



PURINA® PRO PLAN® SYMPOSIUM 2025

Integrative Approach to Gastrointestinal Health

**Unblocking Fat Digestion: A
Comprehensive Approach to Manage
Acute and Chronic Gastrointestinal
Diseases in Dogs and Cats**



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Nestle Purina Petcare



Outline

1. Fat: definition, roles, uptake
2. Low fat diets
 1. Role of low fat diets on gastrointestinal diseases
 2. Nutritional considerations for formulating a low fat diet
3. MCT in GI disease
4. Omega 3 fatty acids in GI disease
5. Take home messages

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1. Fat: definition, roles, uptake

2. Low fat diets

1. Role of low fat diets on gastrointestinal diseases

2. Nutritional considerations for formulating a low fat diet

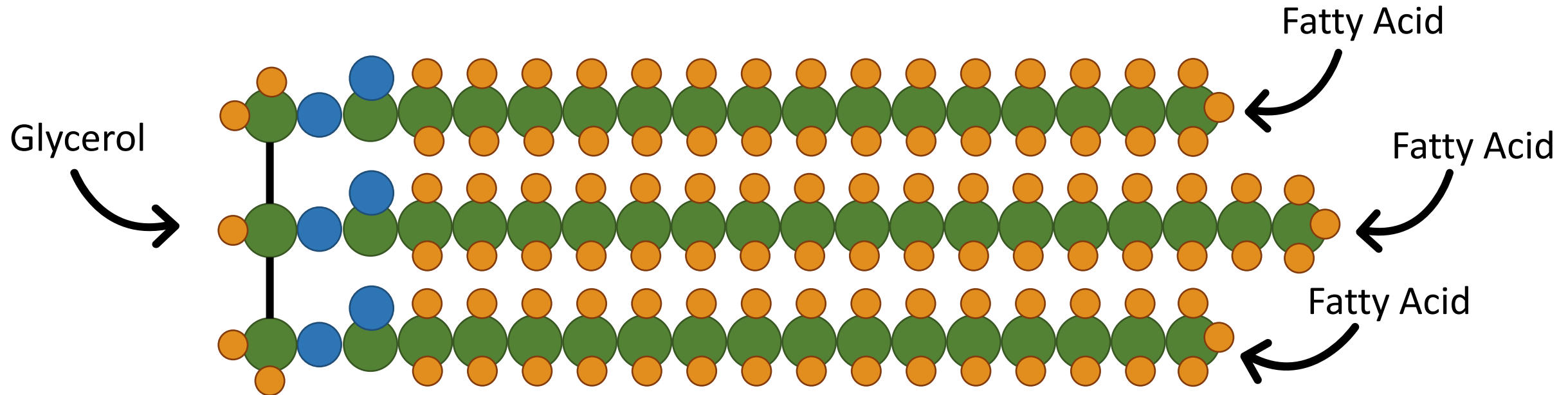
3. MCT in GI disease

4. Omega 3 fatty acids in GI disease

5. Take home messages

Dietary Fat

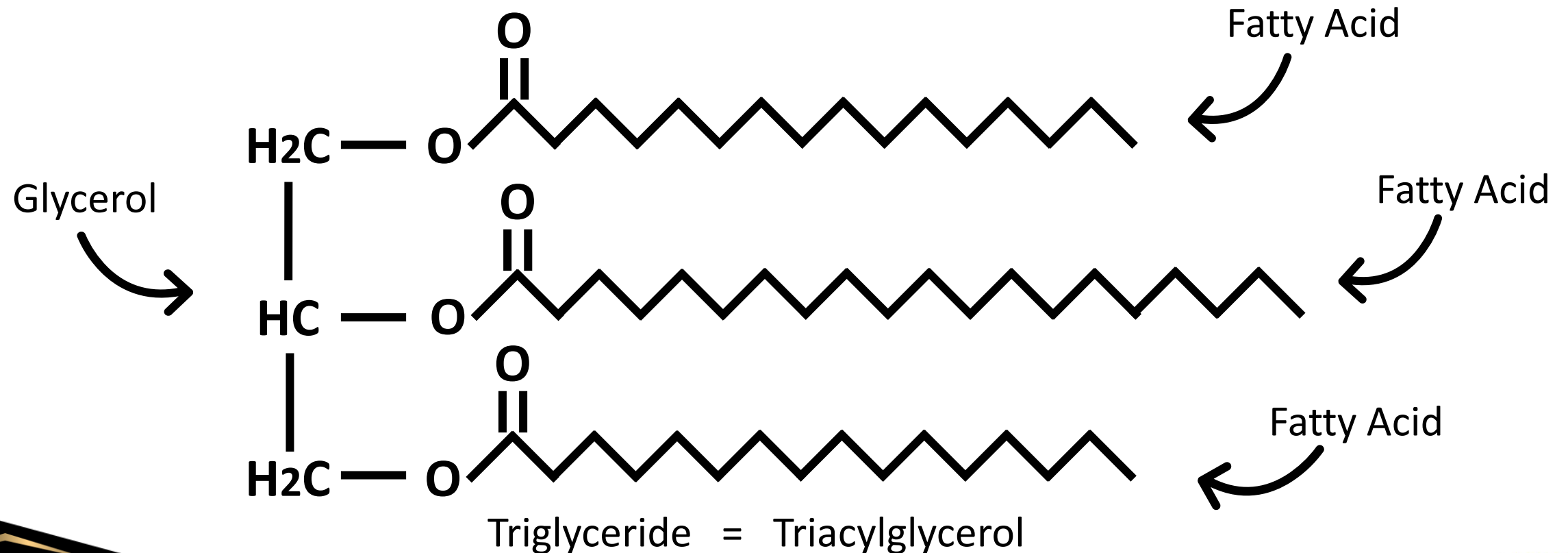
- › Dietary fat is an over-arching term used to describe the different types of fat that can be found in a pet food.



Triglyceride = Triacylglycerol

Dietary Fat

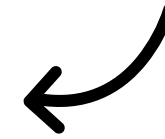
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Names for Fatty Acids



Saturated



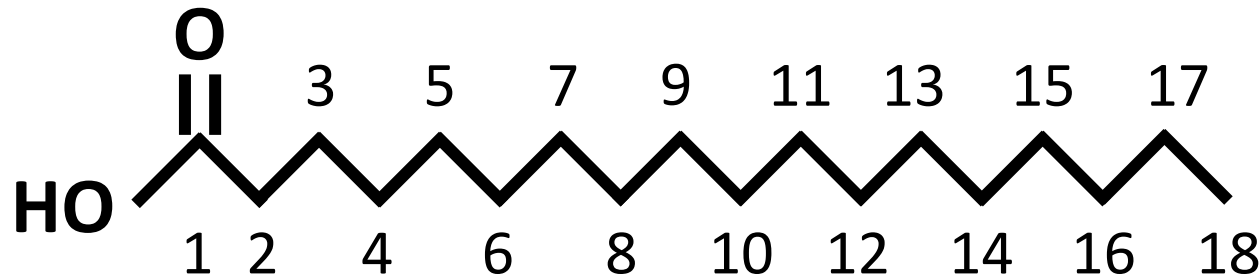
Monounsaturated



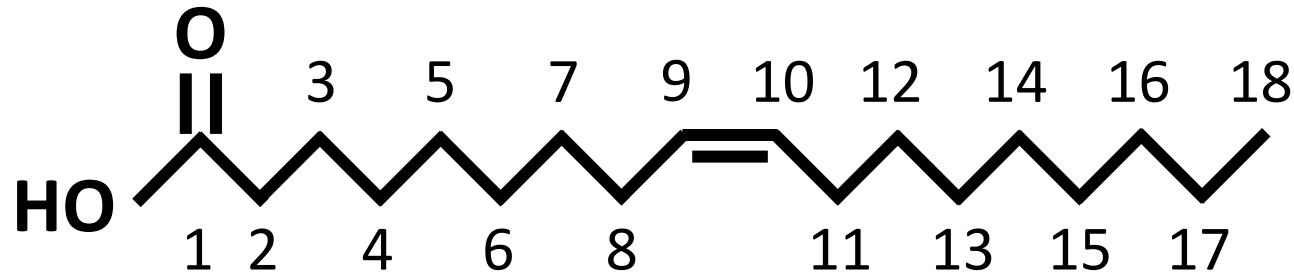
Polyunsaturated



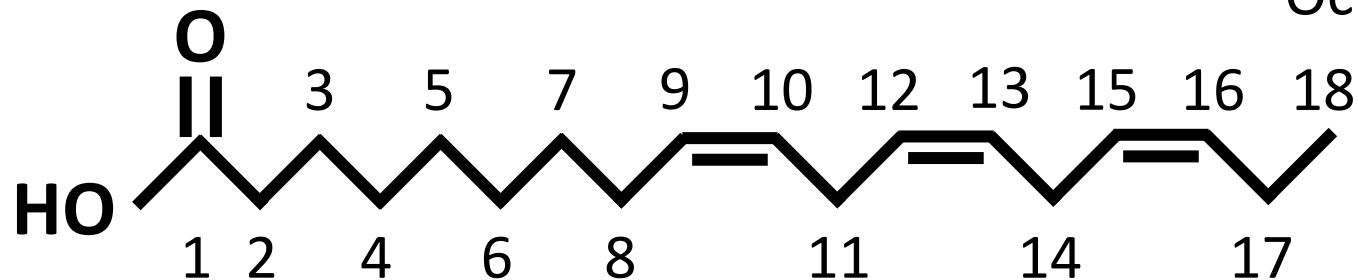
Names for Fatty Acids



~~Octadecanoic Acid~~

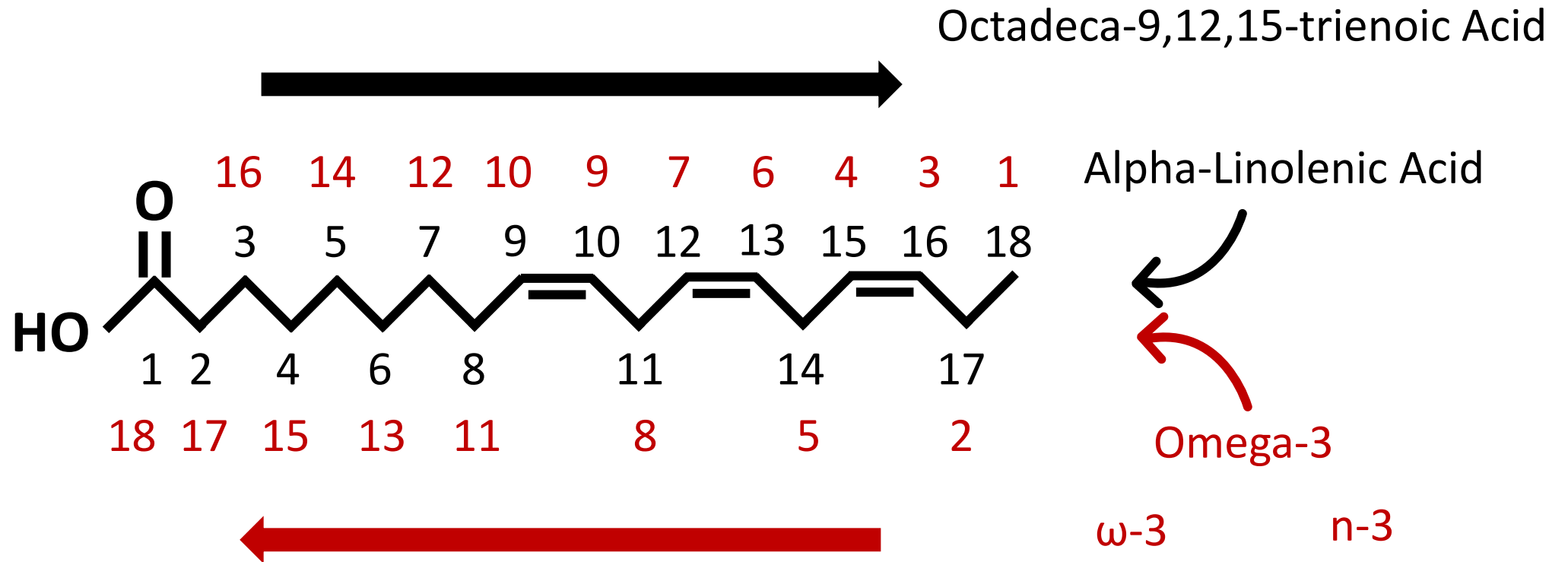


~~Octadecenoic Acid~~

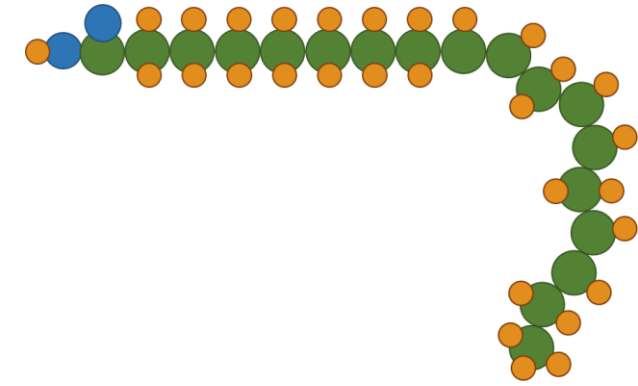


~~Octadecatrienoic Acid~~

Names for Fatty Acids



Functions of Dietary Fat in Animals



- › Aid in absorption of fat soluble vitamins
- › Source of energy
- › Cellular membrane integrity and flexibility
- › Inflammation regulation
- › Vision
- › Neural communication
- › Skin
- › Contributes to metabolic water

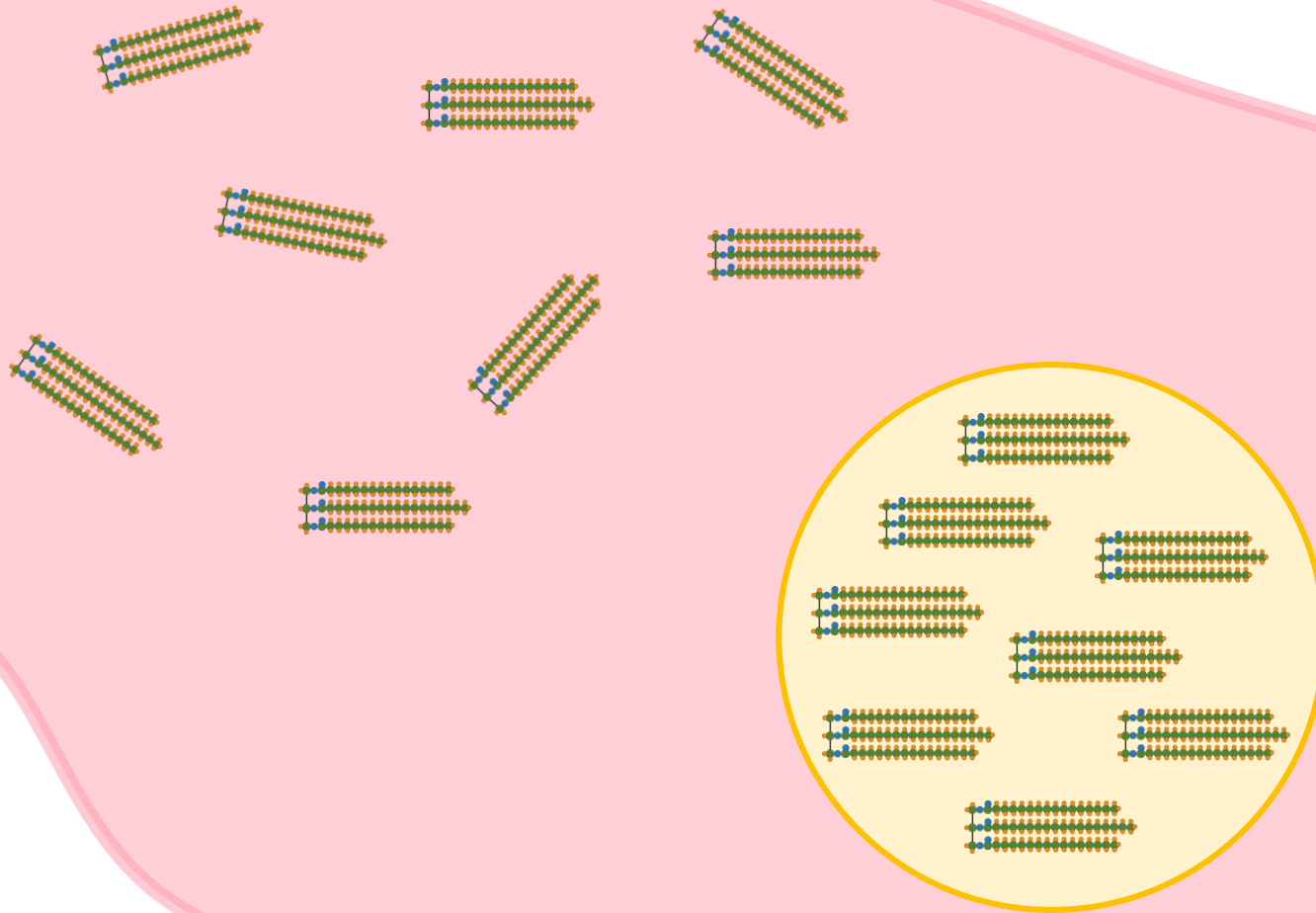
Functions in Food

- › Provide essential fatty acids
- › Aid in absorption of fat-soluble vitamins
- › Energy
- › Taste

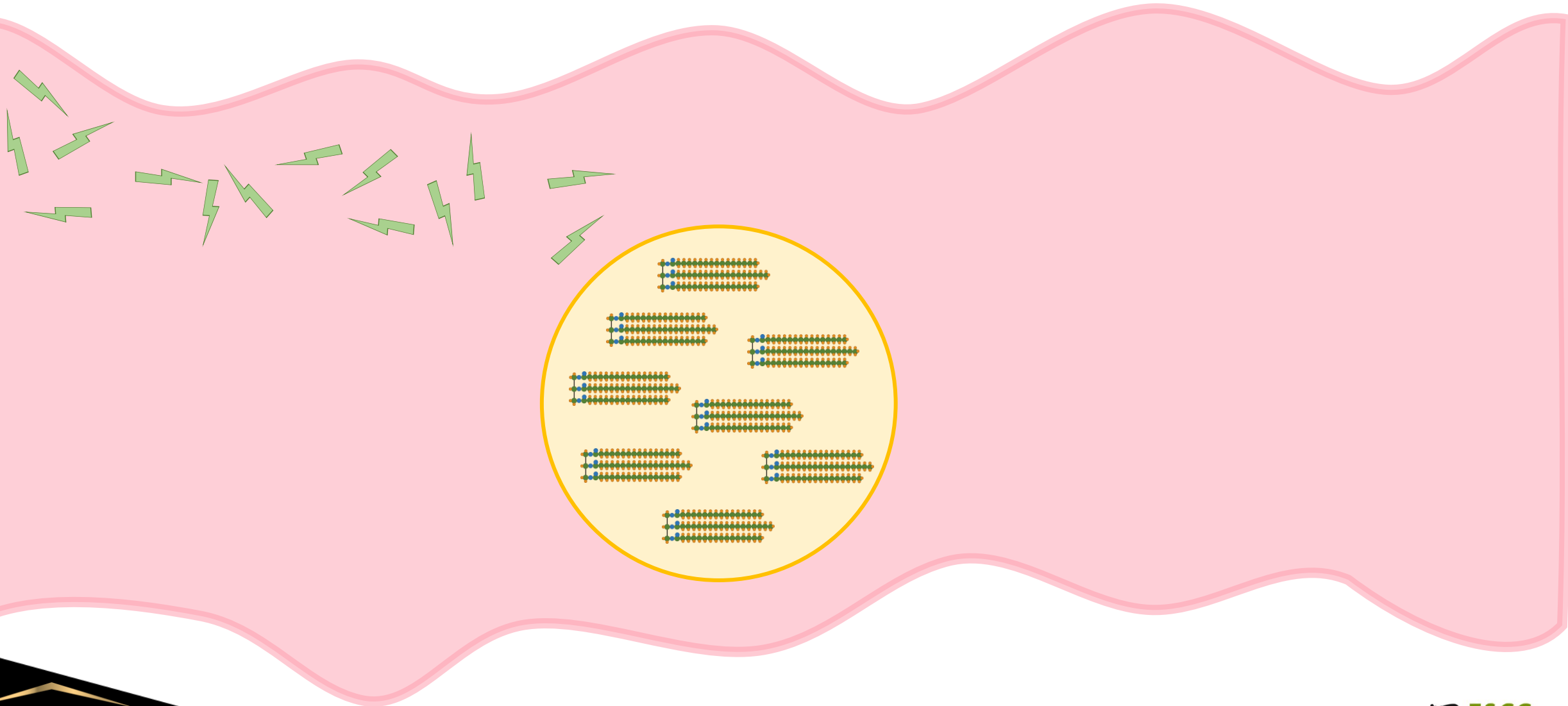
Short-Chain Fatty Acids (SCFA)

- › ≤ 6 Carbons in length
- › Role for gut health and cell energy
- › Not typically included in diets
 - › Produced by gut microflora
- › Volatile

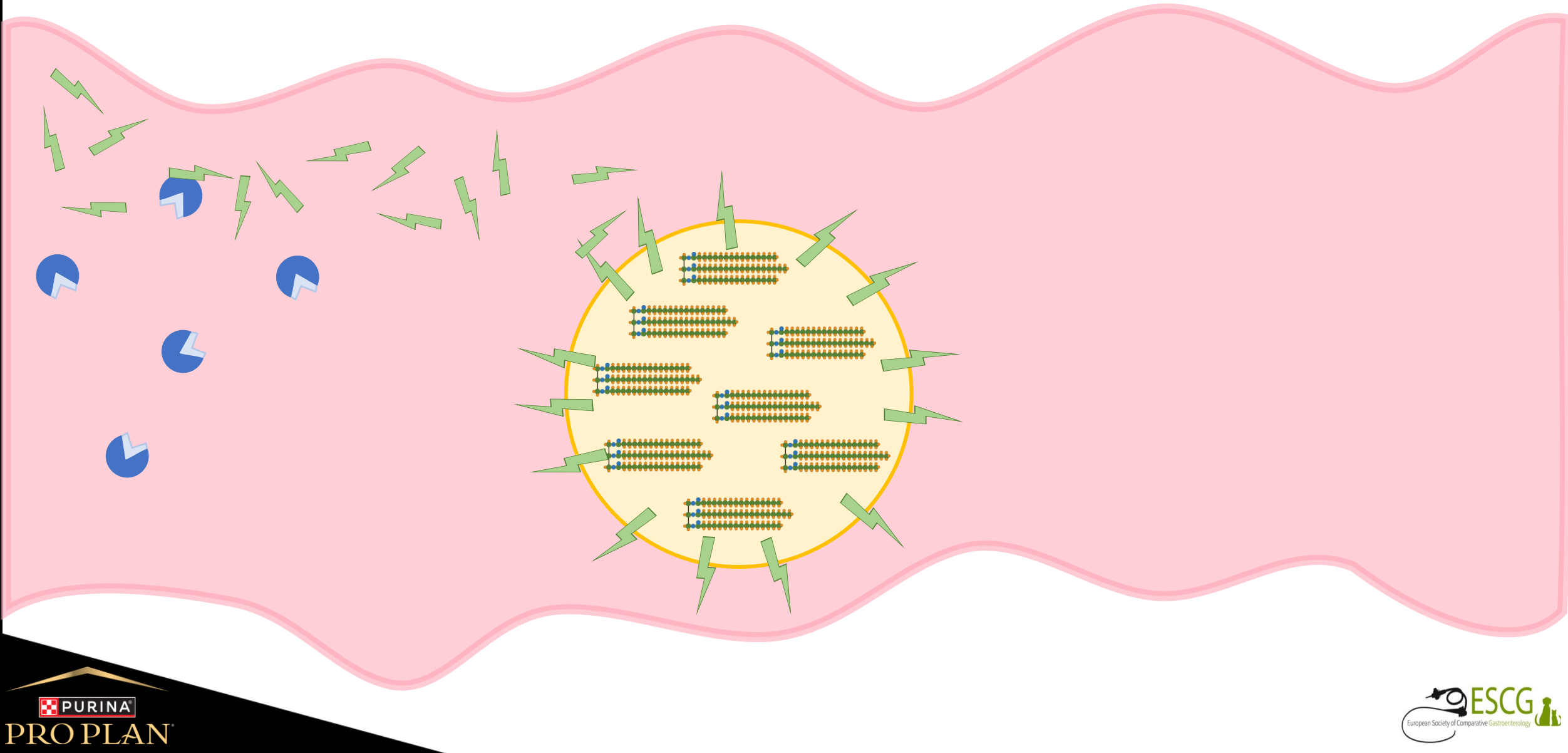
Digestion and Absorption



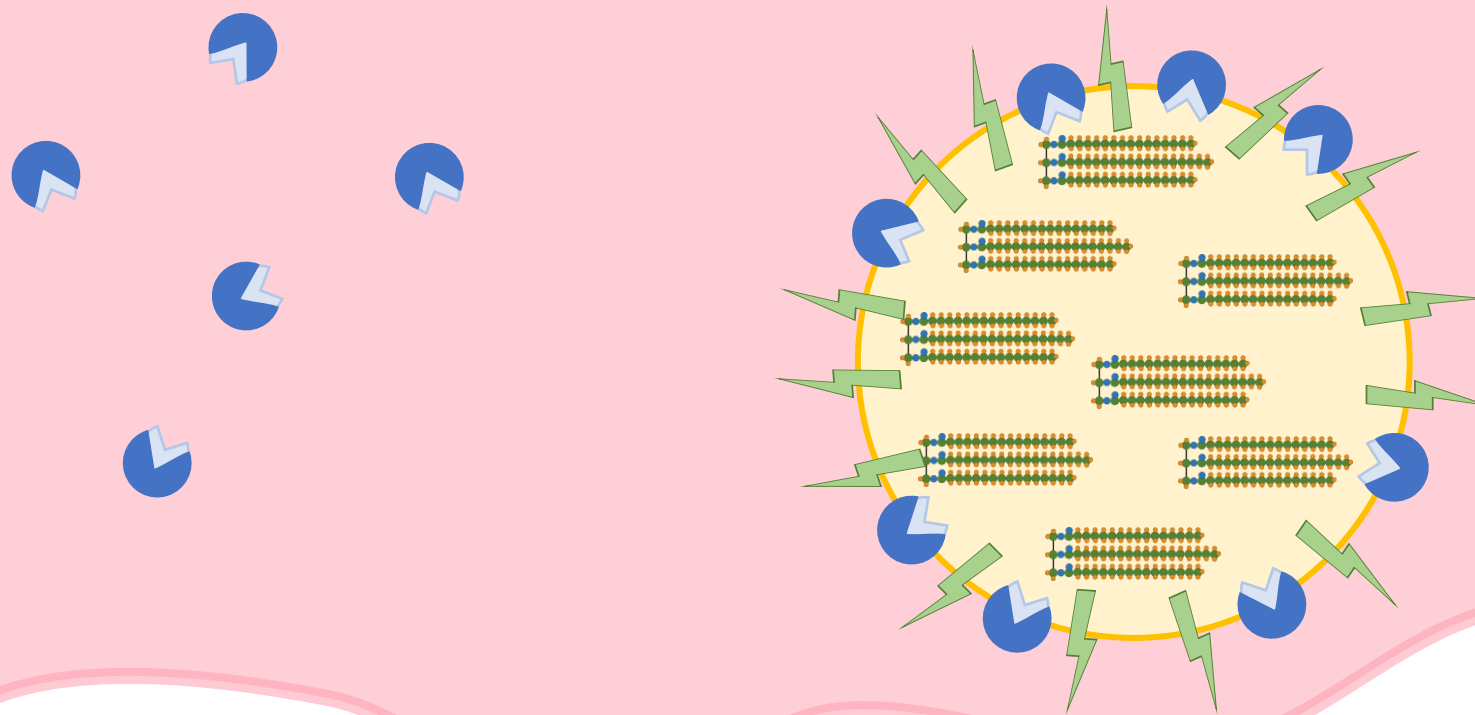
Digestion and Absorption



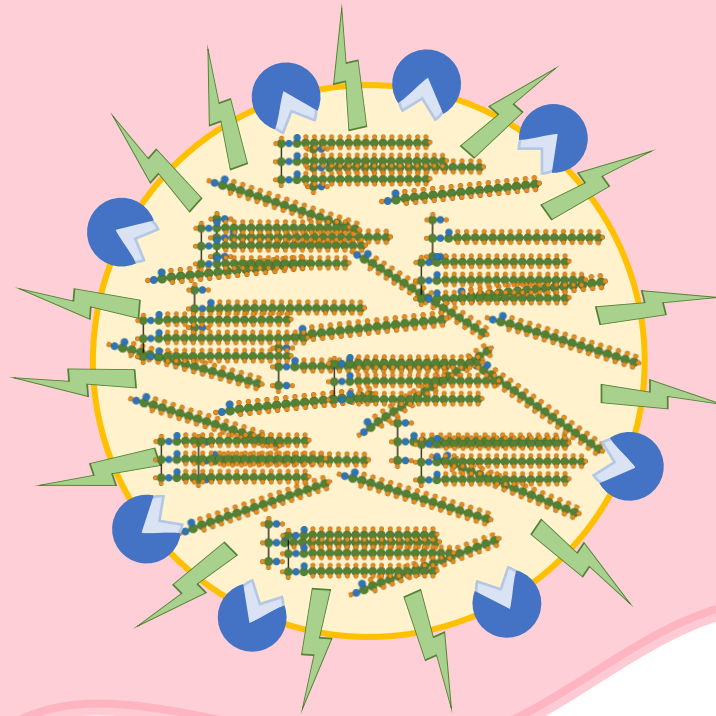
Digestion and Absorption



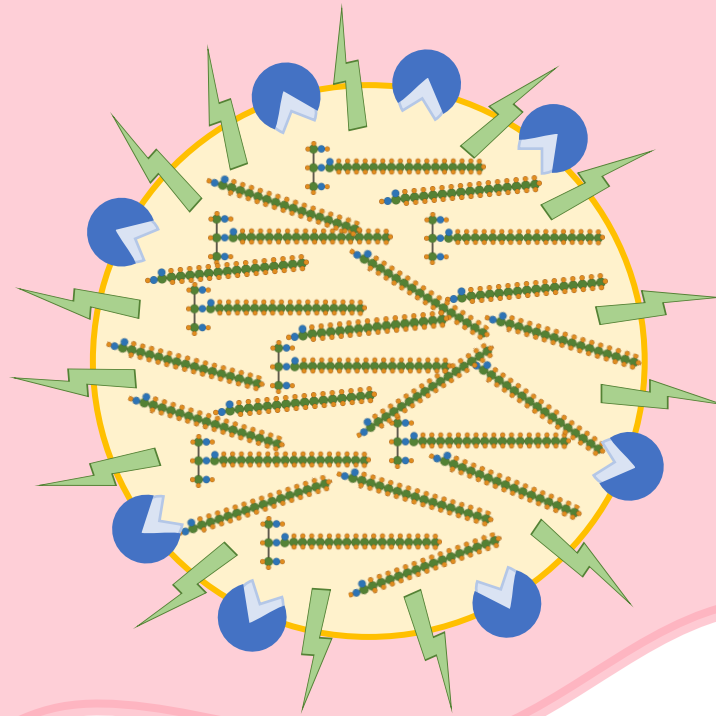
Digestion and Absorption



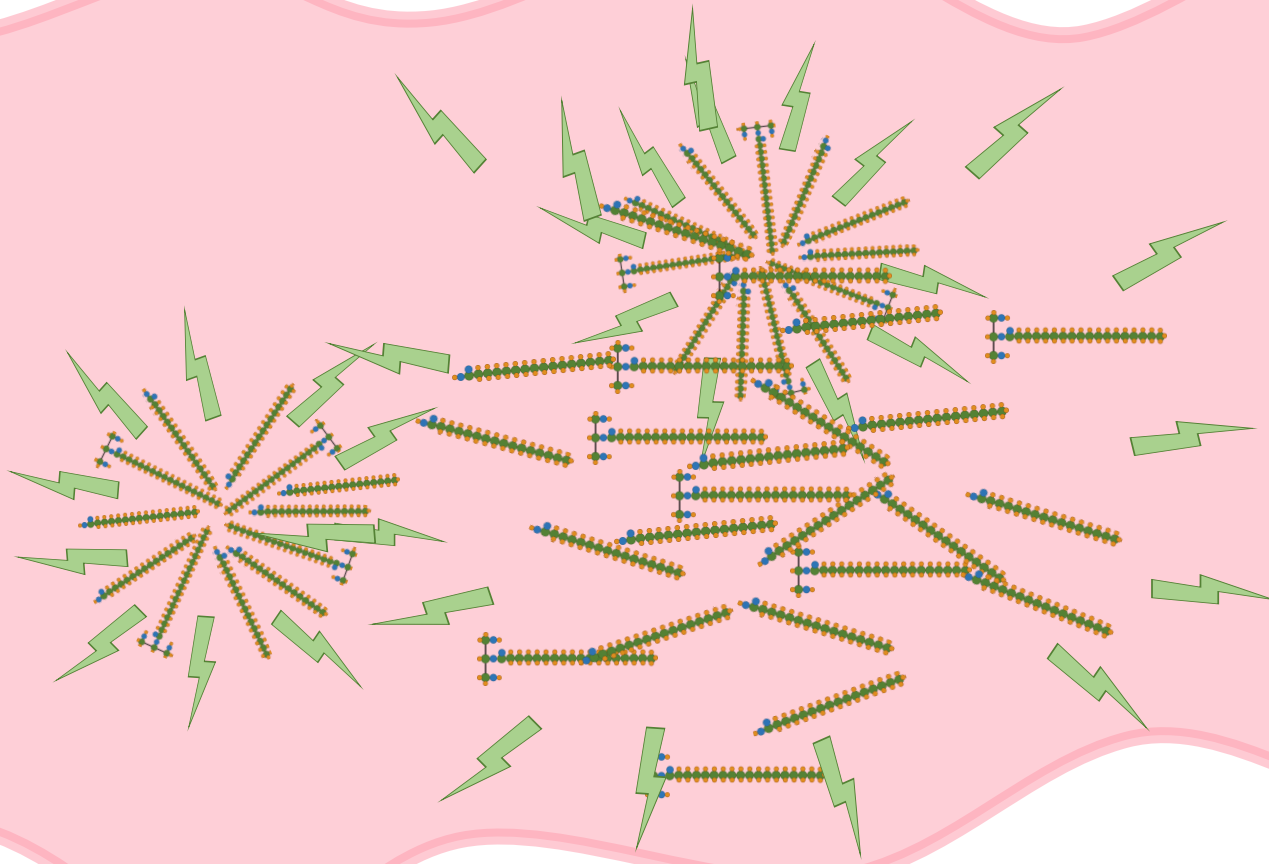
Digestion and Absorption



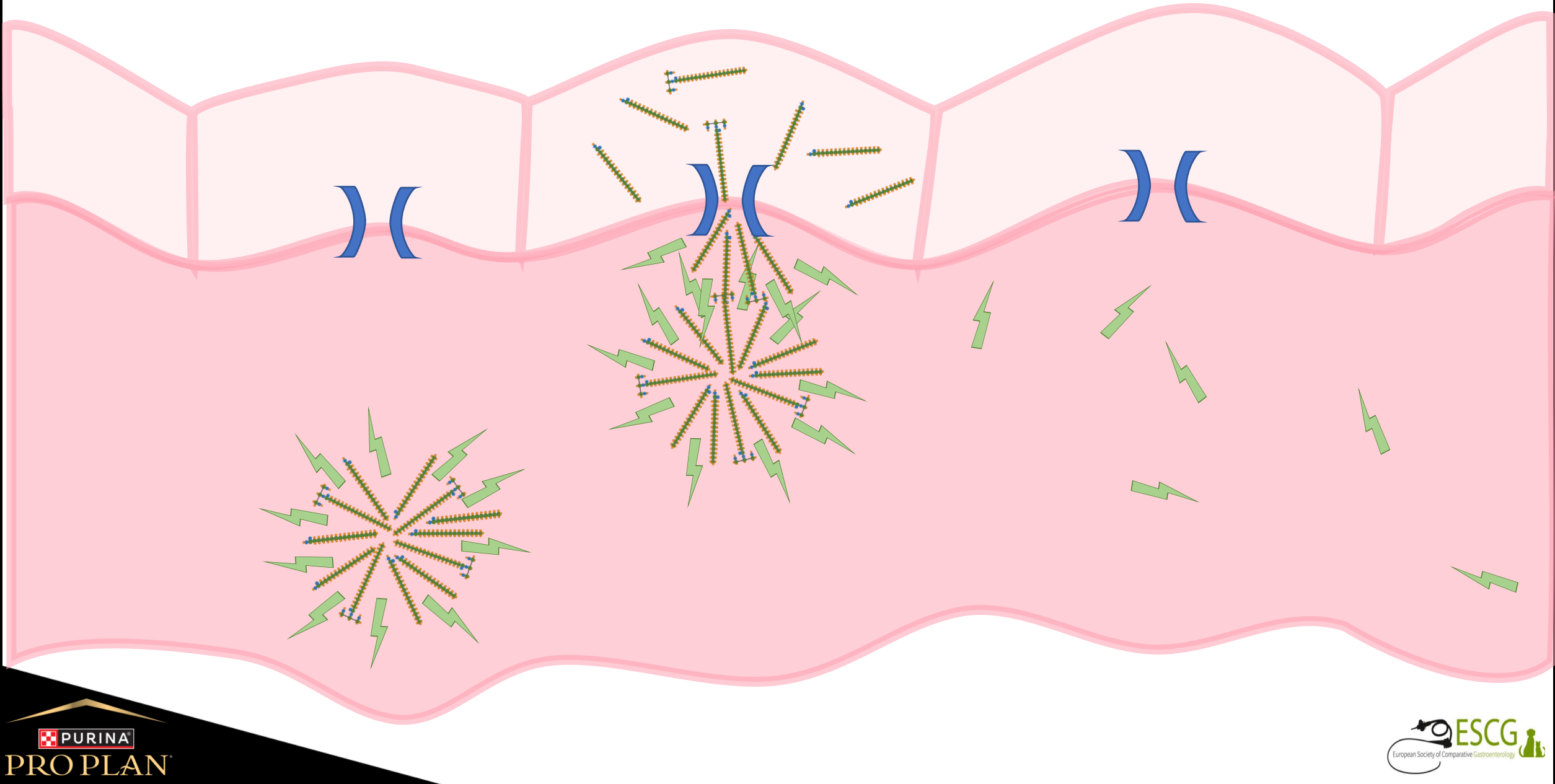
Digestion and Absorption



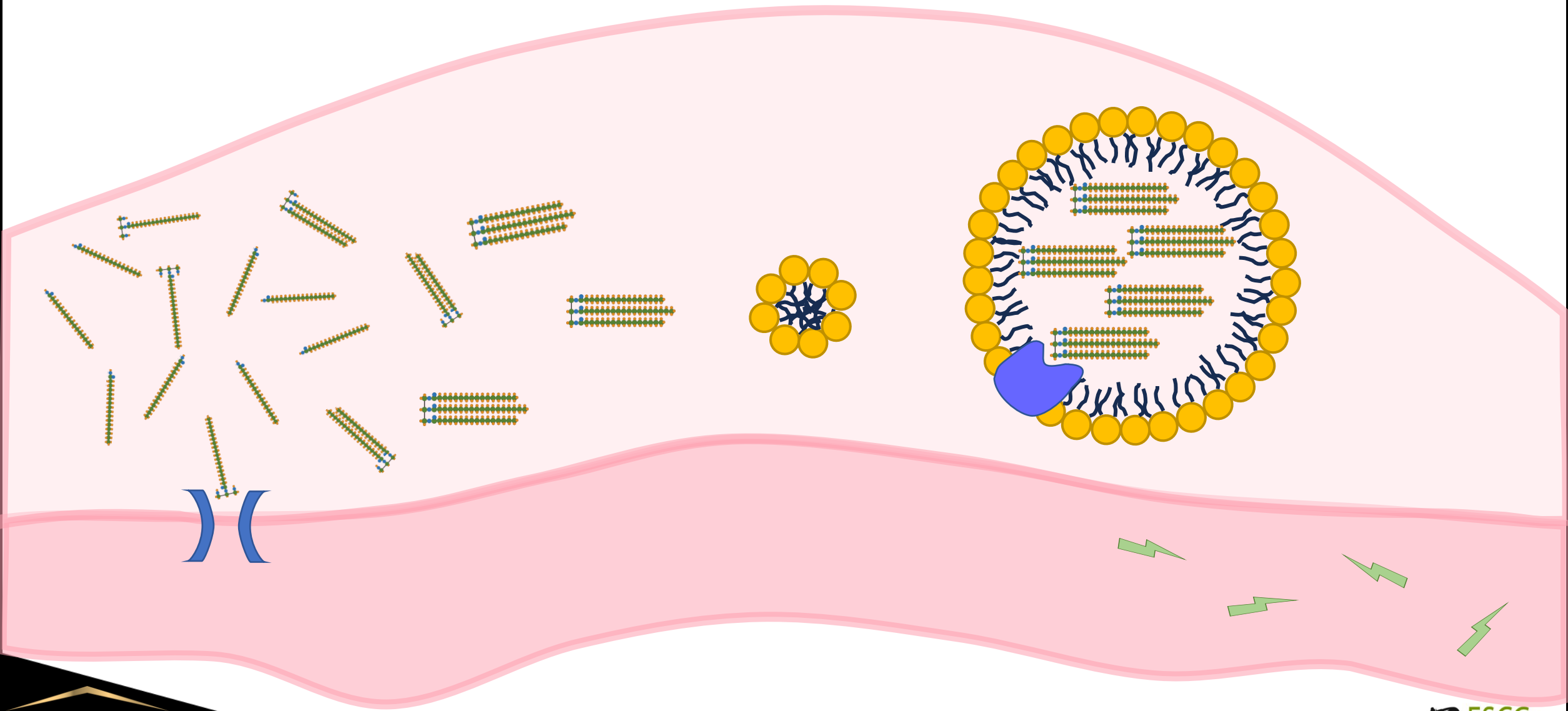
Digestion and Absorption



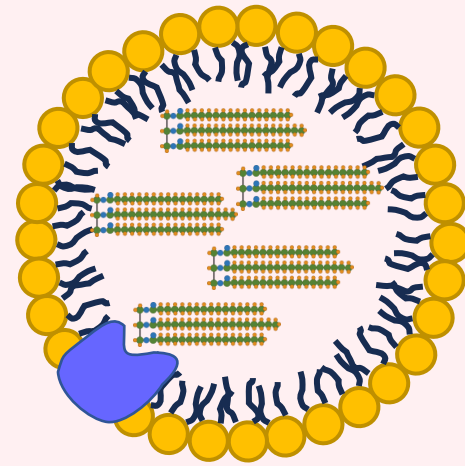
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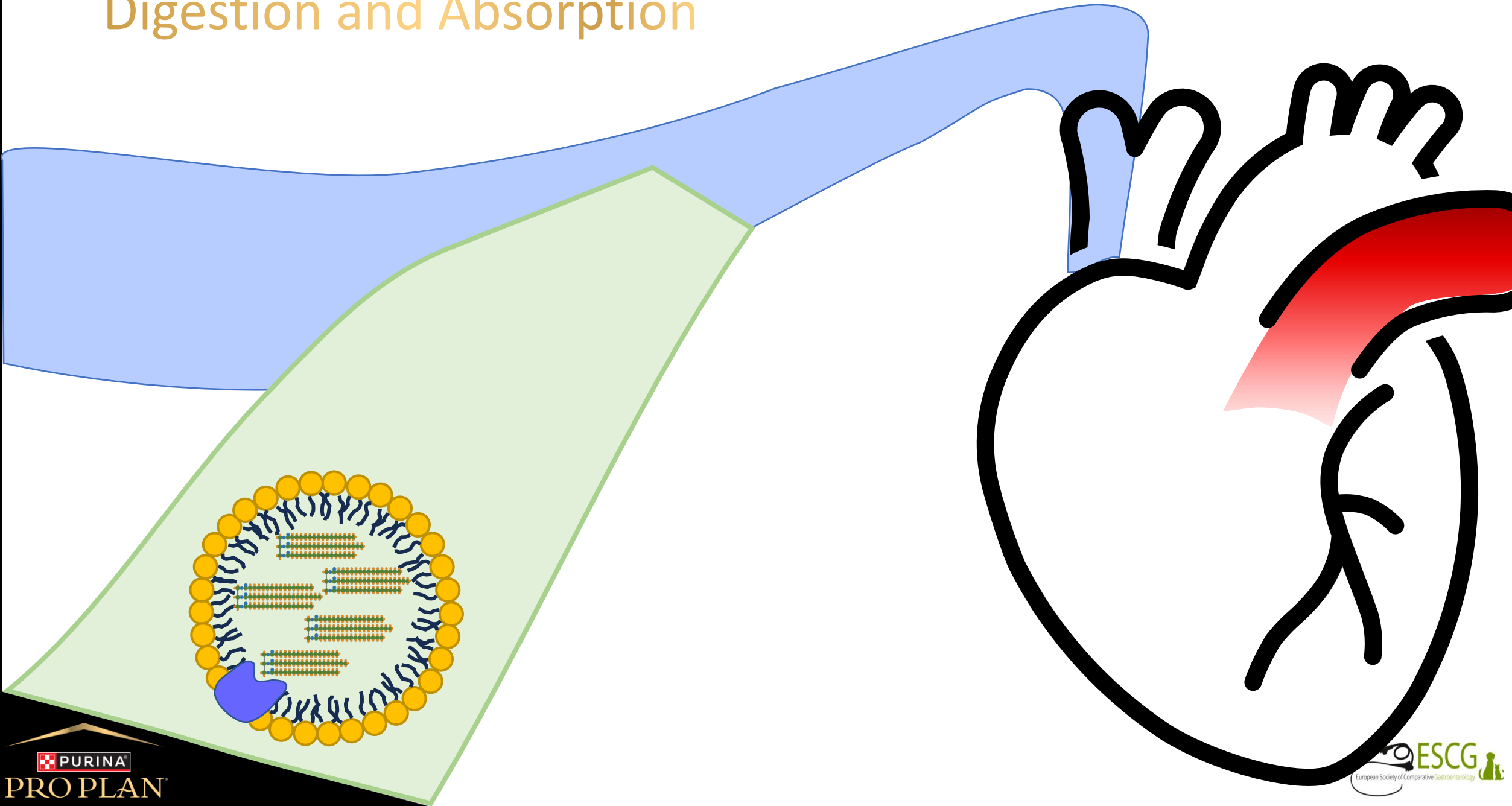
Digestion and Absorption



Digestion and Absorption



Digestion and Absorption



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1.Fat: definition, roles, uptake

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2.Nutritional considerations for formulating a low fat diet

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Diets for CE

Intestinal

High digestibility
+/- other strategies

Subgroup (K9): Low Fat

Elimination
("hypoallergenic")

Limited ingredients

Novel ingredients

Fibre enhanced

Colitis
Constipation

Hydrolysed protein

Amount of fat



- ↑ energy density and palatability
- Enhances absorption of fat soluble vitamins...



- Delays gastric emptying
- Complex to digest
- Others?

Pancreatitis

- Pancreatitis— premature zymogen activation
- Etiopathogenesis not 100% known
- Associations/risk factors:

Dog:

Breed
Medications
Trauma
Ischemia
Obesity
Hyperlipidemia
High fat diets/treats

Cat:

- **Idiopathic**
- Trauma
- FIP
- **Hyperlipidemia**
- Intestinal & liver disease (triaditis)





- Hyperlipidaemia
 - 18-26% dogs with acute pancreatitis can show elevations in TAG and/or cholesterol
 - Cause or consequence?
 - Toxic FA/microthrombi/calcium soaps
- High fat diets – trigger or worsen
 - SUL 81 g/1000 kcal (30% DM) (NRC 2006)
 - Old data!
 - No regulatory or industry maxima
- Fatty scraps?

STANDARD ARTICLE

Journal of Veterinary Internal Medicine **ACVIM**
Open Access American College of
Veterinary Internal Medicine

Serum triglyceride and cholesterol concentrations
and lipoprotein profiles in dogs with naturally occurring
pancreatitis and healthy control dogs

Panagiotis G. Xenoulis^{1,2} | Paul J. Cammarata³ | Rosemary L. Walzem⁴ |
Jan S. Suchodolski¹ | Jörg M. Steiner¹

Associations between dietary factors and pancreatitis in dogs

Kristina Y. Lem, DVM, MS; Geoffrey T. Fosgate, DVM, PhD, DACVPM;
Bo Norby, C Med Vet, MPVM, PhD; Jörg M. Steiner, med vet, Dr med vet, PhD, DACVIM

- Looked at:
 - Table scraps (routine & week before admission)
 - Unusual food items (week before admission),
 - garbage access (week before admission)
 - part of a large gathering with food (week before admission)
 - Did NOT look into specific diets and their fat content
- Dogs with 1 or + – esp. getting into the trash - more likely to have pancreatitis (+ factors → + likely).
- Authors hypothesize trash and scraps might be high fat and increase risk.

Nutritional support pancreatitis

› Supportive role. Goals:

- › Provide nutrients for body function and recovery in an easily available manner
- › Provide energy to maintain stable body weight, ideal BCS
- › Minimize pancreatic stimulation – low fat?

Nutritional support pancreatitis

- › Lots of unknowns! – best practice?
 - › Clinician dependent
 - › Cats??
- › Some controversies include:
 - › Do patients need fat restriction? Dogs vs cats
 - › What does “low fat” mean – no regulatory guidance

22	Support of lipid metabolism in the case of hyperlipidaemia	Fat ⁽¹¹⁾ ≤ 110 g/kg complete feed with a moisture content of 12 % ⁽¹²⁾ 36 g/1000 kcal (30% calories)	Dogs and cats
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COMMISSION REGULATION (EU) 2020/354

of 4 March 2020

establishing a list of intended uses of feed intended for particular nutritional purposes and repealing Directive 2008/38/EC

Diet choice: dogs



- › **Lack of data**
- › Complete and balanced diet, highly digestible (“intestinal”)
- › Consensus that in dogs with AP low fat can help
 - › No consensus on what Low Fat means
- › Intestinal Low Fat diets (16-22% calories) → can be used w/o sacrificing calories

Statistical trend: low fat fed patients: fewer intolerance episodes

JOURNAL OF
Veterinary Emergency
AND Critical Care



Retrospective Study

Journal of Veterinary Emergency and Critical Care 00(0) 2017, pp 1–9
doi: 10.1111/vec.12612

Retrospective evaluation of the impact of early enteral nutrition on clinical outcomes in dogs with pancreatitis: 34 cases (2010–2013)

Jessica P. Harris, DVM; Nolie K. Parnell, DVM, DACVIM; Emily H. Griffith, PhD and Korinn E. Saker, MS, DVM, PhD, DACVN

What about long term?

- › Return to original diet?
 - › Fat level
 - › Trigger identified?
 - › Obese dogs: weight loss plan!
 - › Hyperlipidemia
- › For chronic/recurrent cases
 - › Consider long term use diet lower in fat than the diet at diagnostics (50% decrease)
 - › Low fat treats!

What about cats

- › Chronic dz + common
- › No evidence fat moderation helps
- › Complete and balanced for the lifestage, highly digestible
- › Consider co-morbidities (e.g. hydrolysed diets in triaditis)
- › Can try to moderate fat (vs current diet) if refractory or lipemia

53 g/1000 kcal
(45% ME)

Journal of Veterinary Emergency and Critical Care 19(4) 2009, pp 337–346
doi: 10.1111/j.1476-4431.2009.00438.x

Nasogastric tube feeding in cats with suspected acute pancreatitis: 55 cases (2001–2006)

Jennifer A. Klaus, DVM; Elke Rudloff, DVM, DACVECC and Rebecca Kirby, DVM, DACVIM, DACVECC



ACVIM consensus statement on pancreatitis in cats

Marnin A. Forman¹ | Joerg M. Steiner²  | P. Jane Armstrong³ |
Melinda S. Camus⁴ | Lorrie Gaschen⁵ | Steve L. Hill⁶ | Caroline S. Mansfield⁷ |
Katja Steiger⁸

Protein losing enteropathy - K9

J Vet Intern Med 2014;28:809–817

The Clinical Efficacy of Dietary Fat Restriction in Treatment of Dogs with Intestinal Lymphangiectasia

H. Okanishi, R. Yoshioka, Y. Kagawa, and T. Watari

Received: 27 June 2019 | Accepted: 21 January 2020

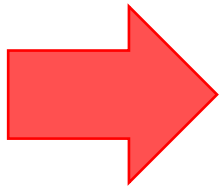
DOI: 10.1111/jvim.15720

STANDARD ARTICLE

Journal of Veterinary Internal Medicine  **Open Access**
American College of Veterinary Internal Medicine

Clinical characteristics of dogs with food-responsive protein-losing enteropathy

Noriyuki Nagata¹  | Hiroshi Ohta¹  | Nozomu Yokoyama² | Yong Bin Teoh¹ | Khoirun Nisa¹  | Noboru Sasaki¹ | Tatsuyuki Osuga² | Keitaro Morishita²  | Mitsuyoshi Takiguchi¹ 



Prospective evaluation of a change in dietary therapy in dogs with steroid-resistant protein-losing enteropathy

S. A. JABLONSKI WENNOGLE¹, J. STOCKMAN AND C. B. WEBB

Prospective Evaluation of Low-Fat Diet Monotherapy in Dogs with Presumptive Protein-Losing Enteropathy

Marc Myers, VMD, Stephen A. Martinez, DVM, DACVIM, Jonathan T. Shiroma, DVM, MS, DACVR, Adam T. Watson, DVM, DACVR, Roger A. Hostutler, DVM, MS, DACVIM

- Some PLE dogs respond to low fat diet (alone or + IS)
- ☐ Commercial: 16-24% fat calories (20-30 g/1000 kcal)
 - ☐ HMD <16% calories (<20 g/1000 kcal)

- › Buster, 9 year old Yorkshire terrier
- › 5.1 kg, BCS 5/9, MCS 3/4
- › Lethargy, anorexia, dyspnoea
 - › Pleural effusion
- › Normal echocardio, UPCR

	units	reference range ¹	Day 1
Alk Phosphatase	IU/L	10 - 150	15
ALT	IU/L	5 - 107	142
AST	IU/L	5 - 55	88
CK	IU/L	10 - 200	191
GGT	IU/L	0 - 14	4
Amylase	IU/L	450 - 1240	785
Lipase	IU/L	100 - 750	423
Albumin	g/dL	2.5 - 4.0	1.2
Total Protein	g/dL	5.1 - 7.8	3
Globulin	g/dL	2.1 - 4.5	1.8
Total bilirubin	mg/dL	0.0 - 0.4	0.2
BUN	mg/dL	7 - 27	14
creatinine	mg/dL	0.4 - 1.8	0.6
Cholesterol	mg/dL	112 - 328	82
Glucose	mg/dL	60 - 125	72
Calcium	mg/dL	8.2 - 12.4	7.8
Phosphorus	mg/dL	2.1 - 6.3	3.9
TCO2	mEq/L	17 - 24	20
Chloride	mEq/L	105 - 115	122
Potassium	mEq/L	4.0 - 5.6	5.5
Sodium	mEq/L	141 - 156	151
Anion gap	mEq/L	12 - 24	15
Magnesium	mg/dL	1.5-2.6	
T4	ug/dL	0.8 - 5.0	1.5

› Endoscopic biopsies: lymphangiectasia

Management:

Primary cause (if any)

Supportive (e.g.
clopidogrel...)

Diet

- ✓ Highly digestible
- ✓ Elimination diet if secondary to food responsive chronic enteropathy
- ✓ Main: Fat restriction (decrease lymphatic flow and lacteal pressure)

Nutritional Assessment Checklist

To be completed by the pet owner. Please answer the following questions about your pet:

Pet's name: Buster Species/breed: YST Age: 9 y
 Owner's name: Ms X Date form completed: _____

- 1 How active is your pet? Very active ☐ Moderately active ☐ Not very active ☒
 2 How would you describe your pet's weight? Overweight ☐ Ideal weight ☒ Underweight ☐
 3 Where does your pet spend most of the time Indoor ☒ Outdoor ☐ Indoor & Outdoor ☐

Please list below the brands and product names (if applicable) and amounts of ALL foods, treats, snacks, dental hygiene products, rawhides and any other foods that your pet is currently eating, including foods used to administer medications:

Food	Form	*Amount	Number	Fed since
Examples:				
• Purina Cat Chow	dry	½ cup	2x/day	Jan 2010
• 90% lean hamburger	pan-fried	3 oz (85 grams)	1x/week	May 2011
• Milk Bone medium	dry	2	3/day	Aug 2012
• Greenies Salmon Dental	treat	2	daily	Jan 2013
Maintenance diet	Dry	ad lib	daily	
Table scraps		?	daily	
Chicken jerky		1-2	daily	

*If you feed by volume, what size measuring device do you use? _____

*If you feed tinned/canned food, what size tins/cans? _____

- 4 Do you give any dietary supplements to your pet (for example: vitamins, glucosamine, fatty acids, or any other supplements)? No ☒ Yes ☐

If yes, please list brands and amounts: _____

- › Current diet: 34 g fat/1 000 kcal (29% fat calories)
 - › Not counting table foods or other treats

Feeding plan:

❑ Diet choice: Commercial “low fat” (19 g/1 000 kcal, 16% fat calories) – 44% reduction

❑ Allowance – energy needs estimated as 322 kcal/day

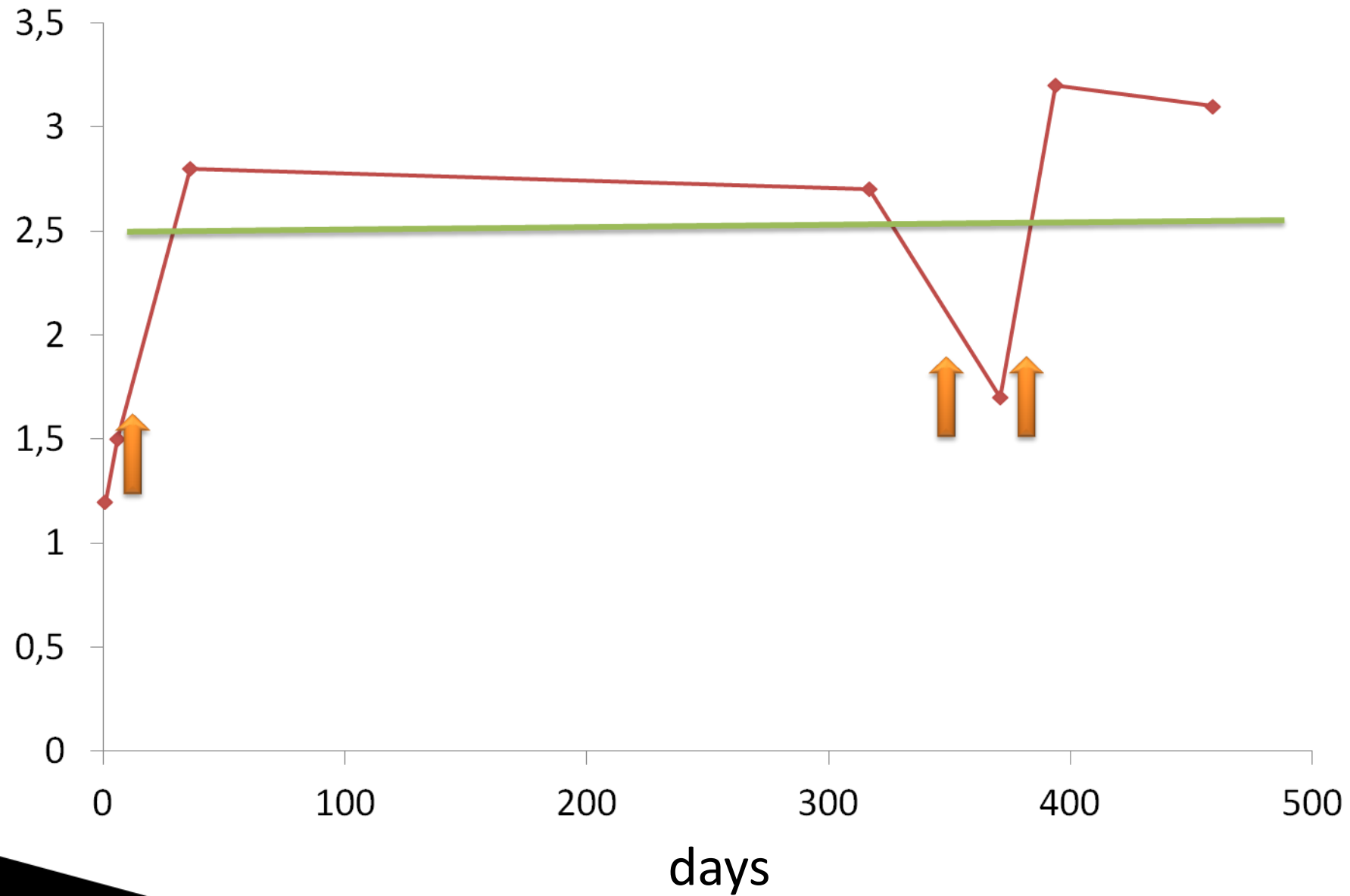
Diet: 3.7 kcal/g $\rightarrow 322/3.7 = 87$ grams/day

❑ Schedule: 29 g x 3

- › Partial improvement
- › Needs more fat restriction?
Limited novel ingredients?
- › Homemade diet:
 - › Egg whites
 - › White rice
 - › Corn oil ($\omega 6$)
 - › No omega 3 source
 - › Supplements

10% fat calories (11 g/1000 kcal)
Still meeting EFA requirements

Albumin (g/dL)



When choosing a low fat diet:

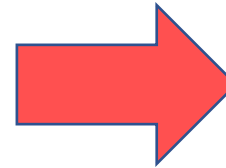
- › Do a diet history to assess current fat intake – complete
- › Fat intake should be assessed on a calorie basis! – do not trust claims

Example

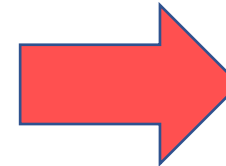
Intestinal low fat dry diet (7% as fed)

Caregiver finds commercial raw diet with 7% fat and considered equivalent (plus more “natural”)

Product guides of vet diets usually provide information on calorie basis



20 g/1000 kcal
(17% calories)

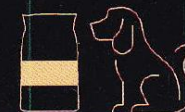


50 g/1000 kcal
(42% calories)

CANINE DRY TYPICAL ANALYSIS

PER 100 KCAL

PURINA
PRO PLAN
VETERINARY DIETS



		PURINA® PRO PLAN® VETERINARY DIETS AND RELATED PRODUCTS											
Nutrient	Unit	CC	DM	DRM	EN	FF	HA	HP	JM	NC	NF	OM	UR
Protein	g	7.2	10.8	7.5	6.5	12.3	5.7	4.8	8.1	7.7	3.4	9.6	5.5
Fat	g	4.1	3.5	4.6	2.8	4.3	2.7	4.6	3.2	3.8	3.8	2.0	3.7
Carbohydrate	g	11.0	8.6	8.7	13.5	3.0	14.6	11.7	11.0	9.8	15.5	15.8	12.4
Crude fibre	g	1.2	2.0	0.6	0.5	0.2	0.5	0.9	0.7	0.4	0.5	3.4	0.4
Ash	g	2.0	2.0	1.7	1.6	1.8	1.5	1.5	1.9	1.9	1.2	2.2	1.2
Minerals													
Calcium	g	0.42	0.42	0.30	0.32	0.16	0.30	0.26	0.36	0.41	0.20	0.46	0.17
Phosphorus	g	0.20	0.30	0.25	0.24	0.30	0.27	0.19	0.28	0.26	0.11	0.28	0.17
Magnesium	g	0.04	0.04	0.04	0.03	0.02	0.02	0.03	0.03	0.03	0.02	0.04	0.02
Sodium	g	0.05	0.07	0.09	0.08	0.43	0.10	0.05	0.11	0.09	0.05	0.07	0.05
Potassium	g	0.16	0.18	0.20	0.18	0.27	0.20	0.19	0.25	0.25	0.21	0.21	0.17
Chloride	g	0.22	0.07	0.26	0.30	0.20	0.22	0.18	0.24	0.20	0.18	0.09	0.17
Iron	mg	7.0	6.3	5.1	4.5	51.0	3.8	2.4	4.7	5.2	3.8	5.8	5.1
Copper	mg	0.0	0.5	0.5	0.5	10.0	0.5	0.1	0.5	0.5	0.6	0.6	0.5
Zinc	mg	5.0	4.7	3.3	4.6	96.0	4.6	5.1	5.0	5.0	4.8	5.1	4.5
Manganese	mg	1.0	1.2	1.1	1.4	21.0	1.4	0.4	1.3	1.4	1.5	1.6	1.3
Selenium	mg	0.01	0.01	0.01	0.01	0.06	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Iodine	mg	0.11	0.07	0.04	0.07	0.84	0.07	0.07	0.08	0.08	0.07	0.07	0.07
Vitamins													
Vitamin A	IU	645.5	558.3	572.0	535.3	-	533.9	497.0	518.7	633.0	552.5	740.8	575.7
Vitamin D ₃	IU	29.8	29.3	31.9	25.0	-	26.0	43.7	44.6	28.1	37.4	32.5	25.9
Vitamin E	IU	24.1	14.1	7.5	13.1	146.77	8.1	12.0	21.9	11.2	8.1	10.1	7.6
Vitamin K	mg	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Thiamine (vit. B ₁)	mg	0.65	0.82	0.70	0.78	-	0.76	0.34	0.77	0.64	0.77	1.07	0.71
Riboflavin (vit. B ₂)	mg	0.33	0.43	0.30	0.35	-	0.33	0.33	0.37	0.34	0.35	0.50	0.36
Pyridoxine (vit. B ₆)	mg	0.34	0.47	0.35	0.40	-	0.39	0.30	0.40	0.36	0.39	0.59	0.44
Niacin (vit. B ₃)	mg	3.53	4.75	3.22	4.21	-	3.43	1.83	4.41	3.97	3.71	5.49	3.96
Pantothenic acid (vit. B ₅)	mg	1.06	1.29	1.02	1.21	-	1.10	0.92	1.27	1.06	1.22	1.59	1.12
Cobalamin (vit. B ₁₂)	mg	0.01	0.01	0.01	0.01	-	0.01	0.00	0.01	0.01	0.01	0.01	0.01
Folic acid (vit. B ₉)	mg	0.10	0.14	0.11	0.12	-	0.12	0.08	0.12	0.11	0.12	0.17	0.12
Biotin (vit. B ₇)	mg	0.00	0.01	0.00	0.00	-	0.00	0.00	0.01	0.01	0.00	0.01	0.01
Choline	mg	48.8	48.9	60.8	51.5	-	74.4	153.8	70.4	51.0	79.0	64.4	45.7
Essential fatty acids													
Linoleic acid	g	-	0.56	0.58	0.46	-	0.49	0.51	0.38	0.57	0.61	0.47	0.50
ω-3	g	-	0.10	0.41	0.08	-	0.16	0.12	0.27	0.17	0.11	0.03	0.07
ω-6	g	-	0.58	0.63	0.47	-	0.49	0.61	0.40	0.54	0.66	0.47	0.55

Nutritional Considerations & Challenges Creating Low Fat Diets

- › Essential fatty acids
- › Effect on digestibility
- › Many ingredients contain fat
 - › Limitations on ingredients allowed in pet food
- › Palatability

Outline

1.Fat: definition, roles, uptake

2.Low fat diets

1.Role of low fat diets on gastrointestinal diseases

2.Nutritional considerations for formulating a low fat diet

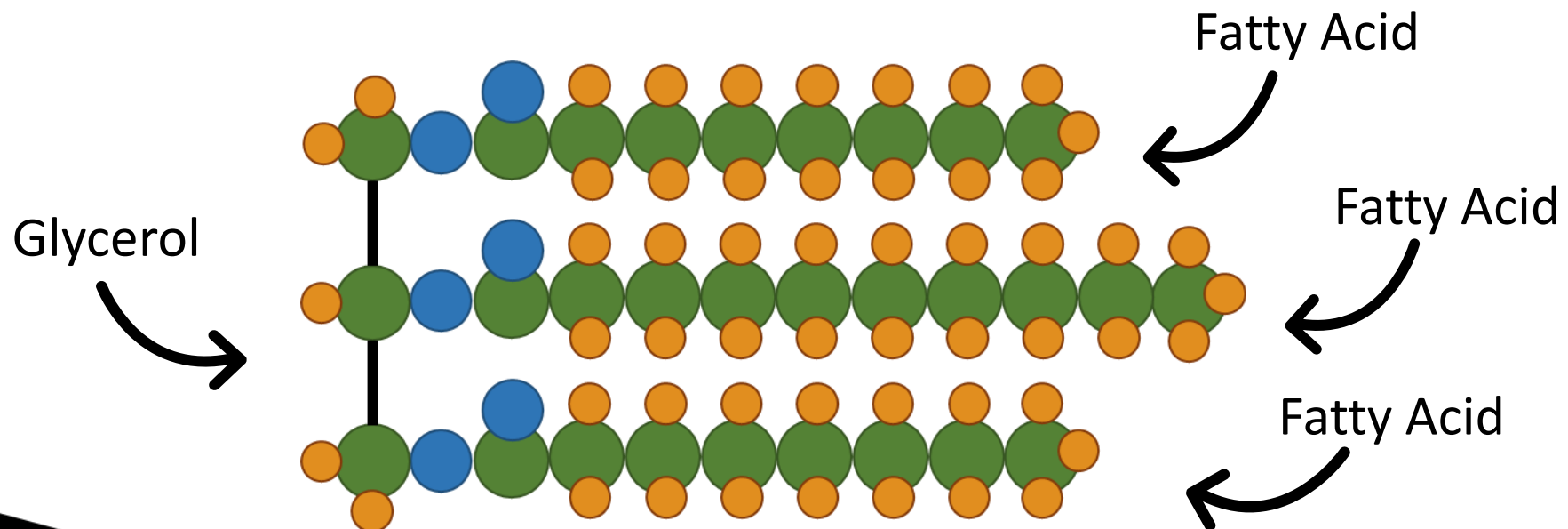
3.MCT in GI disease

4.Omega 3 fatty acids in GI disease

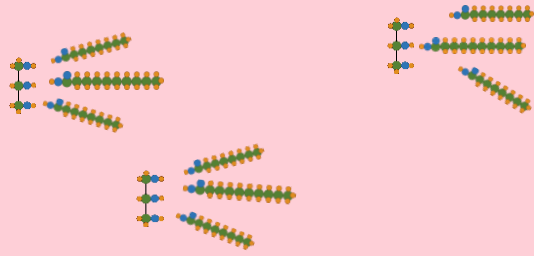
5.Take home messages

Medium-Chain Triglycerides (MCT) Definition

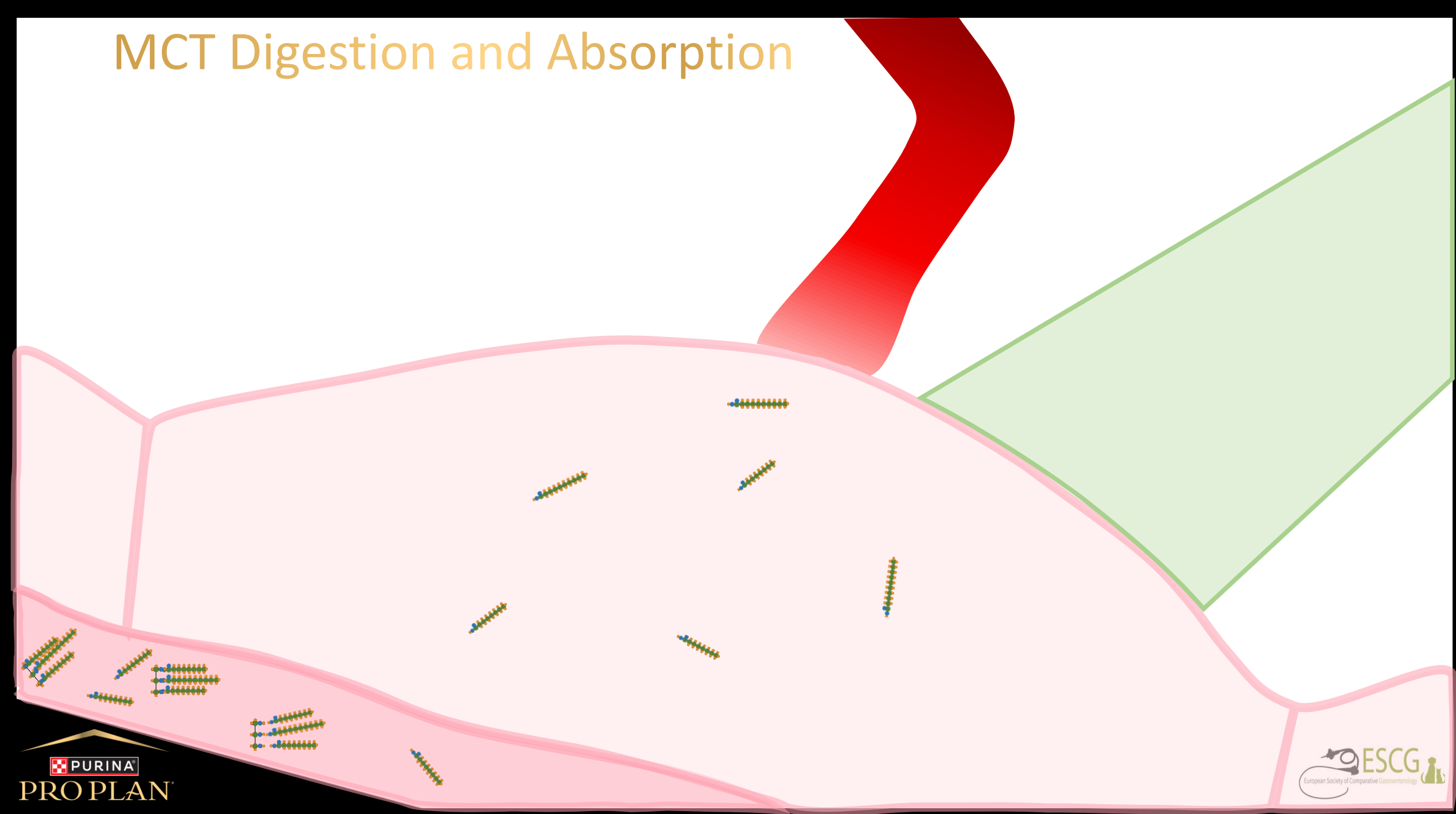
- › A triglyceride composed of medium-length fatty acids
- › 6-12 Carbons in Length
 - › 6 Carbon fatty acids have some properties of both short- and medium-length fatty acids
 - › 12 Carbon fatty acids have some properties of both medium- and long-length fatty acids
- › Only saturated form (no double bonds)



MCT Digestion and Absorption



MCT Digestion and Absorption



PURINA®
PRO PLAN®



MCTs – What Can They Do?

- › Additional/Alternative energy source
 - › Including for the gastrointestinal cells
- › Easily absorbed source of fat, high in energy
- › Increase daily activity

MCT in GI disease

- Specific interest in fat malabsorption syndromes (intestinal lymphangiectasia, EPI)
- Careful! **Do not provide EFA**

Effects of exchange of dietary medium chain triglycerides for long-chain triglycerides on serum biochemical variables and subjectively assessed well-being of dogs with exocrine pancreatic insufficiency

Gabriele M. Rutz, Dr med vet; Jörg M. Steiner, Dr med vet, PhD; John E. Bauer, DVM, PhD; David A. Williams, VetMB, PhD

Impact of fatty acid composition on markers of exocrine pancreatic stimulation in dogs

Yunyi Zhang¹, Claudia A. Kirk¹, M. Katherine Tolbert², Jörg M. Steiner², Dallas Donohoe³, Maryanne Murphy¹, Cary Springer⁴, Angela Witzel-Rollins^{1*}

Article

Fecal Microbiota, Bile Acids, Sterols, and Fatty Acids in Dogs with Chronic Enteropathy Fed a Home-Cooked Diet Supplemented with Coconut Oil

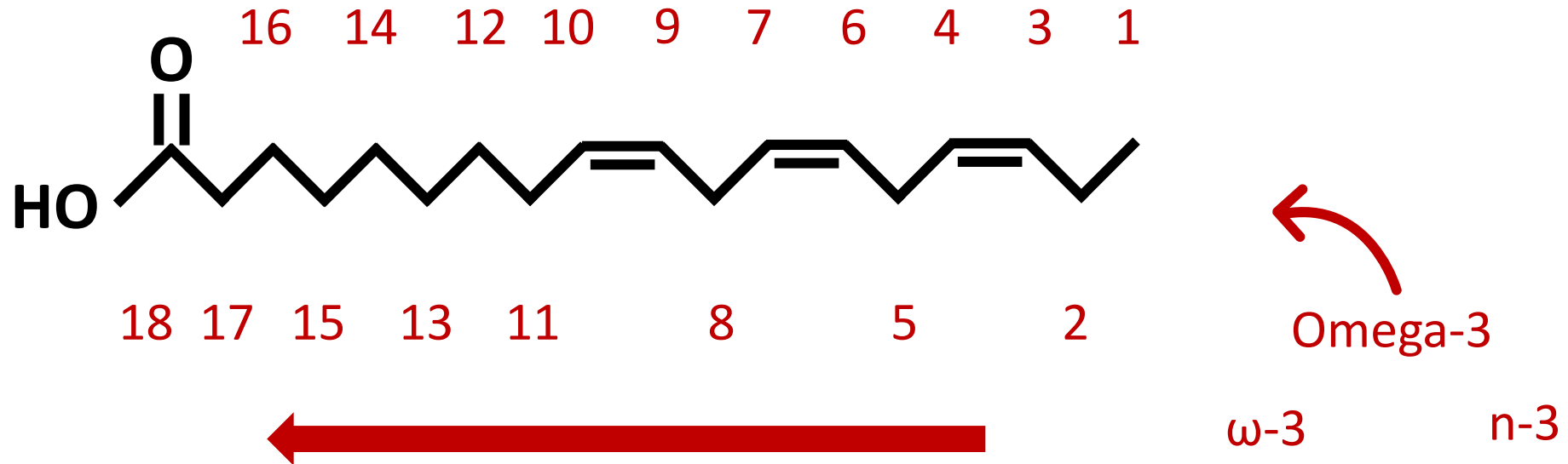
Carla Giuditta Vecchiato^{1,*}, Carlo Pinna¹, Chi-Hsuan Sung², Francesca Borrelli De Andreis¹, Jan S. Suchodolski², Rachel Pilla², Costanza Delsante¹, Federica Sportelli¹, Ludovica Maria Eugenia Mammi¹, Marco Pietra^{1,†} and Giacomo Biagi^{1,†}

18 CE dogs
HMD limited novel
ingredients + 10% calories
coconut oil

Outline

1. Fat: definition, roles, uptake
2. Low fat diets
 1. Role of low fat diets on gastrointestinal diseases
 2. Nutritional considerations for formulating a low fat diet
3. MCT in GI disease
- 4. Omega 3 fatty acids in GI disease**
5. Take home messages

Omega-3 Fatty Acids Definitions



- › Conditionally essential fatty acids
- › All are long-chain fatty acids with minimum of 3 double bonds.
- › ALA, EPA, DHA are most known for dietary purposes

Omega-3 Fatty Acids – What Can They Do?

- › Vision
- › Neural communication (myelin sheaths)
- › Important for managing cell permeability (including gut cells)
- › Regulate inflammatory environment in the body

Omega 3 fatty acids in GI disease

- › Proposed beneficial in chronic inflammatory enteropathies due to modulation of inflammation
- › Lack of prospective clinical data – safe, potentially helpful
 - › Canine dose extrapolated from cAD studies: 125 mg EPA+DHA/kg^{0.75}
 - › Cats?
- › Diet vs supplementation

Take home messages

- › Fat plays an important role in the diet (essential fatty acid provision, energy density, texture, palatability) and in the body (energy source, cell membrane structure, hormones, secondary messengers...)
- › Fat modification (in type and amount) is an important dietary strategy in several gastrointestinal diseases, especially in dogs
- › Fat sensitive GI conditions include pancreatitis, some types of PLE and CIE
- › Commercial intestinal low fat diets, despite challenges in formulation, are overall palatable, with acceptable energy density and can be used in these cases
 - › Ultra low fat homemade diets can be formulated when these are not sufficient



PURINA® PRO PLAN® SYMPOSIUM 2025

Integrative Approach to Gastrointestinal Health



Thank you!