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BIOREGULATORY MEDICINE FOR THE MANAGEMENT OF LEAD IN TWO ANDEAN CONDORS (VULTUR GRYPHUS), SANTANDER-CUNDINAMARCA-COLOMBIA. CASE REPORT

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Keywords (MeCS): Complementary therapies, lead poisoning, wild animals, homeopathy.

INTRODUCTION

Wild populations of the Andean Condor (Vultur gryphus) have suffered an alarming decline in recent decades. The condition of the species has gone from being endangered to a critical in countries such as Venezuela, Colombia, Ecuador and Peru. Despite the scant information on this species in the country, it is known that this species is drastically declining in the countries that make up the northern Andes. According to experts, it is estimated that only around 150 individuals remain in Colombia.[1] The main threat facing this species is humans and the mistaken belief about its supposed predatory activity on livestock, lead poisoning is the most common form of heavy metal toxicity in birds and is now probably the most frequent poisoning induced in birds. Worldwide. Both free-living and captive birds are at risk of lead poisoning[2]. Additionally, lead chelation treatment, which is carried out with calcium disodium edetate, is not easily accessible in Colombia, which makes medical management of this type of situation difficult, placing the conservation of this species at risk. This case report shows the management of two cases of lead poisoning in the Andean Condor (Vultur gryphus) in the wild, from bioregulatory medicine, thanks to which they could be successfully released in record time. Finally, this report will contribute to the clinical management of this type of conditions not only in the species in question but also in other animals and even in the reformulation of the management of acute and chronic exposures to lead in humans.

INFORMATION OF THE PATIENT

The report of this case is of two individual animals, Condor of the Andes (Vultur gryphus) that were found with signs of intoxication at the end of last year, in a moor located in the municipality of Cerrito-Santander (Colombia), where they were provides initial medical care (a dose of atropine (doses are not reported) and a dose of mineral oil (doses are not reported) is provided and which report that the individuals presented several episodes of vomiting before being transferred. These animals were transferred 5 days then to the Wakatá-Jaime Duque Biopark (Cundinamarca-Colombia), where they were treated in a timely manner, stabilized, hydrated (20 ml of Nacl 0.9% IV for the female and 30 ml of Nacl 0.9% IV for the male) administered a dose of activated charcoal to the Female with an esophageal probe at a dose of 3 gr/kg, Atropine was administered at a dose of 0.5mg/kg (¼ IV y ¾ IM) and the bioregulatory medicine approach was started immediately (it will be described in the treatment section). Possible organophosphate, carbamate and/or lead poisoning was established as a presumptive diagnosis.

CLINICAL FINDINGS

The day the individuals arrived, the following findings were observed as a result of the clinical examination.

INDIVIDUAL 1

Condor Female (H)

Age: Adult (identified to be around 20 years old) Dehydration rate: 10%

Body condition: 1/5 Mental state: depression Weight: 7.2 kg

Forecast: Bad

1.https://sostenibilidad.semana.com/medio-ambiente/articulo/condor-andino-en-colombia-por-que-crecio-su-poblacion/38401

2. Ian J.Fishera Deborah J.Paina Vernon G. Thomasb. A review of lead poisoning from ammunition sources in terrestrial birds. Biological Conservation. Volume 131, Issue 3, August 2006, Pages 421-432.

https://www.4vultures.org/2016/11/30/lead-poisoning-and-vultures-new-scientific-contributions/

INDIVIDUAL 2 C

Condor Male(M) Age: Juvenile

Dehydration percentage: 8% Body condition:

2/5

Mental state: Alert Weight: 10 kg Prognosis: Reserved

On the day of arrival, multiple x-rays are taken of both individuals, finding in the Female Condor findings compatible with lead particles in her digestive tract (Figure 1).

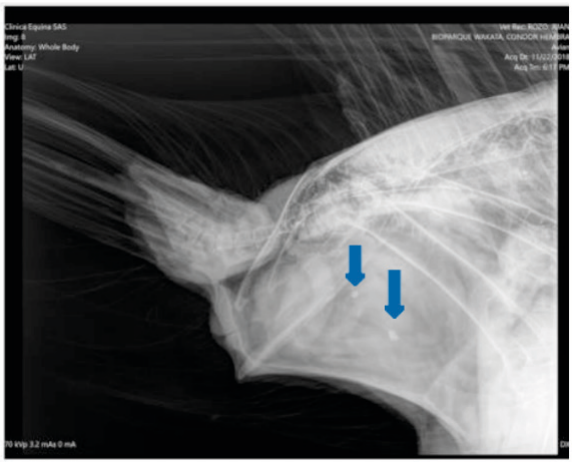


Figure 1: Possible lead particles in the digestive tract of Condor Female (Vultur gryphus)

Source: Biopark Wakatá, 2018.

The results obtained during the entire recovery period are shown below. It must be noted that the indicator used to assess their recovery, in addition to the improvement in clinical signs, was the improvement of blood chemistry, mainly uric acid and phosphorus, and the level of leukocytes, and that these allow a direct relationship with the drugs used (Table 1, Figures 2-4, Table 2 and 3):

Regarding blood lead levels, it is assumed that levels above 30µg/dl[3], other authors report that levels between 6 and 10µg/dl indicate concern and could be a suggestion of chronic intoxication, which is characterized in part by vomiting and progressive weight loss among others[4]. In accordance with the above, the animals arrived with symptoms compatible with this type of intoxication. The levels of lead blood levels found on day zero (time of arrival of the condors) and the behavior throughout the treatment period are shown below (Table 2 and Figure 5).

Throughout the recovery process, blood chemistry measurements were performed, the results of each of the analytes (Table 3) and the behavior of some chemicals are presented below (Figures 6-8).

DIAGNOSTIC PROCESS

As it was previously mentioned, the initial presumptive diagnosis was poisoning according to the signs of depression, vomiting, loss of appetite and his body condition added to the information provided by the personnel who initially attended him and the epidemiology of this species in neighboring countries. and of the world.

Subsequently, with the values of Lead in the blood (See Table 2), due to the marked leukopenia (See Table 1) and the clinical signs described at the beginning in point 5 of clinical findings, it is determined as a probable diagnosis: lead poisoning and another toxic as organophosphates and/or carbamates according to those used by the peasants of the area. However, these last two could not be identified due to the time elapsed between the discovery of the individuals and their arrival at the biopark. In this sense, exposure to lead by individuals is important and was considered a vital part of the established homotoxicological treatment protocol.

To assess his recovery, in addition to the improvement of clinical signs, the

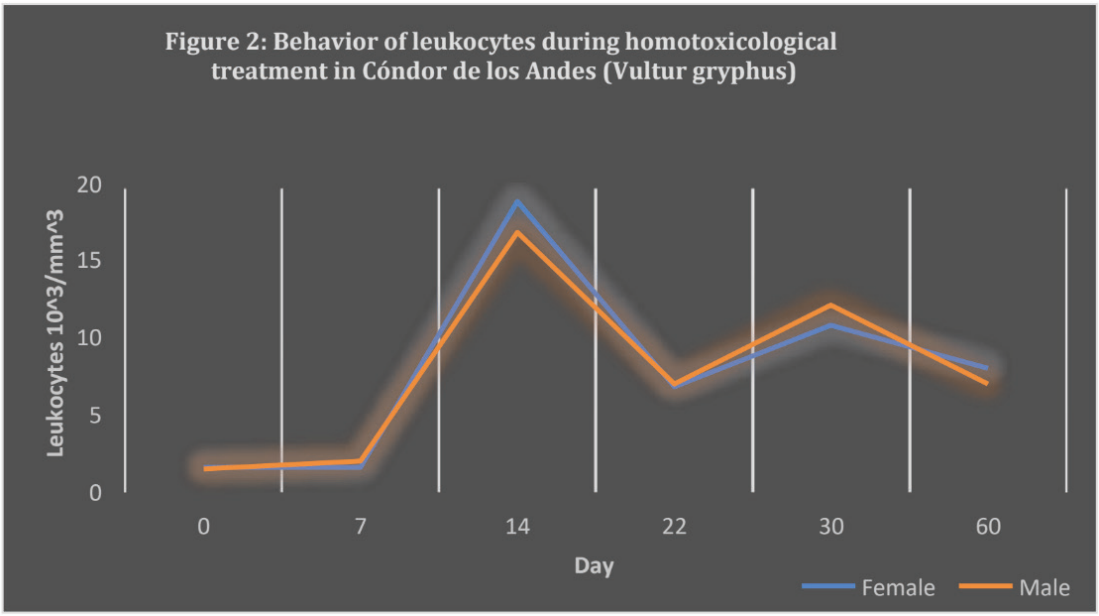
3. Jiri Pikula, et al. Lead toxicosis of captive vultures: case description and responses to chelation therapy. BMC Veterinary Research 2013, 9:11 http://www.biomedcentral.com/1746-6148/9/11

4. Kelly TR, Johnson CK. Lead exposure in free-flying turkey vultures is associated with big game hunting in California. PLoS One. 2011 Apr 6;6(4).

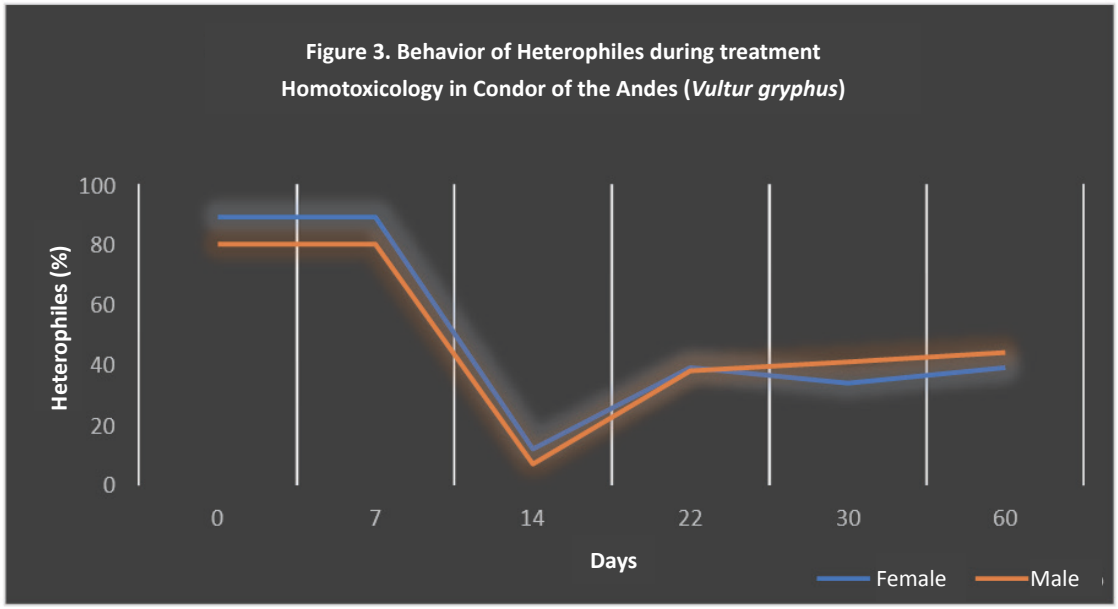
ANALYTE	Day 0		Day 7		Day 14		Day 22		Day 30		Day 60		VALUE OF REFE-RENCE	UNIT
	H	M	H	M	H	M	H	M	H	M	H	M		
Hematocrit	49	50	49	41	41	33	53	50	50	53	53	51	**(41- 51)**	**%**
Hemoglobin	16,3	20	16,3	13,7	13,7	11	17,7	16,7	16,7	17,7	17,7	17	**(14- 22)**	**g/dl**
Red blood cells	2,46	2,22	2,46	2,22	1,11	1,6	2,1	2,05	3,3	1,8	2,7	2,8	**(1-2,6)**	**10^6/ mm ^3**
Leukocytes	**1,6**	**1,5**	**1,6**	**2**	18,8	16,8	6,8	7	10,8	12,1	8	7	**(4- 10,1)**	**10^3/ mm ^3**
HeterophileR	89	80	89	80	12	7	39	38	34	41	39	44	**(34- 69)**	**%**
Heterophile A	1,4	1,6	1,4	1,6	2,3	1,2	2,7	2,7	3,7	5	2,7	3		**10^3/ mm ^3**
Lymphocytes R	10	11	10	20	88	93	61	62	66	59	61	66	**(24- 66)**	**%**
Lymphocytes A	0,2	0,4	0,2	0,4	16,5	15,6	4,1	4,3	7,1	7,1	4	4		**10^3/ mm ^3**
Monocytes R	0	0	0	0	0	0	0	0	0	0	0	0	**(0-6)**	**%**
Monocytes A	0	0	0	0	0	0	0	0	0	0	0	0		**10^3/ mm ^3**
Eosinophils R	1	0	0	0	0	0	0	0	0	0	0	0	**(0-1)**	**%**
Eosinophils A	0	0	0	0	0	0	0	0	0	0	0	0		**10^3/ mm ^3**
Basophils R	3	2	0	0	0	0	0	0	0	0	0	0	**(0-2)**	**%**
Basophils A	0	0	0	0	0	0	0	0	0	0	0	0		**10^3/ mm^3**
Platelets	1,5	1	1,5	1,5	1,69	1,84	2,01	1,97	2,2	2,4	2,2	2,2	**(1-9)**	**10^5/ mm^3**
			linfocitos reactivos 15%	linfocitos reactivos 8%	linfocitos reactivos 10%	linfocitos reactivos 45%	linfocitos reactivos 18%	linfocitos reactivos 10%	linfocitos reactivos 8%	linfocitos reactivos 4%				
R: Relative A: Absolute														
H: Female M: Male														

Table 1: Cóndor de los Andes (Vultur gryphus) blood cells during the recovery period

Source: Biopark Wakatá, 2018.



Source: Agudelo AN, 2018-2019.



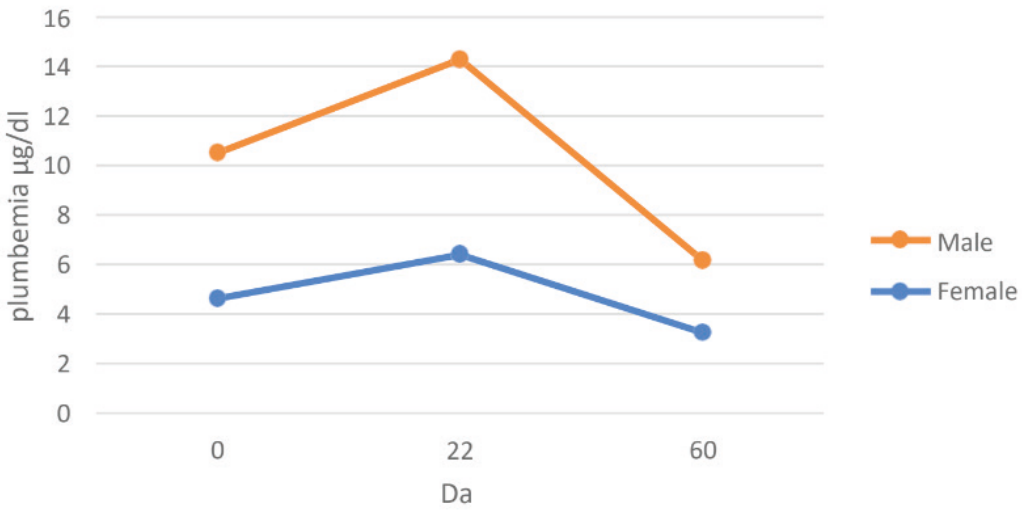
Source: Agudelo AN, 2018-2019.

ANALYTE	Day 0		Day 22		Day 60		UNIT
	Female	Male	Female	Male	Female	Male	
Lead in blood	4,63	5,88	6,4	7,89	3,25	2,92	µg/dl

Table 2. Plumbemia in Condor of the Andes (Vultur gryphus) during the treatment period.

Source: Biopark Wakatá, 2018-2019.

Figure 5. Niveles y comportamiento de plumbemia en Cóndor de los Andes (*Vultur gryphus*) durante periodo de tratamiento



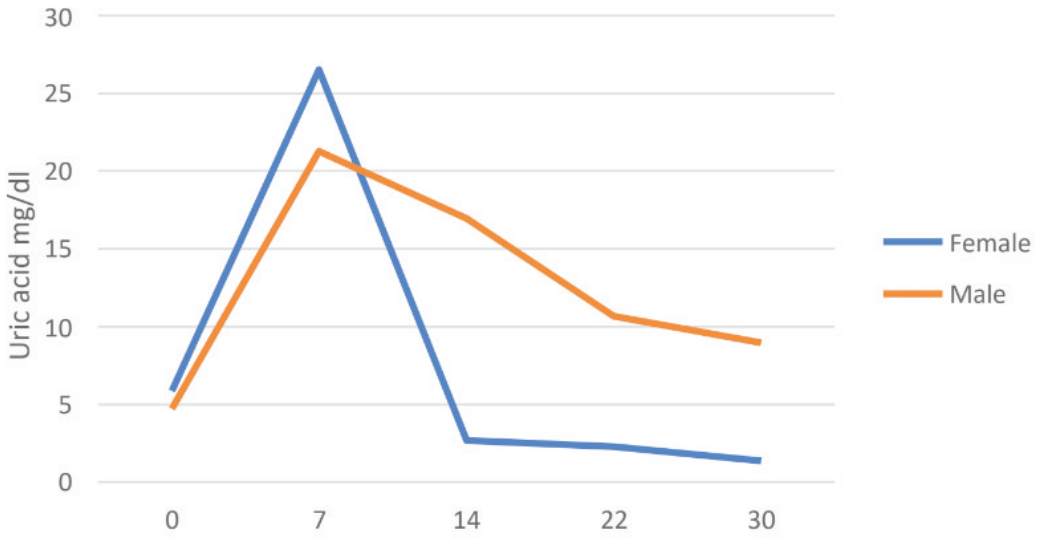
Source: Agudelo AN, 2018-2019.

ANALYTE	Day 0		Day 7		Day 14		Day 22		Day 30		Day 60		VALUES OF REFERENCE	UNIT
	H	M	H	M	H	M	H	M	H	M	H	M		
AST	47	44			22,91	32,02	13,99	26,94	19,77	29,2	15,49	28,2	**(11-43)**	**U/L**
URIC ACID	5,87	4,71			**26,53**	**21,2**	2,68	**16,9**	2,26	10,65	1,36	8,97	**(2-12)**	**mg/dl**
PHOS-PHORUS	4,23	6,05					**13,36**	**12,27**	5,79	5,29	5,11	4,31	**(3-6)**	**mg/dl**
FAS	146	NE			373,56	**106**	69,29	440,5	70	438,2			**(106-536)**	**U/L**
SERUM CALCIUM	8,8	NE									7,4	8,36	**(6-10)**	**mg/dl**
BT	1	1,2	1		1,11	1,03	**1,85**	1,11	**1,27**	1,09	**1,42**	1,03	**(0,17-1,26)**	**mg/dl**
BD	**0,7**	**0,7**	**0,7**		0,18	0,22	0,49	0,11	**0,55**	**0,83**	**1,03**	**0,51**	**(0,1-0,45)**	**mg/dl**
BI	0,3	0,4	0,3		**0,93**	**0,81**	**1,36**	**1**	**0,72**	0,26	0,39	0,52	**(0,13-0,57)**	**mg/dl**
PT	5	5,2	5	4,2	5	**5,9**	5,4	5	5,4	5	**5,8**	5,2	**(2,5-5,5)**	**g/dl**
ALB	**1,8**	1,3	**1,82**	1,38	1,26	1,45	1,38	**1,52**	**2,6**	**2,6**	1,4	1,3	**(0,8-1,5)**	**g/dl**
GLOB	3	2,8	3,18	2,82	3,74	4,45	4,02	3,48	2,8	2,4	4,4	3,9	**(1,5-4,5)**	**g/dl**
H: Female, M: Male														

Table 3. Blood chemistry values of the Andean Condor (Vultur gryphus) during the recovery period.

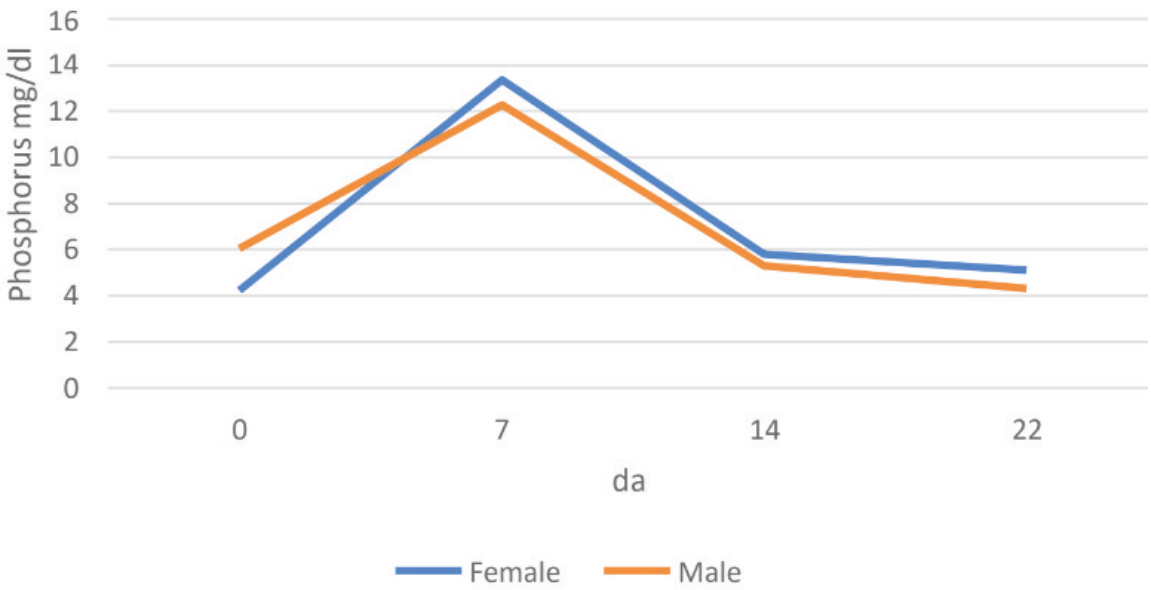
Source: Biopark Wakatá, **2018.**

Figure 6. Levels and behavior of uric acid in Cóndor de los Andes (Vultur gryphus) during treatment



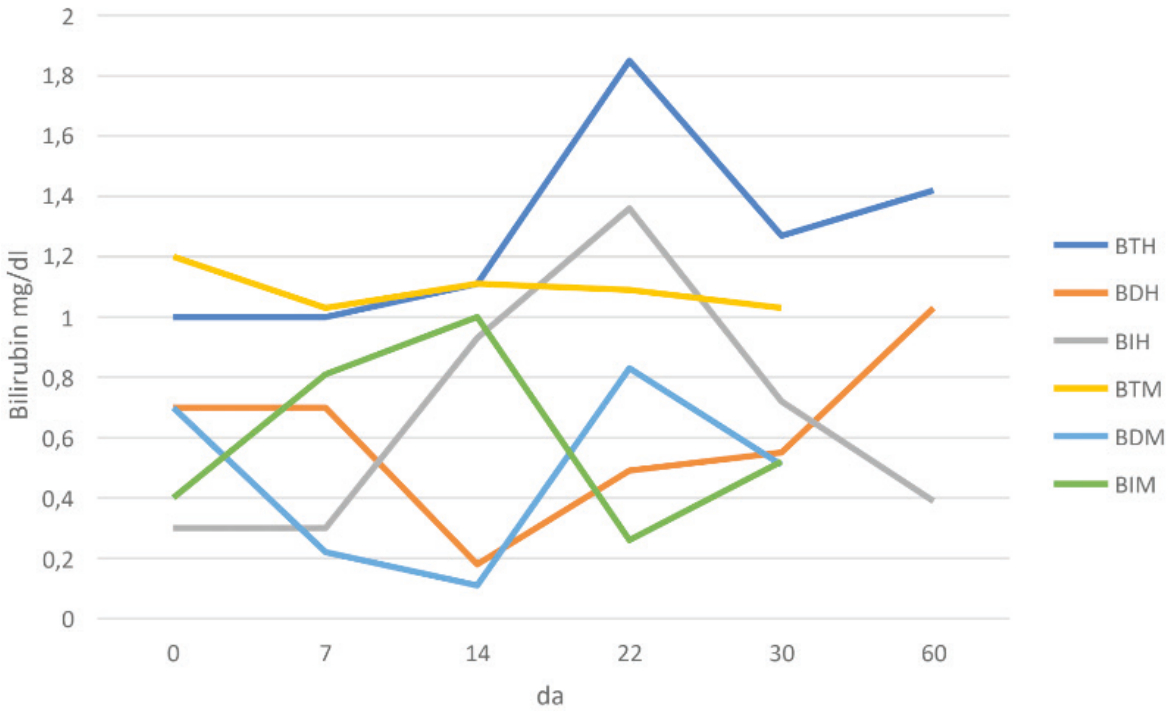
Source: Agudelo AN, 2018-2019.

Figure 7. Phosphorus levels and behavior in Cóndor de los Andes (Vultur gryphus) during treatment



Source: Agudelo AN, 2018-2019.

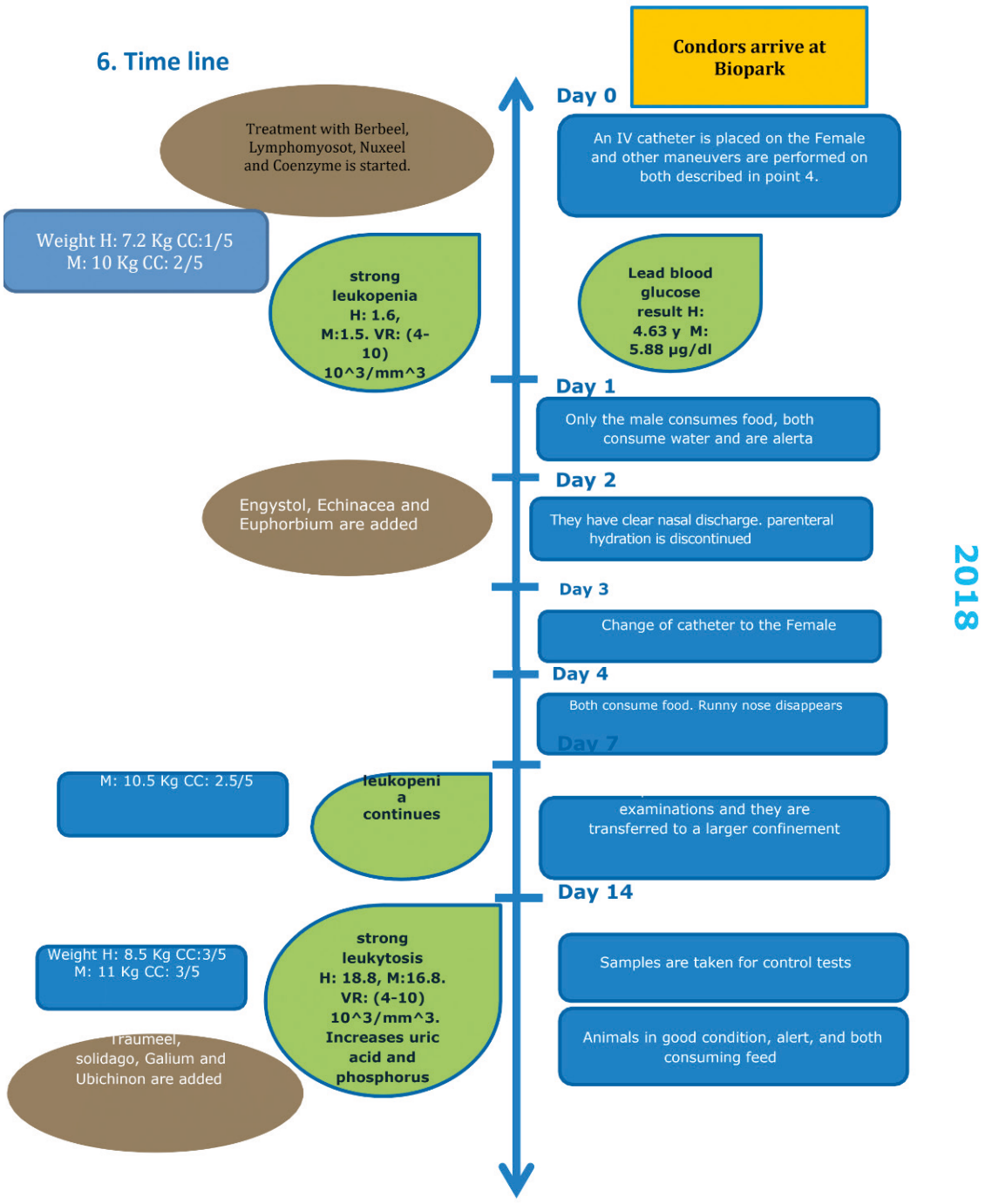
Figure 8. Bilirubin levels and behavior in Cóndor de los Andes (Vultur gryphus) during treatment

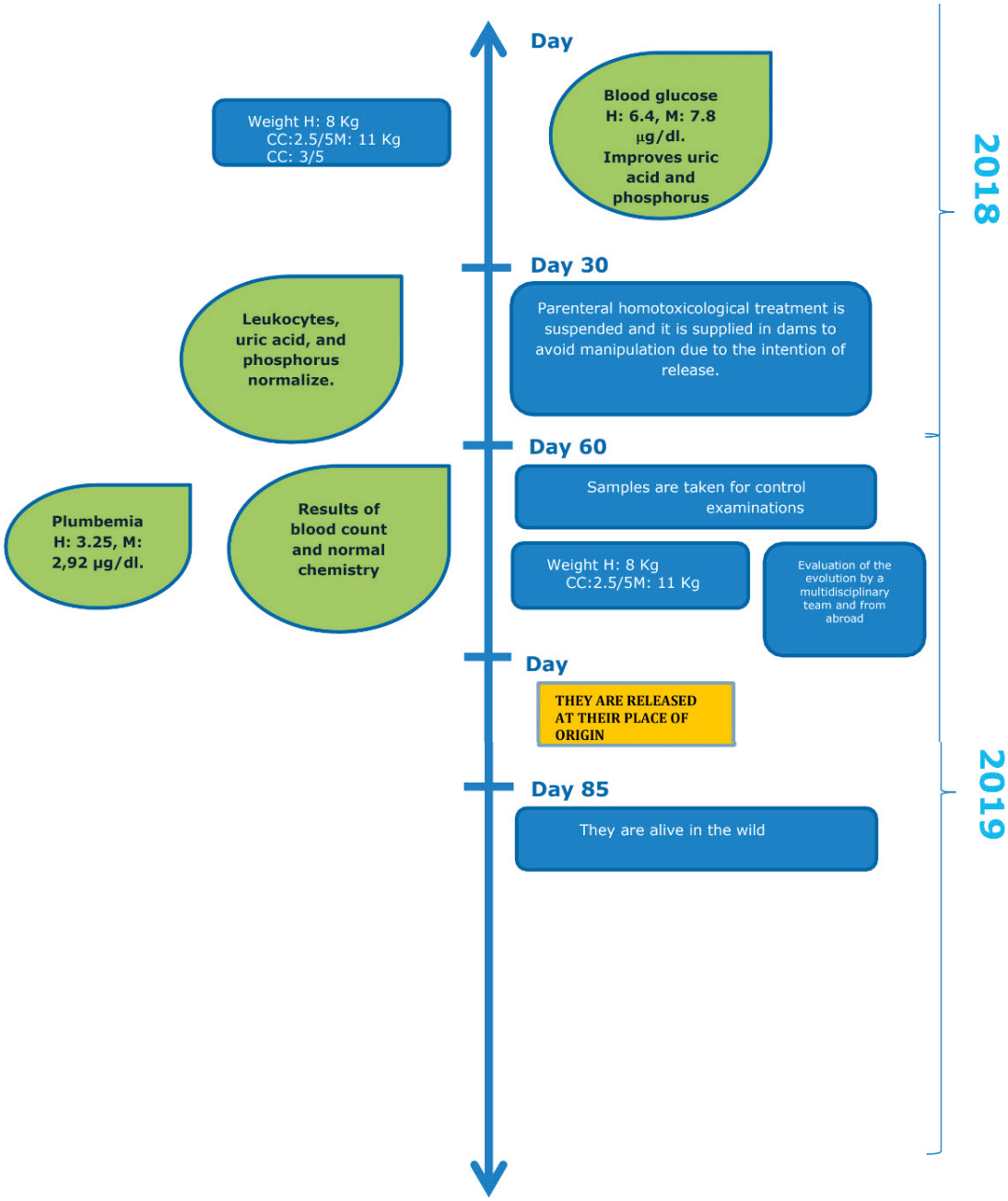


BTH: Female Total Bilirubin, BDH: Female Direct Bilirubin, BIH: Female Indirect Bilirubin, BTM: Male Total Bilirubin, BDM: Male Direct Bilirubin, BIM: Male Indirect Bilirubin.

Source: Agudelo AN, 2018-2019.

TIME LINE


6. Time line
Condors arrive at Biopark
Day 0
An IV catheter is placed on the Female and other maneuvers are performed on both described in point 4.
Treatment with Berbeel, Lymphomyosot, Nuxeel and Coenzyme is started.
Weight H: 7.2 Kg CC:1/5 M: 10 Kg CC: 2/5
strong leukopenia H: 1.6, M:1.5. VR: (4-10) 10^3/mm^3
Lead blood glucose result H: 4.63 y M: 5.88 µg/dl
Day 1
Only the male consumes food, both consume water and are alerta
Day 2
Engystol, Echinacea and Euphorbium are added
They have clear nasal discharge. parenteral hydration is discontinued
Day 3
Change of catheter to the Female
Day 4
Both consume food. Runny nose disappears
Day 7
M: 10.5 Kg CC: 2.5/5
leukopeni a continues
examinations and they are transferred to a larger confinement
Day 14
Weight H: 8.5 Kg CC:3/5 M: 11 Kg CC: 3/5
strong leukytosis H: 18.8, M:16.8. VR: (4-10) 10^3/mm^3. Increases uric acid and phosphorus
Samples are taken for control tests
Traumeel, solidago, Galium and Ubichinon are added
Animals in good condition, alert, and both consuming feed
2018


Day
Weight H: 8 Kg
CC:2.5/5M: 11 Kg
CC: 3/5
Blood glucose
H: 6.4, M: 7.8
µg/dl.
Improves uric
acid and
phosphorus
2018
Day 30
Leukocytes,
uric acid, and
phosphorus
normalize.
Parenteral homotoxicological treatment is suspended and it is supplied in dams to avoid manipulation due to the intention of release.
Day 60
Samples are taken for control examinations
Plumbemia
H: 3.25, M:
2,92 µg/dl.
Results of
blood count
and normal
chemistry
Weight H: 8 Kg
CC:2.5/5M: 11 Kg
Evaluation of the evolution by a multidisciplinary team and from abroad
Day
THEY ARE RELEASED AT THEIR PLACE OF ORIGIN
Day 85
They are alive in the wild
2019

improvement of blood chemistry, mainly uric acid and phosphorus, and the level of leukocytes, since these allow a direct relationship with the homotoxicological drugs used.

Below are images of the recovery process of the individuals (Figure 9).

THERAPEUTIC APPROACH

Describe the (1) types of interventions (such as pharmacologic, surgical, preventive, lifestyle, self-care), (2) administration and intensity of the intervention (including dosage, strength, duration, frequency) and (3) rationale behind the therapy protocol.

Continuation of describing the type of interventions carried out for the recovery of the Condor of the Andes (*Vultur gryphus):*

FOLLOW-UP AND RESULTS

The follow-up of the results was done with the permanent relationship of the laboratory findings. Mainly leukocyte levels, uric acid and phosphorus levels and lead levels. Likewise, the relationship of the results with the clinical evolution of the individuals, the consumption of food and the improvement or not from body condition more than weight, since pre-handling regurgitation due to stress was a factor that influenced weight.

The most important results were to note the marked action of the drugs on leukocytes in such a short treatment time and the possible effect on lead levels that had the expected behavior in an allopathic chelation treatment[5] (Figures 10-17).

DISCUSSION

In the first place, this case had as strengths in the first measure, the rapid evolution of the individuals, mainly the female, who arrived in worse condition, since in comparison with approaches from allopathy, the recovery times are on average of 4 months 7. Likewise, this case made it possible to identify that it is possible to carry out treatments of this type in wildlife, reducing mortalities due to the lack of information or medication available for a species or in a certain place and with the great advantage of a minimal risk of adverse effects. Additionally, this case could generate the need to evaluate the effects of this protocol in other individuals of the same species and other animal species and even in humans that present blood lead levels that may affect their health.

Finally, this case saved the lives of two Cóndor de los Andes (Vultur gryphus) and at the same time its successful release, which contributes to the conservation of a species that is in critical condition in our country and other neighboring countries.

Regarding the limitations, they were the following: Since the intention from the beginning was to recover the individuals to release them in the shortest possible time, the times and frequencies of treatment were not ideal. However, the recovery and evolution of the Condor was rapid, which in turn accelerated the process. In the same way, the frequency and administration of the drugs was altered since it was necessary to reduce the handling of the individuals to reduce stress, since this is a very important factor in wild animals.

Regarding the action of the drugs used in the protocol, in this specific case no studies or case reports have been reported that evidence the use of this protocol for lead levels in Cóndor de los Andes (Vultur gryphus), since the Therapeutic approach for this type of situation in this species is with calcium disodium edetate[6], which is a medicine that is difficult to access in countries like Colombia, which affects the survival of this species due

5. Ibid

6. Op cit 5 y 6.

Figure 9. Process and evolution of the case of lead fever in the Andean Condor (Vultur gryphus)

A - IV supply of homotoxicological drugs to a female Condor (Vultur Gryphus), B: Male Condor the day after arrival at the Biopark, C: Female Condor the day after arrival at the Biopark, D: Weighing process, E: Condors one day before release.

Source: Biopark Wakatá, 2018-2019.

TYPE OF INTERVENTION	DESCRIPTION/PROTOCOL
Medical stabilization and use of drugs for suspected organophosphates	• Hydration with 20 ml of Nacl 0.9% IV to the female and 30 ml of Nacl 0.9% IV to the male. • Activated carbon to the female with an esophageal probe at a dose of 3 gr/kg • They were given Atropine at a dose of 0.5mg/kg (¼ IV and ¾ IM)
Start of homotoxicological treatment: basic detoxification for each Condor	2 ml of Berbeel + 1 ampoule of Lymphomyosot +2 ml of Nuxeel + 2 ml of coenzyme. Female IV and Male IM SID X 3D. Then a dose 3 times a week for 3 weeks. Then only the coenzyme once a week until the day of the release.
Medications are added for runny nose and leukopenia	2ml of Engystol + 2ml of Echinacea + 2ml of Euphorbium. Autosanguis female and IM SID X 3D male. Then a dose 3 times a week for 3 weeks. Then just the Engystol a once a week until the day of release.
Medications are added due to an increase in uric acid and phosphorus, due to leukocytosis, and deep detoxification is started in the second week of treatment.	Renal support: Solidago to both individuals 1 ampoule. Autosanguis female, IM male 3 times a week for 3 weeks then once a week until the day of release. Modulation of leukocytosis: Traumeel 2 ml to each individual 2 ml IM once a week until day of release. Deep detoxification: each individual 1 ampoule of Galium + 1 ampoule of Ubichinon IM 3 times a week for 3 weeks then 1 time a week until the day of release.
After 4 weeks of treatment, parenteral administration is suspended and medication is injected into the feeding dam with the same frequency established until day 60.	

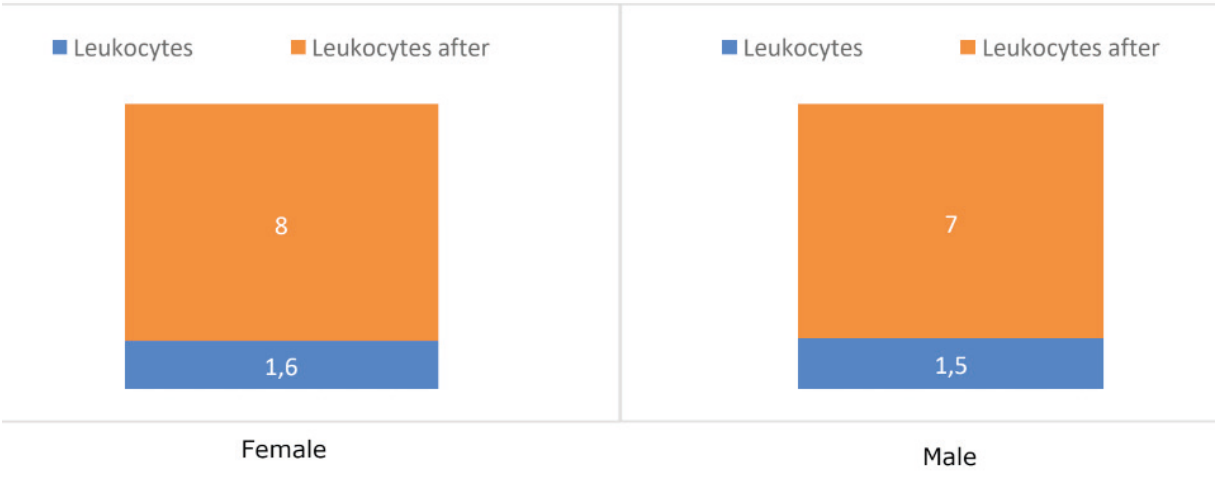


Figure 10. Comparison of leukocyte levels before and after treatment.

Source: Agudelo AN,2018-2019.

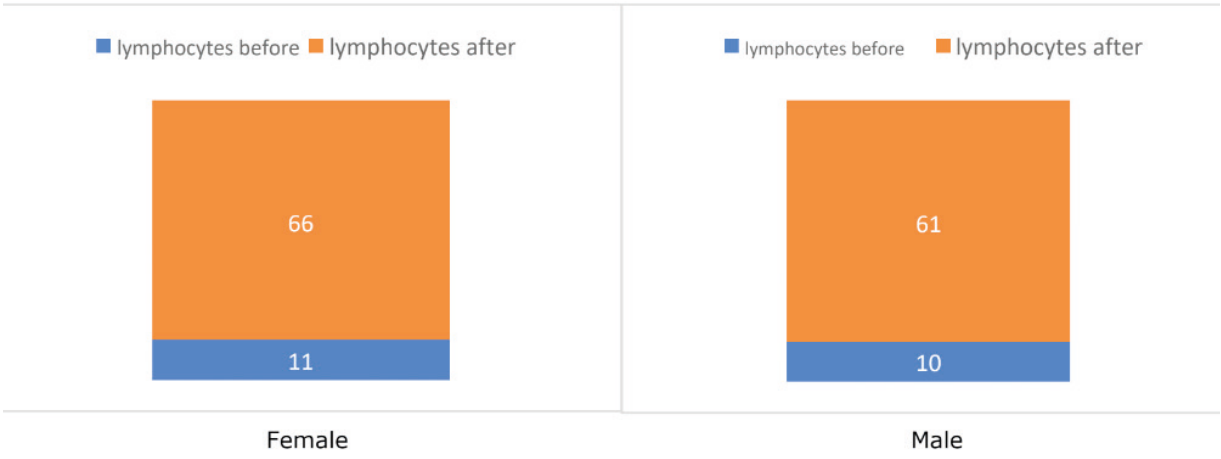


Figure11. Comparison of lymphocyte levels before and after treatment

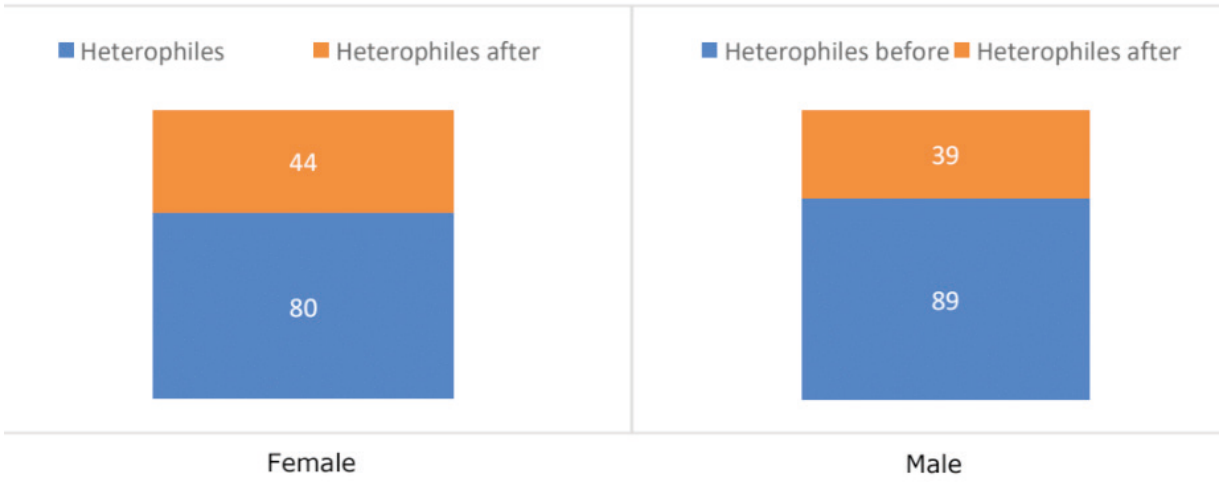


Figure12.Comparison of heterophil levels before and after treatment.

Source: Agudelo AN,2018-2019.

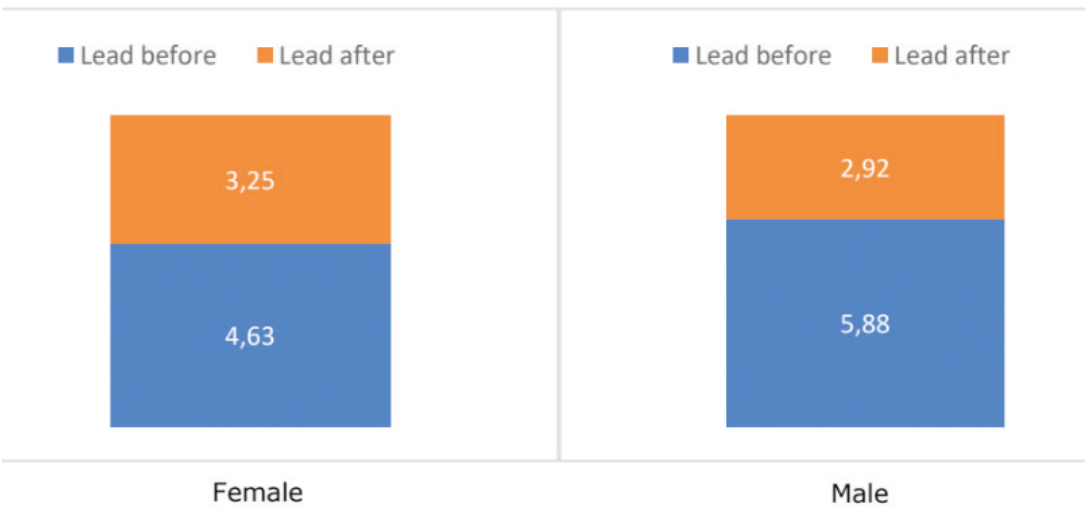


Figure13.Comparison of blood lead levels before and after treatment. Female condor.

Source: Agudelo AN,2018-2019.

to poisoning and intoxication of this type. However, studies show that drugs such as Coenzyme stimulate blocked enzymatic systems in degenerative diseases as well as in case of defective enzymatic functions as in the case of heavy metal poisoning; to improve the use of oxygen, it is also indicated in the case of metabolism disorders and weight loss, which are conditions that frequently occur in individuals who are exposed to significant levels of heavy metals such as lead[7]. In the case of Ubichinon, it stimulates antitoxic defensive mechanisms, in order to reactivate blocked enzymatic systems in case of enzymatic dysfunctions and degenerative diseases[8]. For this reason, this medication together with the coenzyme and Galium played a vital role in Lead levels in these individuals, therefore these findings suggest the need to carry out specific studies to address this type of medical conditions from bioregulatory medicine.

Additionally, it is important to highlight the observed effect of Engystol on the leukocytes of both individuals, which is consistent with the studies that show that this drug is a powerful immunostimulant which activates the defenses[9] and in this case the response was so rapid that modulation with Traumeel was necessary.

Finally, all other medications that were used either for superficial detoxification and organic support (Berbeel Homaccord Ad us. vet ampoule, Nuxeel Homaccord Ad us. vet ampoule, Lymphomyosot N ampoule, Solidago compositum ampoule, Echinacea compositum vet ampoule and Euphorbium compositum vet) had an expected effect and met the desired objective of maintaining optimal digestive function, providing support to the renal and respiratory system, supporting the renal and respiratory system[10].

CONCLUSIONS

Please add 3-5 bullet points about what are the learning points of this clinical case. What is the educational merit of this case to the clinical community, what new learnings this case is demonstrating compared to what is already in practice? What other practitioners will learn from this case, how may it change the current practice?

- The knowledge that bioregulatory medicine is applicable to any species is reaffirmed and can contribute significantly to wildlife medicine and also to the conservation of biodiversity, since it could increase the success in the processes of rescued animals and with potential release-reintroduction possibilities.
- There is a need to address cases of lead poisoning through bioregulatory medicine in different species, including humans.
- The concept that Engystol Ad us. vet is a drug with an important immunostimulating effect, which generates the need to carry out studies in wild animals.

7. VADEMÉCUM DE MEDICINA VETERINARIA. Laboratorios Phinter-Heel. Editorial G.D.A Ediciones, S.L, Sixth edition. España. 2001.

8. HARISH H, Dittman J. Untersuchungen zur Wirkunf von Ubichinon Injeel an Injeel forte mit zellfreien Systemen. 1997.

9. Engbers H, Effects of the Homeopathic Preparation Engystol on Interferon-γ-Production by Human T-Lymphocytes. Immunological Investigations 2006; 35:19-27.

10. https://www.heel.cl/es_cl/research.html