an animal referred to a cardiologist in 2021, being diagnosed with Myxomatous Mitral Valve Disease in stage B2, and demonstrating the evolution of the disease to date.

**Abstract:** Degenerative mitral valve disease (DMVD) consists of progressive degeneration of the mitral valve that can occur either in isolation or in association with the tricuspid valve, leading to incomplete coaptation of its leaflets and subsequent valve regurgitation. It's the most common cardiac condition in small animals, accounting for about 75% of cases of heart disease in dogs, mainly affecting elderly small-breed dogs. Breeds with a genetic predisposition, such as Cavalier King Charles Spaniels and Bull Terriers, tend to develop the disease early. It can be classified into four stages: A, B, C, and D, with B having subdivisions (B1 and B2). Animals in stages A, B1, and B2 are asymptomatic, showing clinical signs only from stage C onwards. The report details the case of a 13-year-old Fox Terrier diagnosed at stage B2 of the disease, progressing to stage C within two years—a cardiologist conducted annual monitoring.

**Keywords:** degenerative myxomatous mitral valve disease, pimobendan, pulmonary edema.

I. INTRODUCTION

Degenerative myxomatous mitral valve disease (DMVM) is the most common heart disease in small animals, accounting for around 75% of cases of heart disease in dogs [9]. The prevalence of MVD increases markedly with age in small dogs, with up to 85% showing evidence of valve damage by 13 years of age [3].

According to Petrus Gimenes and Mantovani (2019), the proper functioning of the mitral valve is based on the structural and functional performance of six components: the posterior wall of the left atrium, the valve ring, the valve leaflets or cusps, the tendon chordae, the papillary muscles of the left ventricle and the left ventricular wall, each of these components plays an independent and synergistic role, contributing to complex functions that maintain valve competence. Any structural changes in the elements of the mitral apparatus affect valve mechanics, compromising its efficiency.

The disease involves a gradual myxomatous degeneration over time with the disorganization of collagen bundles and a reduction in their content, excess production of glycosaminoglycan that results in a change in the valve structure leading to poor coaptation of the leaflets. Poor coaptation of the leaflets allows regurgitation of the mitral valve, resulting in the murmur characteristic of the disease [7].

According to the latest consensus published by ACVIM in 2019, an echocardiogram (ECHO) and chest x-ray in the absence of ECHO are recommended to diagnose the disease. However, caution should be taken due to the marked variation in thoracic conformation and racial differences in the vertebral cardiac scales. The disease can also be recognized during a screening or routine examination by auscultating a typical heart murmur when there is regurgitation of the mitral valve.

The main symptoms that the animal presents when it reaches the advanced stage of the disease are Exercise intolerance, dry cough, decreased appetite, difficulty breathing, and syncope, which are findings associated with a worse prognosis in affected dogs [6].

According to the classification system for treating dogs with DMVM, published by Atkins et al. 2019, described below (Table 1) [9], there are four primary stages of the disease.

**Table 1:** Four preliminary stages of degenerative myxomatous mitral valve disease

<table>
<thead>
<tr>
<th>Stages</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage A</td>
<td>Identifies patients at high risk of developing heart disease but who do not yet have identifiable structural changes in the heart.</td>
</tr>
<tr>
<td>Stage B</td>
<td>Identifies patients with structural heart disease but who have never developed clinical manifestations of heart failure. This stage is divided into:</td>
</tr>
<tr>
<td></td>
<td>B1: Asymptomatic patients who do not present radiographic or echocardiographic evidence of cardiac remodeling in response to valve disease.</td>
</tr>
</tbody>
</table>

**Author a:** Graduating in Veterinary Medicine – Una – Pouso Alegre/MG – Brazil. e-mail: kerencristina90@hotmail.com

**Author p:** Internship supervisor, Veterinary Cardiologist - Pouso Alegre/MG – Brazil.
B2: Asymptomatic patients who present hemodynamically significant mitral valve regurgitation, evidenced by radiographic and echocardiographic findings of left heart enlargement.

Stage C Patients with previous or current clinical symptoms of heart failure associated with structural changes in the heart.

Stage D Patients with end-stage heart disease with signs of heart failure who are refractory to mainstay therapy require particular or advanced treatment strategies to remain comfortable regardless of the presence of the disease.

Source: Petrus; Gimenes; Mantovani - Treatise on cardiology of dogs and cats

This work aims to report the case of an animal referred to a cardiologist in 2021, diagnosed with Myxomatous Mitral Valve Disease in stage B2, and demonstrate the evolution of the disease to date.

II. Case Report

A Fox Terrier dog male, 13 years old, neutered, weighing 12 kg, was treated at the Veterinary Clinic Animal Medical Center (AMC) in Pouso Alegre - MG, Brazil, and was sent for cardiological evaluation. He consulted a general practitioner due to complaints of intense tremors, where a chest x-ray was requested. During this examination, an increase in the cardiac silhouette was observed in a topography corresponding to the left atrium, resulting in the patient being referred to a specialist.

In the anamnesis, the owners reported that the animal never had coughs, syncope, or convulsions, just tremors since it was a puppy. On physical examination, a grade 3/6 murmur was heard in the mitral focus, normal heart, and respiratory rates, systemic arterial hypertension (180mmHg), and normal-colored mucous membranes.

An echocardiogram (ECHO) (Figure 1) showed a thickened mitral valve and enlarged heart chambers. At first was prescribed Pimobendan PO at a dose of 0.25 mg/kg BID, continuous use, and requested to return in 30 days.

Upon return, the owners reported that the animal was more active and was not quickly tired. His pressure had already decreased from 180 mmHg to 160 mmHg, and he continued using pimobendan.

Figure 1: Echocardiogram 2021: Thickenened/degenerated mitral valve (A); Observed in Doppler mode, significant mitral valve insufficiency (B); Hemodynamic assessment - Mitral regurgitation gradient: 3.45 m/s / 47.68 mmHg; enlargement of left cardiac chambers; left ventricular diastolic dimension above normal limits was observed

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One year later, the animal returned for a new evaluation, repeating the ECHO (Figure 2), which showed the progression of the increase in the left atrium. The electrocardiogram (ECG) (Figure 3) shows baseline sinus arrhythmia with the presence of a premature ventricular complex (Figure 4). Owners report drowsiness, hyporexia, and syncope. However, they did not present tiredness or cough. Blood pressure was 80 mmHg.

Due to the arrhythmia, Sotalol was prescribed at a dose of 25 mg/kg PO, BID for continuous use, and Omega 3 PO at a dose of 600 mg/kg SID became necessary, and pimobendan continued.

*Figure 2:* Echocardiogram (2022): observed increase in the left atrium and ventricle; thickened/degenerated mitral valve (A); observed in a Doppler study, turbulent systolic flow within the left atrium, characterizing significant mitral valve insufficiency (B); systolic turbulent flow within the right atrium, representing mild tricuspid valve insufficiency (C); hemodynamic assessment - maximum velocity gradient mitral regurgitation: 3.51 m/s /49.22 mmHg; observed left ventricular diastolic dimension above normal limits with normal systolic function parameters, characterizing systolic dysfunction; preserved diastolic function
Table 2: Electrocardiographic report (2022)

<table>
<thead>
<tr>
<th>Observed parameters</th>
<th>Observed parameters</th>
<th>Observed parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>QRS axis: 67.07 °</td>
<td>QT Interval: 210 ms</td>
<td>Duration of T: 54 ms</td>
</tr>
<tr>
<td>P axis: 58.01 °</td>
<td>PR Interval: 108 ms</td>
<td>QRS duration: 72 ms</td>
</tr>
<tr>
<td>Amplitude of S: -0.06 mV</td>
<td>R amplitude: 2.26 mV</td>
<td>Minimum HR: 49 bpm</td>
</tr>
<tr>
<td>PR Segment: 52 ms</td>
<td>P amplitude: 0.22 mV</td>
<td>Average HR: 95 bpm</td>
</tr>
<tr>
<td>ST segment: 84 ms</td>
<td>T amplitude: -0.74 mV</td>
<td>Maximum HR: 297 bpm</td>
</tr>
<tr>
<td>Duration of P: 56 ms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments

Baseline sinus arrhythmia.

The QRS axis is within normal limits for the species. Episodes of the premature ventricular complex were observed.

An increase in the P wave and QRS complex duration was observed, suggesting atrial and left ventricular overload.

Ventricular repolarization disorder was observed due to the rise in the amplitude of the T wave (> 25% of the R wave), which is compatible with electrolyte changes and myocardial hypoxia.

Conclusions: Baseline sinus arrhythmia with the presence of premature ventricular complex...
At the beginning of 2023, the patient returned to repeat the cardiological evaluation. During the anamnesis, the Guardian reported that the patient did not present episodes of syncope and remained stable during this period, continuing the previously adopted treatment.

After eight months, the patient returned with a worsening condition, repeated ECHO (Figure 6) and ECG (Figure 7), where diastolic dysfunction and worsening of the arrhythmia were observed. Amiodarone 8.7 mg/kg orally was prescribed, replacing Sotalol, one tablet BID, and Furosemide (Lasix) 1.7 mg/kg orally was prescribed every 12 hours. Pimobendan was continued. After a week, a reassessment was carried out, and the ECG demonstrated stability in the arrhythmia (Figure 8).
Figure 6: Echocardiogram (September/2023): significant enlargement of the left heart chambers observed; observed in a Doppler study, systolic turbulent flow within the left atrium characterizing significant mitral valve insufficiency; Observed left ventricular diastolic dimension above standard limits, with normal systolic function parameters, indicating systolic dysfunction; A left ventricular filling pattern of the E>A wave type and an increased E/A ratio were observed, characterizing diastolic dysfunction (restrictive or pseudo-restrictive pattern)

Figure 7: Electrocardiogram (September/2023)
### Table 3: Electrocardiographic report (September/2023)

<table>
<thead>
<tr>
<th>Observed parameters</th>
<th>Observed parameters</th>
<th>Observed parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum HR: 71 bpm</td>
<td>T duration: 68 ms</td>
<td>S amplitude: -0.01 mV</td>
</tr>
<tr>
<td>Average HR: 125 bpm</td>
<td>QT interval: 196 ms</td>
<td>T amplitude: -0.32 mV</td>
</tr>
<tr>
<td>Maximum HR: 400 bpm</td>
<td>ST segment: 56 ms</td>
<td>P axis: 83.89 º</td>
</tr>
<tr>
<td>P duration: 48 ms</td>
<td>P amplitude: 0.29 mV</td>
<td>QRS axis: 81.32 º</td>
</tr>
<tr>
<td>QRS duration: 72 ms</td>
<td>R amplitude: 1.69 mV</td>
<td>PR Interval: 104 ms</td>
</tr>
</tbody>
</table>

**Comments:**

Sustained ventricular bigeminy with clusters of ventricular trigeminy and sinus arrhythmia.

Duration and amplitude of the P wave and QRS complex with values within normal limits for the patient's species, size, and age.

Normal electric axis.

Normal T wave.

Presence of polymorphic premature ventricular extrasystoles, isolated in pairs, in triplets, and at times organized into ventricular bigeminy and trigeminy.

Nothing else is worth noting during the 4 minutes and 41 seconds of monitoring.

**Conclusions:** Sustained ventricular bigeminy with clusters of ventricular trigeminy and sinus arrhythmia.

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**III. Discussion**

In the reported, he was asymptomatic, and the echocardiographic examination showed enlargement of the left heart chambers, thickened and degenerated mitral valve (Figure 1), left ventricular diastolic dimension above normal limits, with normal systolic function parameters, characterizing systolic dysfunction. The thickening and degeneration of the mitral valve indicates its insufficiency, and the other changes represent diastolic dysfunction.

Diagnosed with degenerative myxomatous mitral valve disease, treatment with pimobendan began. According to Boswood et al. (2016), its mechanism of action includes a positive inotropic combination and balanced vasodilation caused by calcium sensitization and phosphodiesterase inhibition, as a result, the effects of pimobendan may consist of increased cardiac output (CO), myocardial contractility and decreased preload and afterload.

In 2022, the animal returned for annual exams one year after the diagnosis. The ECHO showed an increase in the left atrium and ventricle, thickened/degenerated mitral valve (Figure 2), preserved diastolic function, and low probability of pulmonary hypertension; the ECG detected an increase in the duration of the P wave and the QRS complex (Figure 3), suggestive of atrial and left ventricular...
overload, baseline sinus arrhythmia with the presence of a premature ventricular complex.

In most cases, cardiac arrhythmias are not clinically relevant unless they are associated with heart disease or cause an extreme change in heart rate, being very slow, fast, or irregular. [10]. When choosing a medication for treatment, one must consider some things, such as clinical status, associated cardiac or systemic comorbidities, and drug association [13].

Class III antiarrhythmics block potassium channels, preventing a new action potential from occurring before complete repolarization, causing a prolongation of this potential and the refractory period [5].

Sotalol was prescribed to control the arrhythmia presented by the animal with DMVM. According to Treseder et al. (2019), Sotalol is an antiarrhythmic agent commonly used in human and veterinary medicine to control ventricular and supraventricular arrhythmias. Its antiarrhythmic properties are well established and are attributed mainly to the blockade of potassium channels with concomitant non-selective β-adrenergic blockade.

In 2023, the animal returned and repeated only the ECHO (Figure 5), where no significant changes were observed during this period, except for a structural change in the mitral valve, identifying a prolapse and increase in the left ventricular diastolic dimension, with systolic function parameters, characterizing systolic dysfunction; diastolic function remained preserved.

Petrus, Gimenes, and Mantovani (2019, p. 156) report that mitral valve prolapse is a common complication that generally occurs with the progression of MVD. As MVD progresses, mitral valve regurgitant flow increases, promoting volume overload in the left atrium, with an increase in filling pressures in the left heart chambers. There is also progressive cardiac remodeling, characterized by eccentric hypertrophy, initially in the left atrium and, later, in the left ventricle. Systolic dysfunction occurs in the advanced stages of MVD, which culminates in hemodynamic changes and progressive diastolic dysfunction of the left ventricle, affecting general cardiac performance and determining the appearance of congestive heart failure syndrome.

In the same year, eight months later, the patient returned with a worsening condition, presenting pulmonary edema. The animal's condition progressed to stage C with these changes, requiring repeat echocardiographic and electrocardiographic examinations.

The ECHO (Figure 6) showed an increase in the cardiac chambers and diastolic dysfunction compared to the previous exam. The ECG (Figure 7) revealed polymorphic premature ventricular extrasystoles. Due to this change, Sotalol was replaced by amiodarone.

Amiodarone is also a class III antiarrhythmic, being the most indicated in these cases as it is considered broad spectrum and can be used in supraventricular and ventricular arrhythmias [5]. However, its use should be reserved for cases where the animal no longer responds to sotalol treatment due to its various side effects [10]. Its most common adverse effects are liver changes, causing an increase in the concentration of gastrointestinal and enzymes, such as vomiting, diarrhea, and anorexia [11]. Usually, these effects are dose-dependent and reversible if their supply is interrupted at the beginning of clinical manifestations [10].

For pulmonary edema, furosemide (Lasix) was prescribed. Furosemide is a loop diuretic widely used in veterinary clinics. The Food and Drug Administration (FDA) has approved furosemide to treat conditions with volume overload and edema secondary to exacerbation of congestive heart failure, liver failure, or renal failure, including nephrotic syndrome [4]. Its mechanism of action is to inhibit the tubular reabsorption of sodium and chloride in the proximal and distal tubules and in the thick ascending loop of Henle, inhibiting the sodium chloride co-transport system, resulting in excessive excretion of water along with sodium, chloride, magnesium, and calcium [4].

One week later, the patient returned for a reevaluation of the ECG (Figure 8), demonstrating stability in the arrhythmia.

In 2023, there were some complications regarding the patient's treatment. The owner reported that he was no longer able to administer the medications as recommended, providing pimobendan every 24 hours or at a longer interval. Regarding other medications, it was said that the animal accepted it more quickly but could not administer it at the correct time, which may justify the worsening of the condition in a short period. The animal is currently stable and continues to receive monitoring.

IV. Conclusion

Myxomatous mitral valve degeneration is a progressive disease responsible for the most significant number of heart diseases in small animals. We observed that the time for the disease to progress from stage B2 to C was two years, with correct monitoring and treatment reducing its progression over a while. Medications were essential in this case to keep the animal's condition stable.

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Effectiveness of the use of DAFS-25 in the Standard Hepatitis Treatment Regimen for Dogs

By Poberezhets E. P. & Rodionova T. N.

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Abstract- The article provides a study on the effectiveness of the drug DAFS-25 in the standard hepatitis treatment regimen for dogs. The study was conducted in a veterinary clinic «Alabai», Astrakhan, based on the treatment of dogs of the Caucasian wolfhound breed from Kangly kennel. Key indicators of liver status in dogs were taken in the study: alkaline phosphatase (ALP), ALT, AST, ALB (albumin), (TB) total bilirubin, (TP) total protein; in the process of treatment, based on the results of the biochemical rapid analyzer Seamaty 120VP, animals were divided into three groups (one control and two experimental groups) by analyzing their state. Fifteen dogs aged 3-6 were reviewed in the study, the average weight of animals was 65 kg. Biochemical analysis was carried out at the beginning of the study, on the twentieth day and after the end of therapy. The standard treatment regimen was used in the control group and the drug DAFS-25 was added into the standard treatment regimen of experimental groups at a dose of 1.6 mg/kg (104 mg/head) in the second group and 4.8 mg/kg (312 mg/head) in the third group.

Keywords: drug, DAFS-25, hepatitis, caucasian wolfhound, treatment regimen.

GJMR-G Classification: NLMC Code: E05.393.805
Effectiveness of the use of DAFS-25 in the Standard Hepatitis Treatment Regimen for Dogs

Эффективность Применения Препарата Дафс-25 В Стандартной Схеме Лечения Гепатитов У Собак

Poberezhets E. P. & Rodionova T. N.

Abstract - The article provides a study on the effectiveness of the drug DAFS-25 in the standard hepatitis treatment regimen for dogs. The study was conducted in a veterinary clinic «Alabai», Astrakhan, based on the treatment of dogs of the Caucasian wolfhound breed from Kangly kennel. Key indicators of liver status in dogs were taken in the study: alkaline phosphatase (ALP), ALT, AST, ALB (albumin), TB (total bilirubin), TP (total protein); in the process of treatment, based on the results of the biochemical rapid analyzer Seamaty 120VP, animals were divided into three groups (one control and two experimental groups) by analyzing their state. Fifteen dogs aged 3-6 were reviewed in the study, the average weight of animals was 65 kg. Biochemical analysis was carried out at the beginning of the study, on the twentieth day and after the end of therapy. The standard treatment regimen was used in the control group and the drug DAFS-25 was added into the standard treatment regimen of experimental groups at a dose of 1.6 mg/kg (104 mg/head) in the second group and 4.8 mg/kg (312 mg/head) in the third group. There were no lethal outcomes during the study period. The drug DAFS-25 was taken for the research, as it has strong antioxidant properties, positively affects the animals’ body from negative environmental factors, fills selenium deficiency in the body of animals. It positively affects the composition of the blood, improves metabolic processes of the whole organism. As a result of treatment, the general condition of the animals who received therapy came to the physiological norm, biochemical parameters taken at the end of therapy returned to normal, which indicated a complete recovery of the dogs. Studies have shown the efficacy of the drug in the second and third experimental groups, which allows to suggest the drug DAFS-25 as an alternative to other hepatoprotective drugs in the treatment of liver diseases and hepatitis.

Keywords: drug, DAFS-25, hepatitis, caucasian wolfhound, treatment regimen.

I. Введение/INTRODUCTION

В последнее время в ветеринарной практике у собак встречаются очень часто болезни печени. Одно из самых распространенных заболеваний печени является гепатит. Гепатит – это воспалительные заболевания печени, в результате чего орган не выполняет свои основные функции (вывод токсинов из организма, обмен веществ, усвоение витаминов и микроэлементов), и это приводит к ослаблению организма, нарушению работы других органов и систем, интоксикации. Причины возникновения гепатитов у собак
различен. Алиментарный гепатит является одним из часто встречающихся заболеваний в ветеринарной практике. Возникновение заболевания напрямую зависит от нерационального питания, которое приводит к нарушению функционального состояния печени, обмена веществ и в целом на организм животного. Процент смертельных исходов составляет 30-40%. В результате разнообразия патоморфологических изменений при гепатите у собак как правило отмечают пат изменения в желчном пузыре и печени, а так же желтушность слизистых.[1]

I. Introduction

Recently in veterinary practice, liver diseases are common in dogs. Hepatitis is one of the most common liver diseases. Hepatitis is an inflammatory liver disease as a result of which the organ does not perform its basic functions (removal of toxins from the body, metabolism, assimilation of vitamins and trace elements) and this leads to a general weakening of the body, violations in the work of other organs and systems, intoxication. The causes of hepatitis in dogs are different. Nutritional hepatitis is one of the most common diseases in veterinary practice. The occurrence of the disease directly depends on malnutrition, which leads to a violation of the functional state of liver, metabolism and generally the whole organism of an animal. The percentage of deaths is 30-40%. As a result of the diversity of pathomorphological changes with hepatitis in dogs pathological changes in the gall bladder and liver, as well as yellowing of mucous membranes are usually noted.

II. Materialy и Методы

Исследования проводились с апреля по май 2023 года, в рамках ветеринарной клиники «Алабай» и питомника кавказских волкодавов «Канглы» в г. Астрахань. В результате работы было сформировано три группы по пять собак в каждой группе, в возрасте от 3 до 6 лет, весом 65кг. Всего в работе было обследовано 15 собак. Распределение больных животных по группам имело случайный характер. Группы были выделены на основании схемы лечения. Первая (контрольная) группа животных получали лечение по стандартной схеме, которая включала препараты 5% раствор глюкозы 8мл/кг, гептрал 400мг на гол, мильгамма 2мг на гол 0,9% раствор NaCl 10мг/кг. Вторая (опытная) группа так же получала стандартное лечение, но в схему был добавлен органолептический препарат ДАФС-25 в дозе 1,6 мг/кг (104мг/гол.). Третья группа (опытная) гдоживотные получали лечение по той же схеме, что и вторая с добавлением селенорганического препарата ДАФС-25 в дозе 4,8 мг/кг (312 мг/гол.).

III. Результаты Исследований/Research Results

На момент исследования у собак отмечались четко выраженные клинические признаки гепатита, температура тела повышалась до 40 градусов, при осмотре было выявлена слабость слизистых оболочек ротовой полости, десен и склер глаз, у некоторых животных отмечалась незначительная желтушность, желудочно-кишечный тракт нарушен (понос, а у некоторых животных кал содержал непереваренную пищу), снижение аппетита, угнетение общего состояния собак, периодическая рвота. При пальпации отмечалась болезненность в области печени. При УЗИ диагностика увеличение печени, края неровные, повышение эхогенности.[5]

Для оценки влияния препарата ДАФС-25 производили забор крови в начале исследования, на седьмой день и в конце опыта на большую [4]. Биохимический анализ крови проводился на экспресс анализаторе Seamty 120VP. Для наглядности и подтверждения диагноза были взяты наиболее информативные биохимические показатели крови: щелочная фосфатаза (ALP), ALT, AST, общий билирубин (TB), альбумины (ALB), общий белок (TP).[4].

В начале исследования после забора крови полученные показатели были усреднены и представлены в таблице1.
Таблица 1. Биохимические показатели крови собак в начале исследования

<table>
<thead>
<tr>
<th>Обозначения</th>
<th>Показатели</th>
<th>Норма</th>
<th>1 группа (контрольная группа)</th>
<th>2 группа опытная (ДАФС-25 в дозе 104 мг/гол)</th>
<th>3 группа опытная (ДАФС-25 в дозе 312 мг/гол)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALB</td>
<td>Альбумины, г/л</td>
<td>22-39</td>
<td>17±1,20*</td>
<td>19±1,50*</td>
<td>20,6±1,51*</td>
</tr>
<tr>
<td>TB</td>
<td>Общий билирубин, мкмоль/л</td>
<td>0,9-10,6</td>
<td>11,7±0,23*</td>
<td>13,4±0,25*</td>
<td>11,5±0,23*</td>
</tr>
<tr>
<td>TP</td>
<td>Общий белок, г/л</td>
<td>50-100</td>
<td>43±2,11*</td>
<td>46±2,08*</td>
<td>47±2,09*</td>
</tr>
<tr>
<td>ALP</td>
<td>Щелочная фосфатаза, ед/л</td>
<td>10,6-100,7</td>
<td>111,8±3,22*</td>
<td>115,2±3,25</td>
<td>110,3±3,20*</td>
</tr>
<tr>
<td>ALT</td>
<td>АЛТ, ед/л</td>
<td>8,2-57,3</td>
<td>67±2,24*</td>
<td>65,3±2,22*</td>
<td>68,8±2,24*</td>
</tr>
<tr>
<td>AST</td>
<td>АСТ, ед/л</td>
<td>8,9-48,5</td>
<td>55,3±2,12*</td>
<td>57,9±2,13*</td>
<td>58,2±2,13*</td>
</tr>
</tbody>
</table>

Примечание: * p<0,05 относительно физиологической нормы

При исследовании крови собак больных гепатитом в начале лечения отмечается понижение альбуминов у контрольной группы на 29,41% по отношению к физиологической норме, в опытных (второй и третьей) на 15,79%-6,38%, снижение общего белка у контрольной первой группы на 16,28%, а второй и третьей опытных групп на 8,70% -6,38% от нормы. Повышение показателей АСТ и ALT, ACT на 14,02% в контрольной группе, а у опытных 19,38-19,59%, ALT повысился на 16,93% в первой группе, второй и третьей на 13,96%-18,67% относительно физиологической нормы крови. Показатель щелочной фосфатазы крови был повышен у первой контрольной на 11,02%, у опытных 14,20% - 9,53% по отношению к норме. Уровень общего билирубина у всех собак был повышен относительно физиологической нормы на 10,38% первая группа и на 22,64% -8,49%.

Повторное исследование крови собак больных гепатитом проводилось на двадцатый день лечения у всех групп.

Таблица 2. Биохимические показатели крови собак на двадцатый день исследования

<table>
<thead>
<tr>
<th>Обозначения</th>
<th>Показатели</th>
<th>1 группа (контрольная)</th>
<th>2 группа опытная (ДАФС-25 в дозе 104 мг/гол)</th>
<th>3 группа опытная (ДАФС-25 в дозе 312 мг/гол)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALB</td>
<td>Альбумины, г/л</td>
<td>18,5±1,21</td>
<td>20,8±1,23*</td>
<td>21,7±1,24*</td>
</tr>
<tr>
<td>TB</td>
<td>Общий билирубин, мкмоль/л</td>
<td>10,9±0,11</td>
<td>10,7±0,10*</td>
<td>10,6±0,10*</td>
</tr>
<tr>
<td>TP</td>
<td>Общий белок, г/л</td>
<td>45±2,08</td>
<td>47±2,09*</td>
<td>49±2,11*</td>
</tr>
<tr>
<td>ALP</td>
<td>Щелочная фосфатаза, ед/л</td>
<td>101,3±3,21</td>
<td>65,3±2,22*</td>
<td>63,7±2,23*</td>
</tr>
<tr>
<td>ALT</td>
<td>АЛТ, ед/л</td>
<td>58,2±2,13</td>
<td>52,6±2,12*</td>
<td>51,8±2,10*</td>
</tr>
<tr>
<td>AST</td>
<td>АСТ, ед/л</td>
<td>52,4±2,10</td>
<td>50,7±2,08*</td>
<td>49,2±2,02*</td>
</tr>
</tbody>
</table>

Примечание: * p<0,05 относительно результатов анализов первой контрольной группы

При взятии биохимических анализов крови на двадцатый день после начала лечения было отмечено, что показатели были значительно пониженны в второй и третьей группах относительно первой. Щелочная фосфатаза была ниже на 59,03%-55,85%, показатель АЛТ был снижен на 12,36%-10,65%, АСТ понизился 5,69%-2,56%, общий билирубин так же был снижен на 2,83%-1,87%. Отмечено повышение альбуминов у второй и третьей группах на 12,43%-17,30% по отношению к контрольной первой группе. Общий белок так же повысился 4,44%-8,89% по отношению к первой группе.
Таблица 3. Биохимические показатели крови собак по окончанию исследования

<table>
<thead>
<tr>
<th>Обозначения</th>
<th>Показатели</th>
<th>1 группа (контрольная)</th>
<th>2 группа опытная (ДАФС-25 в дозе 104 мг/л)</th>
<th>3 группа опытная (ДАФС-25 в дозе 312 мг/л)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALB</td>
<td>Альбумины, г/л</td>
<td>23±1,52</td>
<td>25±1,53*</td>
<td>27±1,55*</td>
</tr>
<tr>
<td>TB</td>
<td>Общий билирубин, мкмоль/л</td>
<td>8,7±0,21</td>
<td>5,4±0,18*</td>
<td>3,5±0,20*</td>
</tr>
<tr>
<td>TP</td>
<td>Общий белок, г/л</td>
<td>51±2,15</td>
<td>58±2,17*</td>
<td>63±2,22*</td>
</tr>
<tr>
<td>ALP</td>
<td>Щелочная фосфатаза, ед/л</td>
<td>23,3±1,23</td>
<td>22,5±1,08*</td>
<td>18,4±1,20*</td>
</tr>
<tr>
<td>ALT</td>
<td>АЛТ, ед/л</td>
<td>37,8±1,43</td>
<td>35,5±1,40*</td>
<td>33,8±1,42</td>
</tr>
<tr>
<td>AST</td>
<td>АСТ, ед/л</td>
<td>24,8±1,22</td>
<td>21,5±1,12*</td>
<td>19,3±1,13*</td>
</tr>
</tbody>
</table>

Примечание:* p<0,05 относительно результатов анализов первой контрольной группы.

При повторном взятии крови на биохимические показатели после лечения наблюдались достоверные изменения в крови. Так щелочная фосфатаза у всех опытных животных снизилась до 18,5 г/л – третьей группы, второй 22,5 ед/л против 23,3 ед/л контрольной группы. Отмечено снижение ферментов печени у собак второй и третьей групп ЛП до 33,8 ед/л против 37,8 ед/л контрольной группы, АСТ в опытных группах снизилась до 21,5 ед/л во второй группе и до 19,3 ед/л в третьей опытной группе против 24,8 ед/л относительно первой группы. Отмечено снижение общего билирубина у собак опытных групп до 3,5 – 5,4 мкмоль/л против 8,7 мкмоль/л контрольной группы. Повысилась альбумин до 27 г/л – 25 г/л т.е. 23 г/л, общий белок до 63 г/л – 58 г/л по отношению к 51 г/л первой контрольной группе.

Курс лечения у собак на момент исследования составил 45 дней. В результате чего на момент окончания лечения у собак экспериментальных групп (контрольной группы) и в схемах включающих стандартное лечение и ДАФС-25 в дозах 1,6 мг/кг (104 мг/гол) и 4,8 мг/кг (312 мг/гол) улучшилось общее состояние животных, аппетит нормализовался, отсутствовала рвота, масса тела пришла в норму, температура тела отсутствовала, что свидетельствовало об активизации обменных процессов в печени. Возобновилась работа желудочно-кишечного тракта, видимые слизистые ротовой полости и склеры глаз были розового цвета. В результате пальпации отсутствовала болезненность в области печени.

IV. Выводы/Conclusions

При исследовании использование различных схем лечения показало, что стандартные схемы лечения с добавлением препарата ДАФС-25 обладают более эффективным влиянием на печень. Препарат ДАФС-25 обладает сильными антиоксидантными свойствами и выраженным гепатопротекторным действием при гепатите у собак, о чем свидетельствуют данные исследований биохимических показателей и общего состояния животных на момент исследования.

Effectiveness of the use of DAFS-25 in the standard hepatitis treatment regimen for dogs

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EARLY INVITATIONS TO ALL THE SYMPOSIUMS, SEMINARS, CONFERENCES
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Associates get secure and fast GJ work emails with 5GB forward of emails that they may use them as their primary email. For example, john [AT] globaljournals [DOT] org.

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Access to all the premium tools

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Preferred Author Guidelines

We accept the manuscript submissions in any standard (generic) format.

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Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

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The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.
Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27” x 11’”, left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word “Abstract” in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper’s subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned un refereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.

j) There should be brief acknowledgments.

k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

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It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

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The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

**Author details**

The full postal address of any related author(s) must be specified.

**Abstract**

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

**Keywords**

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

**Numerical Methods**

Numerical methods used should be transparent and, where appropriate, supported by references.

**Abbreviations**

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

**Formulas and equations**

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

**Tables, Figures, and Figure Legends**

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.
Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Electronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

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Tips for Writing a Good Quality Medical Research Paper

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of medical research then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

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6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.
20. **Think technically:** Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. **Adding unnecessary information:** Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn’t be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. **Report concluded results:** Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. **Upon conclusion:** Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

**Informal Guidelines of Research Paper Writing**

**Key points to remember:**

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

**Final points:**

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

**The introduction:** This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

**The discussion section:**

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

**General style:**

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

**To make a paper clear:** Adhere to recommended page limits.
**Mistakes to avoid:**

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don’t address the reviewer directly. Don’t use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

**Title page:**

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

**Abstract:** This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

**Reason for writing the article—theory, overall issue, purpose.**

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

**Approach:**

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

**Introduction:**

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.
The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:
Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):
This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:
- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:
It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:
- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.
Results:
The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective
details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to
present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data
or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if
requested by the instructor.

Content:
- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if
  appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or
  manuscript.

What to stay away from:
- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:
As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:
If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached
appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and
include a heading. All figures and tables must be divided from the text.

Discussion:
The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded
based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the
paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results
and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The
implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain
mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have
happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the
data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded
or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

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Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

**Approach:**

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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