

Proceedings

XVIII

WORLD'S POULTRY CONGRESS



1988

EXPERIMENTAL KINETICS OF LITHIUM IN THE PHEASANT

CARDINI G., BAGLIACCA M., DUCCI M., FRATESCHI T.L., MARTELLI F.

Dept. of Anat., Physiol. and Animal Production Science,
Faculty of Veterinary, Pisa University, V.le Piaggio, 2 -
56100 PISA - ITALY

SUMMARY

To study the possibility of lithium introduction in diets for intensively bred growing pheasant, plasma kinetic was investigated in adult pheasants after one single administration of 1, 2 and 3 mEq/Kg of Li_2CO_3 ; 36 birds were used. Plasma samples were taken at different times from oral administration. Results showed that the highest plasma concentrations (mEq/l \pm S.E.) were reached between the 4th and the 7th hour (1.5 ± 0.25 ; 1.9 ± 0.09 ; 2.7 ± 0.25 for 1, 2 and 3 mEq/Kg treated birds, respect.). The absorption phase was dependent on doses ($T/2_{\text{abs}} = 1.28, 1.61, 1.31$; $T/2_{\text{el}} = 11.6, 17.3$ and 28.9 for three doses, respect.). AUC $0 \rightarrow n$ values confirmed the dose dependence of Li kinetic (23.7, 39.1 and 64.6 mEq/l/hour for the 3 doses, respect.).

INTRODUCTION

The use of lithium (Li) is very restricted and, in veterinary medicine, is limited exclusively to experimental studies. To reduce aggression, Li salts were used in fish (9), small rodents (8) and, to increase growth, in rats and chickens (7). Recent experiments on calves (3) showed that the orexic and antidepressive activity of Li is accompanied by a significant weight gain. Since Li kinetic studies have been carried out in few species (4,5) and only incomplete results reported for pheasants (6), we evaluated the kinetic parameters of Li in the pheasants after a single oral administration.

MATERIALS AND METHODS

36 birds, four weeks old, were divided into 3 groups. Each group was treated orally with Li_2CO_3 -capsules (1, 2, 3 mEq/Kg L.W., respect.). Blood samples, obtained by venipuncture of *v. cutanea ulnaris*, were drawn into heparinized tubes 0.5-1-2-3-4-7-8-10-12-24-28 and 32h after Li-intake (to avoid excessive pheasant stress, 4 equally spaced samples were taken from each animal). After centrifugation, plasma samples were stored at -20°C .

Li plasma levels were determined by atomic spectrophotometry (Perkin-Elmer, mod.306; wavelength nm 607.8, with air-acetylene flame). Drug-free plasma spiked with 0.5-1.0-2.0-3.0 Li-ppm were used for the calibration curves (before determination all plasma samples were suitably diluted).

The kinetic parameters were calculated according to an open monocompartmental model; the absorption constant was detected by using a "feathering" system (4) and plasma levels were expressed as mEq/l \pm S.E.

RESULTS AND DISCUSSION

The avg.Li-plasma levels are shown in fig. 1. The absorption phase is seen to be short and similar for all doses: max levels are reached 4th through 7th hours (1.4±.25; 1.9±.09; 2.7±.25 for the

Table 1. Pheasant Li-kinetic-parameters (avg).

DOSE mEq/Kg	$K_{abs.}$ h^{-1}	$T/2_{abs.}$ h	C_{max} mEq/l	$K_{el.}$ h^{-1}	$T/2_{el.}$ h	AUC 0-n mEq/l/h
1	-.54	1.3	1.70	-.06	11.6	23.71
2	-.43	1.6	2.09	-.04	17.3	39.09
3	-.53	1.3	2.92	-.02	28.9	64.58

3 doses, respect). The elimination phase shows a similar mono exponential decay in all groups but results dose-dependent: at the 32nd hour the avg. Li plasma levels were: .3±.07; .69±.14 and 1.4±.44 for 3 doses respect. Kinetic parameters relative to the avg curves are reported in tab.1. Li max-levels (C_{max}), half-life elimination ($T/2_{el.}$) and AUC 0→n increased according to doses while no variation in half-life absorption ($T/2_{abs.}$) was observed. These data show that Li_2CO_3 is well absorbed but the absorption phase is longer than in monogastric animals(5) and shorter than in poligastric ones(4). The quick decay of Li-concentration may be explained by the fact that Li is rapidly distributed in the majority of the body tissues, as shown for other drugs relative to plasma clearance (10) and the dose-dependence of the K_{el} may be explained by the fact that Li is mainly eliminated by the kidneys(2) and probably the too-high plasma levels observed with the highest dose affect renal function reducing Li-elimination(1). In conclusion all subjects included in this study showed a sufficient drug tolerance even if the highest dose produced higher plasma levels than in the human therapeutic range. Further studies to evaluate the Li-kinetic after chronic treatment are however necessary.

REFERENCES

1)Baer L.(1976)Lithium:its role in psychiatric research and treatment. Ed Plenum-Press N.Y./2)Baldessarini R.J.(1980)Farmacological bases of therapeutics.Ed Goodman&Gilman N.Y./3)Ballarini G.(1984)Riv.Zoot.Vet.12:243-4)Cardini G. et al.(1988)XV W.Buiatr.Con.(in press)-/5)Ducci M. et al(1985) Atti S.I.S.Vet.39:195-/6)Ledoux G.M.(1980)Toulouse Univ.These110/7)Lozannoff L. et al. (1985)Growth 49: 91-/8)Sheard M. H.(1970)Nature 228:284-/9)Weis-her M.L.(1969) Pscopharmacol. Berl.15:245-/10) Yeary R.A.(1980) Am.J.Vet.Res.41: 1643-.

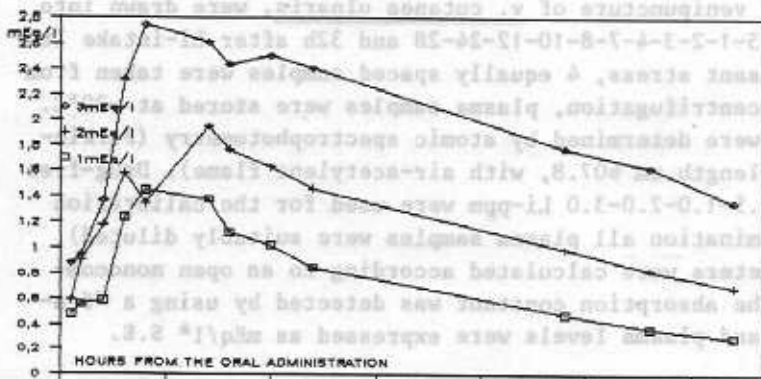


Fig 1. Li plasma levels monitored during the trial.

CINETICA EXPERIMENTAL DEL LITIO EN EL FAISAN

Se ha investigado la cinética del litio en el plasma de faisanes adultos después de una única administración de una dosis de 1, 2 y 3 mEq/Kg de Li_2CO_3 . Se emplearon 36 faisanes divididos en tres grupos de 12 animales para cada una de las dosis. Las muestras de plasma fueron tomadas después de 30 minutos, 1, 2, 3, 4, 7, 8, 10, 12, 24, 28 y 32 horas de la administración per os. La más alta concentración plasmática se alcanzó en los animales tratados respectivamente con 1, 2, y 3 mEq/Kg: a la cuarta hora con promedio de 1,45 mEq/l, a la séptima hora con promedio de 1,95 mEq/l y a la cuarta hora con promedio de 2,75 mEq/l. La fase de absorción fué rápida y sin variar con las dosis ($T/2_{\text{abs}} = 1,3, 1,6$ y $1,3$ horas respectivamente para las tres dosis) mientras que la fase de eliminación dependía de la dosis.

ERFAHRUNGEN UBER LITHIUM KINETIK BEI FASANEN

Es wurden kinetische Untersuchungen gemacht mit Lithium im Plasma bei erwachsenen Fasane nach einmaliger Verabreichung von 1, 2, 3 mEq/l Li_2CO_3 . Es wurden 36 Fasane (12 Fasane für jede Dose) benutzt. Die Plasma Muster wurden je 30 Min, 1st, 2, 3, 4, 7, 8, 10, 12, 24, 28, 32. nach der Verabreichung genommen. Die höchste Plasma-konzentration wurde in der 4. St. erreicht ($1,45 \pm 0,25 \text{ mEq/l}$), in der 7. St. ($1,95 \pm 0,09 \text{ mEq/l}$) und in der 4. St. erreicht ($2,75 \pm 0,25 \text{ mEq/l}$) je mit 1, 2, 3 mEq/Kg Lebendmasse behandelten Vögel. Die Aufnahme phase war ziemlich schnell und ergab unter den Dosen ($T/2_{\text{abs}}$: beim 1.V. = 1,28, beim 2.V. = 1,61, beim 3.V. = 1,31) keinen Unterschied. Die Ausscheidung phase hing von den Dosen ab.

LA CINETIQUE EXPERIMENTALE DU LITHIUM CHEZ LE FAISAN

On a étudié la cinétique plasmatique du lithium (Li) chez 36 faisans adultes après administration unique per os. de Li_2CO_3 aux doses de 1, 2, 3 mEq/kg p.v.. Les échantillons de plasma ont été recueillis après 30 minutes, 1, 2, 3, 4, 7, 8, 10, 12, 24, 28, 32 heures de l'administration orale. La plus élevée concentration plasmatique ($4 \text{ mEq/l} \pm \text{S.E.}$) a été observée entre la 4^{ème} et la 7^{ème} heure ($1,45 \pm 0,25$; $1,95 \pm 0,09$; $2,75 \pm 0,25$ pour les animaux traités respectivement avec 1, 2, 3 mEq/kg). La phase d'absorption a été rapide et n'a pas montrée des différences entre les doses tandis que la phase d'élimination a été subordonnée à la dose. Les valeurs de l' $\text{AUC}_{0 \rightarrow \infty}$ ont confirmé que la cinétique du Li est dose dépendante.

КИНЕТИКА ЛИТИЯ В ФАЗАНЕ

Кинетика лития была исследована в плазме взрослых фазанов после отдельной дозы 1, 2 и 3 мEq/Kg карбоната лития. 36 птиц (12 фазана по каждой дозе) были употреблены. Образчики плазмы взяты после 30', 1ч., 2ч., 3ч., 4ч., 7ч., 8ч., 10ч., 12ч., 24ч., 28ч., 32ч. с первой дозы. Самые большие концентрации лития были достигнуты в 4ом ч. для тезиса 1 ($1,45 \pm 0,25 \text{ мEq/l}$), в 7ом ч. для тезиса 2 ($1,95 \pm 0,09 \text{ мEq/l}$) и в 4ом ч. для тезиса 3 ($2,75 \pm 0,25 \text{ мEq/l}$). Фаза абсорбция было довольно скорая и не отличалась между дозами ($T/2_{\text{abs}} = 1,28$ ч. для 1 мEq/l, 1,6 ч. для 2 мEq/l и 1,31 ч. для 3 мEq/l).

CONTENTS

Opening Address
Welcome Address
Congratulatory Address
Conference Organization
Opening Lecture
Special Lectures
Plenary Lectures
Symposia
General Presentations
Index of Authors



This publication was made by the financial support of
the Japan Regional Public Racing Association

Proceedings

XVIII

WORLD'S POULTRY CONGRESS

General Session
Welcome Address
Congress Opening Address
Congress Organization
General Session
Special Session
Special Session
Special Session
Special Session
Special Session
Special Session
Special Session
Special Session



For further information, please contact the Organizing Committee, Japan Poultry Science Association, 1-1-1, Higashi-Shinjuku, Shinjuku-ku, Tokyo 162, Japan.

September 4-9, 1988

Nagoya, Japan

Japan Poultry Science Association