

# Dietary Management in a dog with Structural Epilepsy: A case report.

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# Clinical Data: 'Piti'

## Demographic Data:

- 5 years old, rescued crossbreed
- Female neutered, 19 kg



## Physical-Neuro Exam:

- Normal physical exam, BCS 2-3
- Reduced activity, mentally impaired
- Neurological high grade abnormal
- Blind, deaf, high grade ataxic
- Chronic disease: Seizure activity



'Piti'

# Clinical Data: 'Piti'

**Problem:** Increasing seizure activity

## Epilepsy Data:

- Onset in 2016
- 4 seizure per months
- Duration of 1-2 minutes
- Cluster Seizures +
- Status epilepticus +
- Seizures in Life: >100



'Piti'

# What is epilepsy?

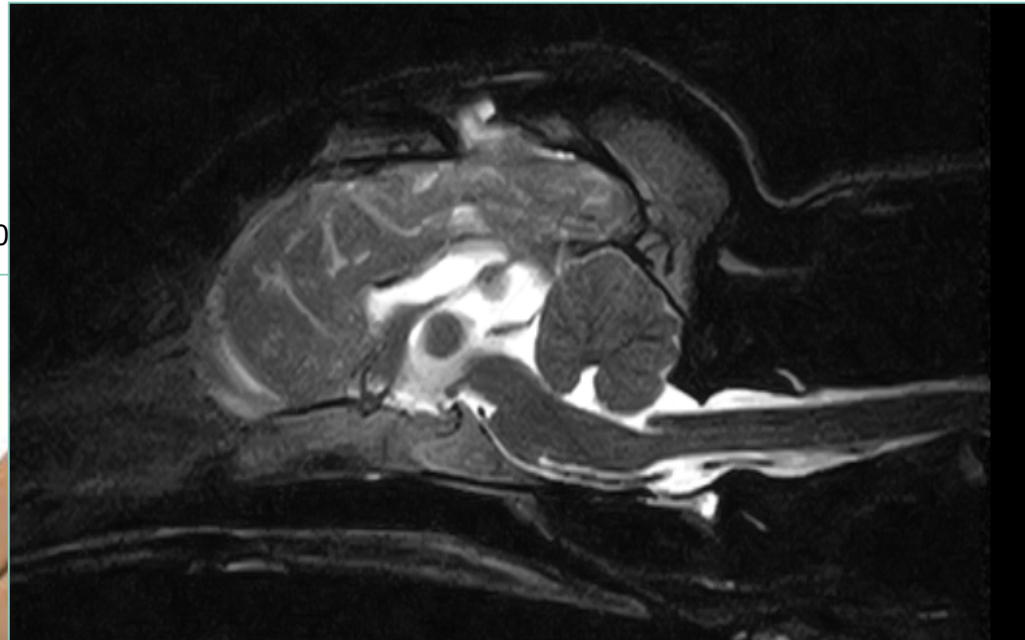
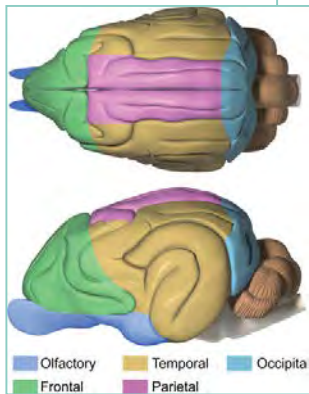
- Most common chronic, neurological condition
- Defined as *brain diseases characterized by recurrent seizures caused by abnormal neuronal activity*. (Berendt et al. 2015)
- Epilepsy can arise from a plethora of causes,
- Classification defined by aetiology and phenotype.
- **Confirmed** by diagnostic imaging, cerebrospinal fluid examination, DNA testing or post mortem findings (DeRisio et al. 2015)



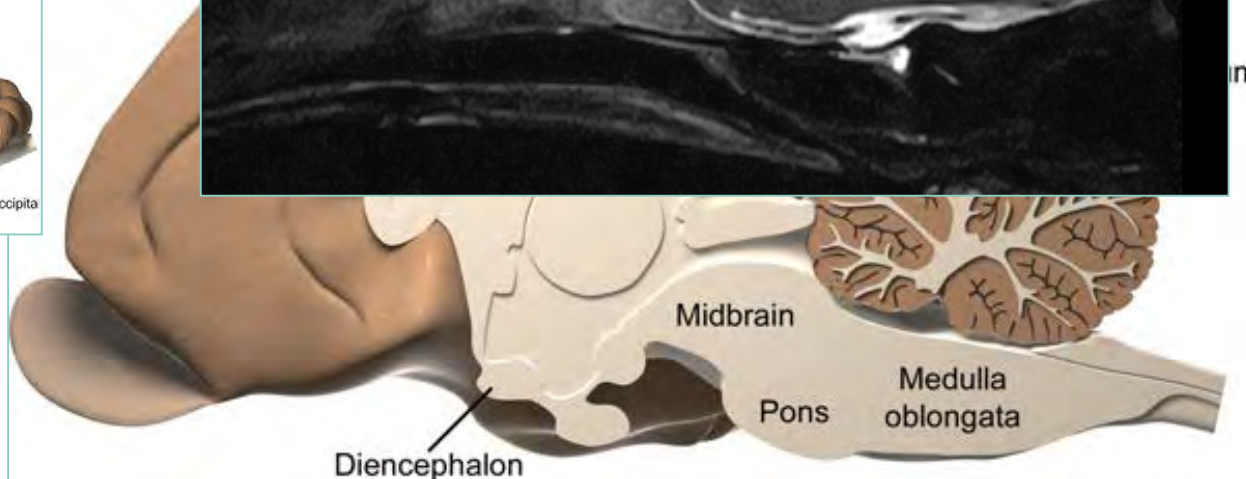


# Diagnostic Imaging: MRI

Dewey et al. 20



Sagittal  
MRI Scan

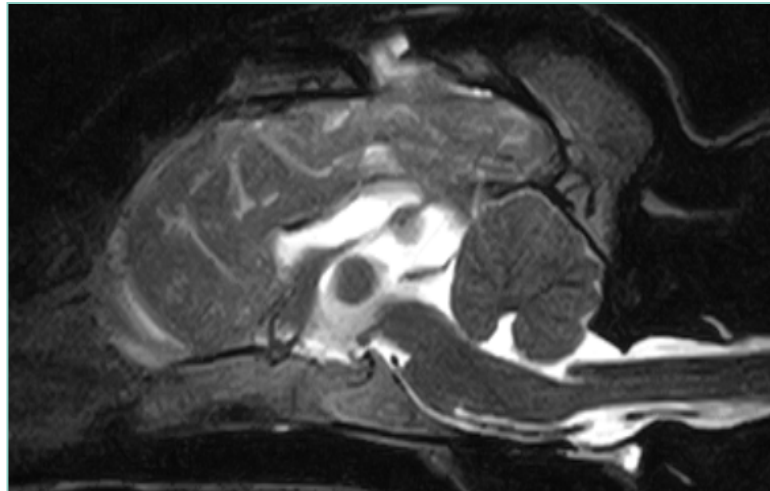


# Diagnostic Imaging: MRI

Normal



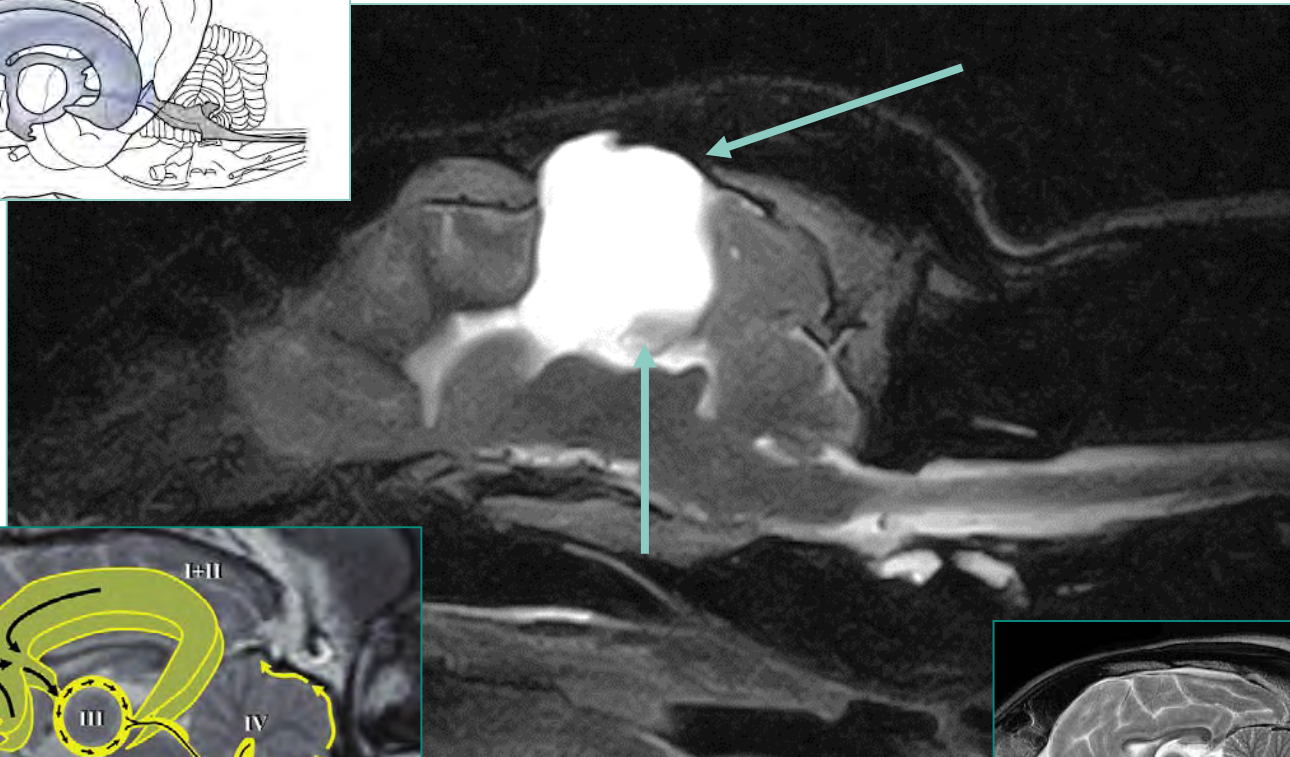
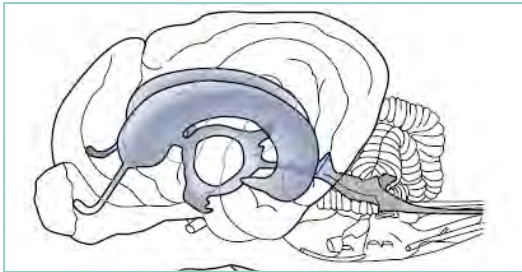
Piti



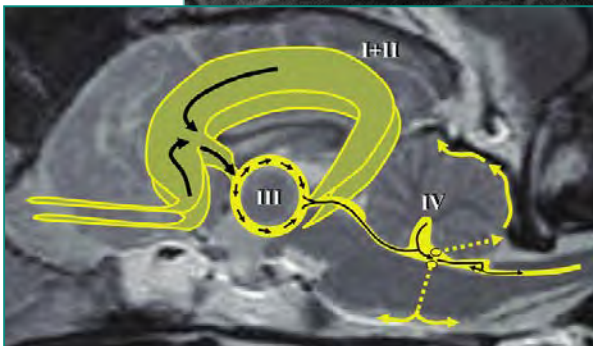
Sagital  
MRI Scan



# Diagnostic Imaging: MRI



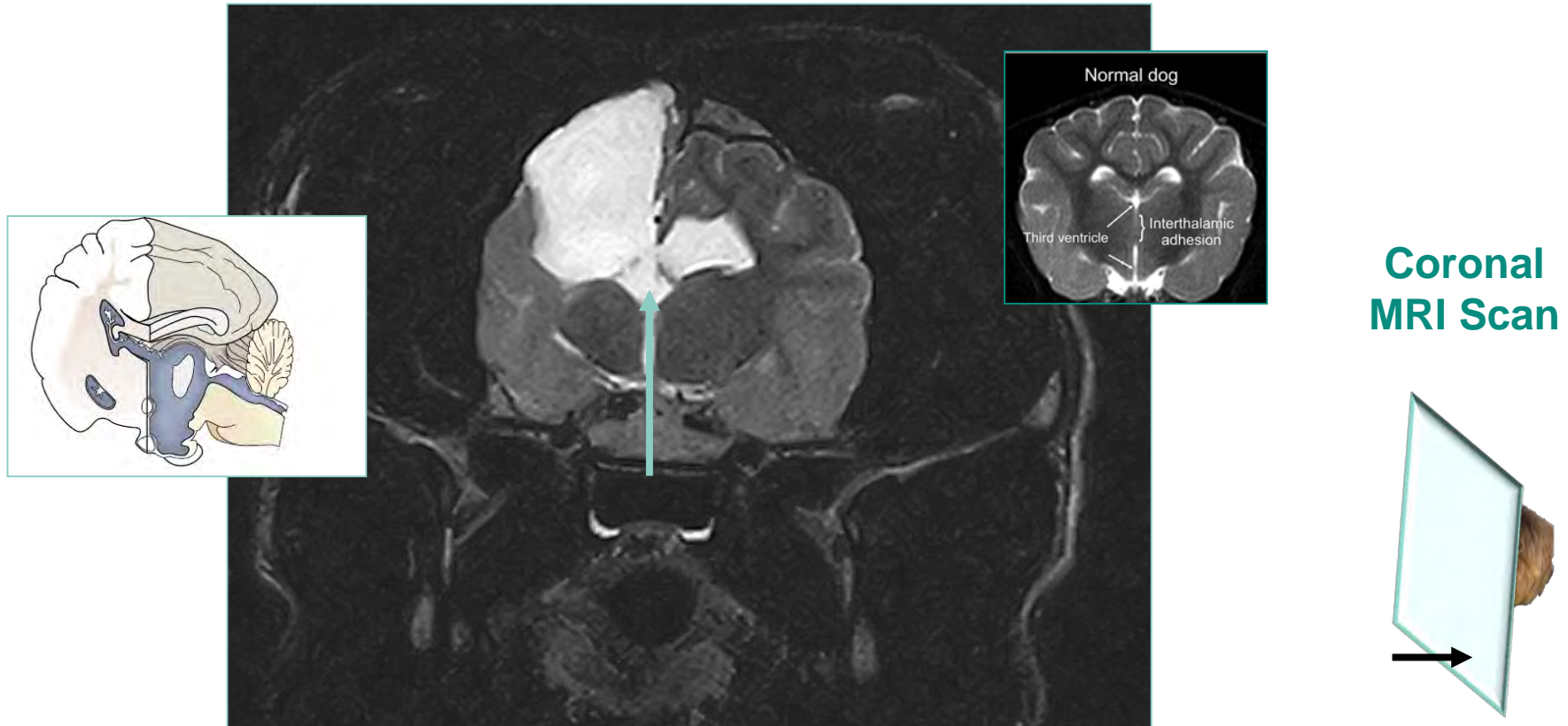
Sagittal  
MRI Scan





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# Diagnostic Imaging: MRI



**Right sided Hydrocephalus (Prosenencephaly)**  
**Ddx: Hydrocephalus Ex Vacuo**

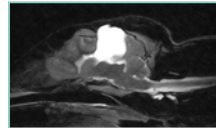
Thomas et al., 2010; Dewey et al. 2016





# Structural Epilepsy (StE)

- Diagnosis for „Piti“:



**Hydrocephalus induced structural epilepsy**

- **Structural epilepsy is defined as ‘*caused by identified cerebral pathology*’, consequence of a known disorder of the central nervous system.** (Berendt et al. 2015, DeRisio et al. 2015).
- **StE** has been associated to physical, neurobehavioral morbidity and **reduced the median life span** (Fredso et al. 2014)

# Therapeutic Management

- **If inoperable**, most **important treatment** with **antiepileptic drugs (AED)** (Bhatti et al. 2015), but accompanied by **unfavourable side effects.** (Charalambous et al. 2016)

**„Piti“**



Under Antiepileptic Drug (AED)  
combination therapy:

- Imipetoin (30mg/kg, 2x),  
Phenobarbital (4 mg/kg, 2x),  
Levetiracetam (26 mg/kg, 3x)
- Emergency meds: Diazepam rectal



# Nutritive Management

- **Diet** is increasingly recognised **having an impact upon seizure activity and behaviour.** (Bosch et al. 2007, Law et al. 2015, Packer et al. 2016)
- *In Veterinary medicine, **no data** regarding dietary intervention for management of structural epilepsy* (Matthews et al. 2012, Scorza et al. 2013, Scorca et al. 2009)
- Many online epilepsy **support groups recommend the use of diet and DS for different epilepsy types based on anecdotal evidences.**





# Nutritive Management



## (A) Feeding assessment

- Calorie needs (19 kg) = RER x 1.2 =  $\approx$  780 kcal ME

Component (feeding plan per day)	Amount [g]	ME [kcal]
Commercial Kidney Diet, Wet Food	350	450
Vitamin B Complex Powder	1	3
Chewsticks	10	35
Jerk Beef	25	120
Treats, average	25	76
Low Carb Cheese Pops, selfmade	25	96
<b>Sum</b>	<b>436</b>	<b>780</b>

RER = Resting Energy Requirement



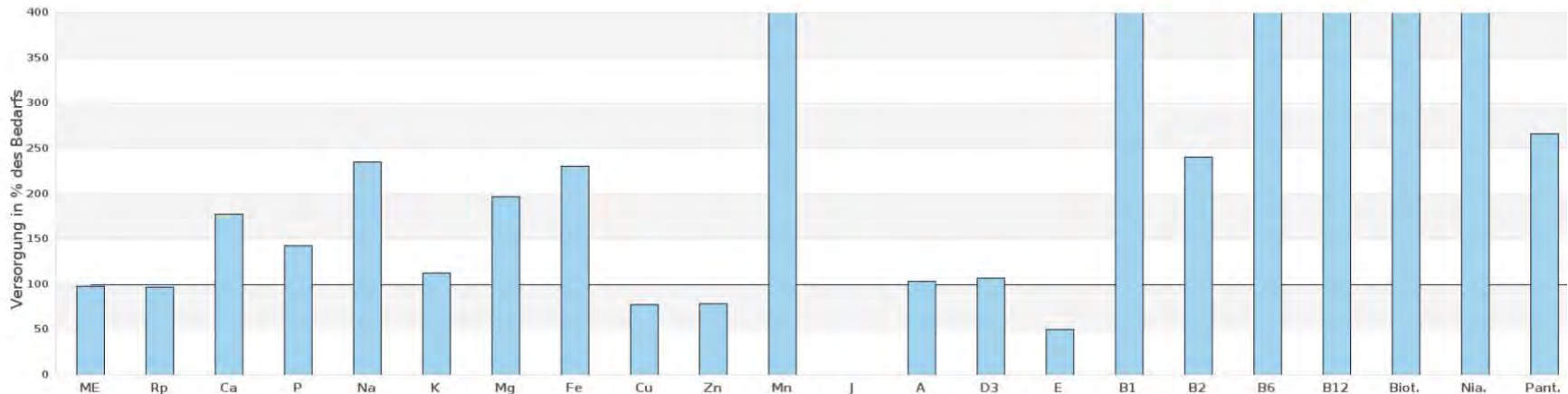


# Nutritive Management



## (B) Needs-based, sufficient supply of other nutrients

- Calorie needs (19 kg) = RER x 1.2 = ≈ 780 kcal ME



RER = Resting Energy Requirement



# Nutritive Management



## (C) Foods nutrient content (energy basis)

- Calorie needs (19 kg) = RER x 1.2 =  $\approx$  780 kcal ME

Nutrient	Amount [g]	kcal/ g	ME [kcal]	% ME
Protein	48	4.4	212	<b>27 %</b>
Fat	31	9.4	293	<b>38 %</b>
Digestible carbohydrates	66	4.1	273	<b>35 %</b>

RER = Resting Energy Requirement



# Nutritive Management



## SUMMARY – What needs to be updated?

- BCS 3-4 (1-9), slight body weight increase would be targeted.
- Fat-dominating feeding regime, 38% of dog's ME [kcal]
- No kidney diet indicated.
- More than double amount of NaCl requirement per day.
- Insufficient supply of Vitamin E.



# Nutritive Management



## (A) Update on calorie intake

- Calorie needs (19 kg) = RER x 1.5 =  $\approx$  950 kcal





# Nutritive Management



**(A) New feeding plan, self-cooked meals  $\approx$  950 kcal**

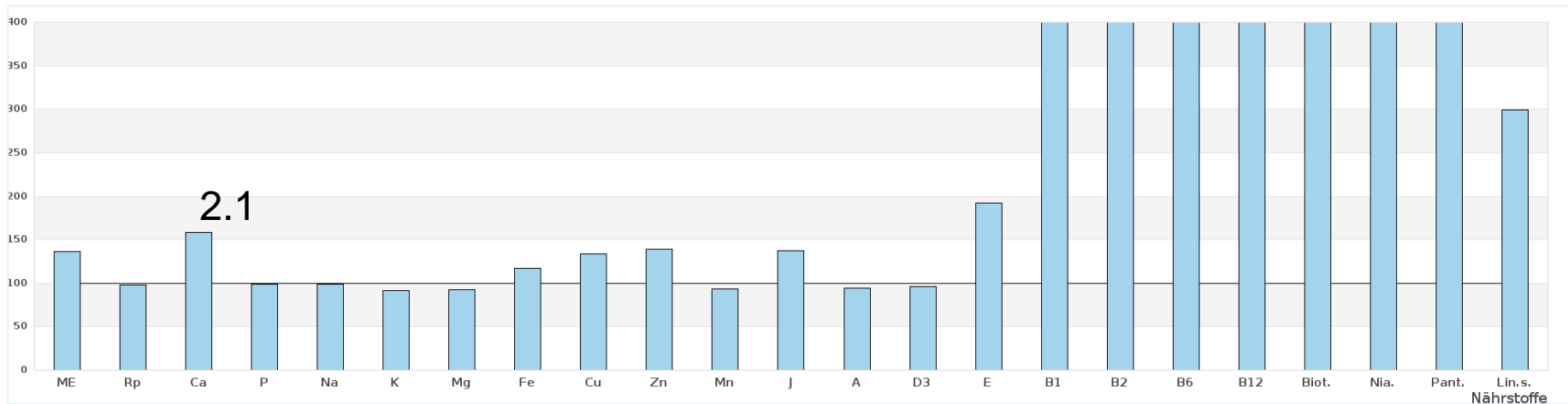
Component (feeding plan per day)	Amount [g]	ME [kcal]
Pork, medium fat (15-19%)	225	504
Potatoes, cooked and peeled	125	99
Thistle oil	10	87
Fish oil	15	130
Mineral Feed	7.5	1
Vitamin B Complex Powder	1.5	4
<i>Cucumber</i>	50	4
<i>Cheese</i>	25	14
<i>Low Carb Cheese Pops, selfmade</i>	25	102



# Nutritive Management



## (B) Needs-based, sufficient supply of other nutrients



### Adjustment of NaCl intake per day:

- Reduction to minimal requirement per day, 250% > 100%
- 0.16 % NaCl in DM **vs.** 0.13%
- FEDIAF: 0.12 % per 100 g DM; NRC: 0.06% per 100 g DM



# Nutritive Management



## (C) Foods nutrient content (energy basis)

Nutrient	Amount [g]	% ME pre	% ME post
Protein	48.3 → 49 g	27 %	23 %
Fat	31.2 → 75.4 g	38 %	75 %
Digestible carbohydrates	66 g → 22.4 g	35 %	10 %



# Nutritive Management



## SUMMARY

- Energy supply adjusted for slight body weight gain,  $\approx$  15%
- High fat, ketotic feeding regime, 75% of dog's ME
- Main fat source: medium-chain triglycerides (MCT)
- Brain health relevant fatty acids: EPA, DHA, ALA
- Highly reduced NaCl intake, overall reduced content in DM
- Balanced supply of all other vitamins and minerals.





# Discussion

- Hydrocephalus is associated with increased cranial pressure (ICP) and changes in CSF neurotransmitters content (DelBigio, 1989; Matiassek, 2008 )
- Cerebrospinal fluid (CSF) production is linked to systemic blood pressure (Al-Sarraf et al. 2007, Gonzalez-Marrero et al. 2010)
- Long-term lowered dietary salt content does affect on hemodynamic mechanisms, ICP and blood pressure in rats (Simchon et al. 1991, Manger et al. 2003; Sinclair et al. 2010)
- MCT enriched diet consumption leads to significant elevation in  $\beta$ -HB, improved seizure control in dogs (Law et al. 2016)

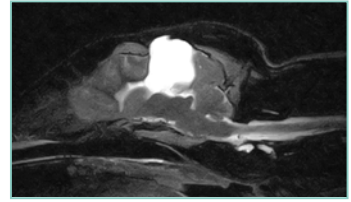
# Follow Up



## What were the effects after *3 months dietary intervention*?

- **Seizure Control:** Seizure freedom **1 vs. 4** seizures a month
- **Serum concentration:** Phenobarbital much more stable.
- **AED-Side Effects:** Less side-effects, improved gait
- **Mental Health:** Mentally less impaired, more active, less hungry
- **Quality of Life:** +++

# Conclusions



- ✓ Reduced NaCl intake might lead to decrease of ICP and CSF content
- ✓ MCT enriched diets brings up antiepileptic properties governed by medium-chain fatty acid metabolism.
- ✓ High fat, ketotic feeding regime, 75% of dog's ME [kcal] provokes ketotic mimicking state supporting antiepileptic properties.



Decreased NaCl↓, MCT↑ enriched diet can improve seizure control in a **dog with structural epilepsy** provoked by *right-sided prosencephaly/hydrocephalus*.



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# Acknowledgments



*Dr Julia Fritz,  
Prof Holger Volk,*

**Thanks ,  
for your attention!**

*Questions?*

Hans **Böckler**  
**Stiftung**



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