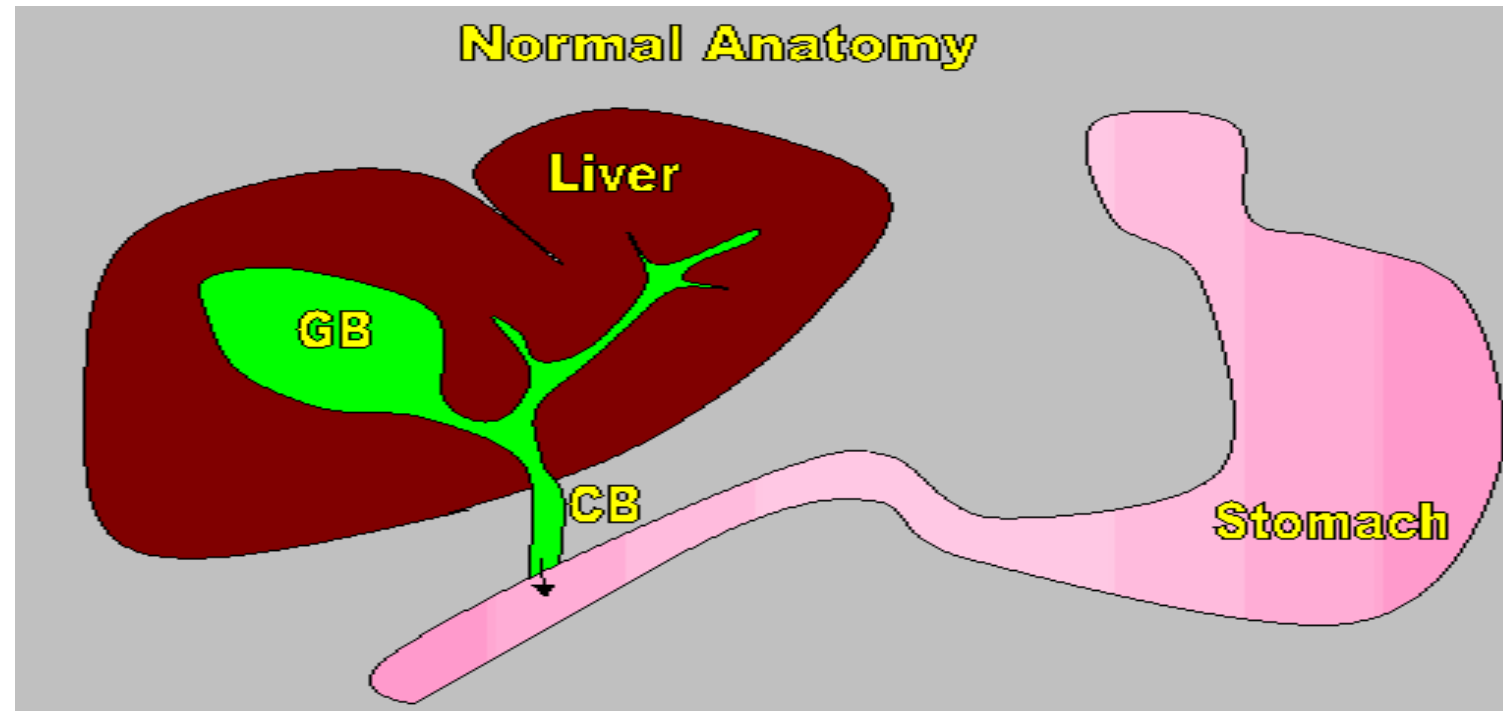


Nutritional management of a dog without gallbladder

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Gallbladder

The gallbladder is a pear-shaped organ that functions as the reservoir for bile, which is produced by the liver, until it is needed for digestion and absorption of fats and fat-soluble vitamins in the small bowel. The liver produce bile every day (Clinical Manual of Small Animals, Birchard SJ, Sherding RG;1996)



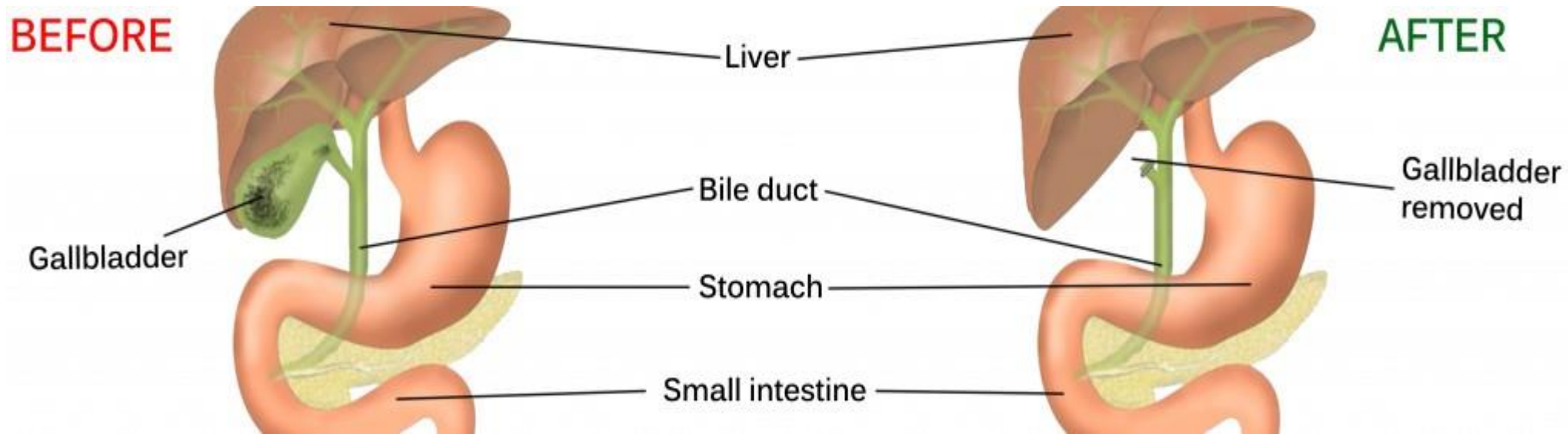
Digestive Biochemistry

Bile is a green-brown fluid that is composed of water, bile salts, mineral salts, cholesterol, phospholipids, proteins, pigments (bilirubin, biliverdin)

- ❖ Bile salts help with the digestion of fats by breaking them down from large globules to smaller globules, lowering surface tension and making a larger surface area
- ❖ Mineral salts neutralise the stomach acid (HCL) to around 7/8 pH in the small intestine

Bile also stimulates the intestinal peristalsis and controls the bacteria by inhibiting putrefactive phenomena

(Clinical Manual of Small Animals, Birchard SJ, Sherding RG;1996)



Indication for gallbladder removal :

Rupture of the gallbladder due to trauma or obstruction of the common bile duct due to stones or congealed bile

Tumor of the gallbladder

Bile then flows from the bile ducts of the liver directly into the small intestine via the common bile duct and **is not as concentrated as before**

(Clinical Manual of Small Animals, Birchard SJ, Sherding RG;1996)

Clinical case

Name: Martina

Breed: Pinscher

Age: 11 years

Body Weight: 4,5 kg

BCS: 5/9

MCS: Normal muscle mass

Diagnosis: gallbladder removal after a trauma

Symptoms: Chronic diarrhea



Cholecystectomy



A number of post-surgical complications following cholecystectomy have been cited in the scientific human literature:

Diarrhea, stomach upset, nausea, vomiting, gas, gastritis secondary to duodenogastric reflux of bile acid

(Mahan LK, 2012)

Biochemical Analysis

Parameters	September 2015	Normal Ranges
AST (IU/L)	157	16-33
ALT (IU/L)	307	13-116
ALP (IU/L)	67	17-119
GGT (IU/L)	9.0	1.0-7.7
Total Protein (gr/dL)	6.0	5.9-7.2
Albumin (gr/dL)	3.0	3.0-3.5
Triglycerides (gr/dL)	171	36-137
Urea (gr/dL)	23	20-48
Glucose	29	80-115
HCO ₃ (mmol/L)	17	17.5-24

Feces: diarrhea and sudden changes
Fecal score: grade 2/5



Medical-nutritional therapy?

In human medicine:

There is not a standard guideline for medical nutritional therapy (MNT) post cholecystectomy.

MNT should be individualized based on the patient's issues and the number of a diet modification may be indicated (human)

- **Fat intake** should be **limited** and excessive amounts in one meal should be avoided
- Increased **fiber** intake will help normalize bowel movements
- It has been suggested that **soluble fiber** added to the diet will act as a sequestering agent and bind the bile in the stomach between meals to avoid gastritis
- Eat smaller meals

(Escott-Stump S.,2012; Mahan LK,2012;Marcason W., 2014)

Medical-nutritional therapy?

In veterinary medicine:

There are not standard guidelines for MNT in human and in animals too

The diet should be adapted to the individual case and the general conditions

The main goals are :

- Ensure the right energy intake
- Moderate fat content (less than previous diet) (Villaverde C., 2012)
- Provide nutritional supplements to control the free radicals
- Follow the key nutritional factors for dogs with epatobiliary disease

(Small Animal Clinical Nutrition 5 th ed)

First diet after cholecystectomy

Commercial dry food prescribed by her veterinarian: Hepatic Royal Canin

Ingredients: rice, corn, animal fat, isolated soy protein, hydrolyzed animal protein, dried beetroot slices, mineral, soy oil, cellulose, fish oil, FOS, flower flour Tagetes.

Guaranteed Analysis: Crude protein 16.0%, Crude fat 16.0% (17.4%DM), Crude Fiber 2.0%(2.17%DM), Ashes 4.7%, moisture 8%.

First diet after cholecystectomy

Why this diet is not correct?

Martina still had diarrhea after more than one month from the cholecystectomy

Dog didn't want to eat commercial feed

Owner requests a homemade diet

MER calculation

$$\text{MER} = K \times \text{BW}^{0,75} = \text{Kcal/die}$$

K= Inactive dogs= 95

K= Active/kennel dogs= 130

K= Active young adult dogs=140

K= Older active dogs= 105

(J. J. Ramsey, 2012:Applied Veterinary Clinical Nutrition)

$$\text{BW} = 4,5 \text{ Kg}$$

$$\text{MER} = 105 \times 4,5^{0,75} = 324 \text{ Kcal/day (1,3565 MJ)}$$

Homemade diet formulation

Energy content: 300 kcal/day (1,256 Mj)

Chicken breast	40 gr
Rice	50 gr
Sunflower oil	2 gr
Salmon oil	2 gr
Zucchini	50 gr
Carrots	50 gr
Apples	60 gr
Soluble fiber supplement	2 gr
Min and vit balancer	2 gr
Vit E supplement	2 cpr(200mg alpha-tocoferol)
Iron supplement	1 cpr(595 mg ferrous sulfate)
Zinc supplement	1cpr +1/2(33,75 mg zinc gluconate)



homemade diet

Pet and owner's
compliance are
important!!



Key nutritional factors for dogs with hepatobiliary disease	DM
Diet energy (kcal) (Biourge et al,1990,1994,1997;Marks et al 1994;Center,1996)	> 4 kcal/g
Protein % (Center,1996;Marks et al,1994;Biourge et al,1994)	15-20
Protein % (encefalopatia) (Laflamme et al,1993)	10-15
Taurin %	0,1
Arginine	-
Sodium %	0,08-0,25
Copper mg/kg (Brewer et al,1989)	<5
Zinc mg/kg (Marks et al,1994)	>200
Iron mg/kg	80-140
Vitamin E IU (Harrison et al,2003,Soden et al 2007)	400
Vitamina C IU (Harrison et al 2003)	100

Martina Diet	DM
Energia dieta kcal	3,8/g
Protein %	20,97
Fat %	6,03
Fiber %	5,4
Taurin %	0,12
Sodium %	0.16
Copper mg/Kg	0,13
Zinc mg/kg	313
Iron mg/kg	112
Vit.E IU	411,95
Vit. C IU	257

Feces after dietary change
Fecal score: grade 3/5



Biochemical Analysis after six month

Martina Biochemical Analysis	September 2015	Normal ranges	February 2016
AST (IU/L)	157	16-33	116
ALT (IU/L)	307	13-116	257
ALP (IU/L)	67	17-119	64
GGT (IU/L)	9.0	1.0-7.7	8.5
Total Protein (gr/dL)	6.0	5.9-7.2	6.5
Albumin (gr/dL)	3.0	3.0-3.5	3.1
Triglycerides (gr/dL)	171	36-137	59
Urea (gr/dL)	23	20-48	46
Glucose	29	80-115	99
HCO3 (mmol/L)	17	17.5-24	18.8

Martina

Today

Feces
Grade 4/5



Alternative commercial diets

Intestinal low fat (Royal Canine)

- Ingredient: Brewers rice, chicken by product meal, wheat, barley, natural flavors, dried plain beet pulp, grain distillers dried yeast, chicken fat, salt, calcium carbonate, fish oil, sodium silico aluminate, psyllium seed husk, potassium chloride, monocalcium phosphate, fos, hydrolyzed yeast, choline chloride, taurine, DL-methionine, marigold extract, vitamins, minerals.
- Guaranteed Analysis : Crude protein 20,0%, Crude fat 4,5-8,5 %, Crude fiber 3,6%, Moisture 10%

Gallbladder

Which type of diet would you choose for this case????

References

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Thanks for your attention
Questions?