

Contents

Editors	X	1.4.7	Liver and biliary tract	81
Authors	XI	1.4.8	Pancreas	91
Abbreviations	XX	1.5	Endoscopy	94
Preface	XXV		<i>Michael D. Willard</i>	
		1.5.1	Introduction	94
		1.5.2	Endoscopic procedures	95
		1.5.3	Collection of biopsies	98
		1.5.4	Endoscopical findings	102
		1.5.5	Interventional procedures	106
		1.5.6	Capsule endoscopy	110
I	Diagnosis of gastrointestinal disorders	1.6	Diagnostic laparoscopy	111
1	Diagnostic tools		<i>David C. Twedt</i>	
1.1	Clinical history	1.6.1	Introduction	111
	<i>Olivier Dossin</i>	1.6.2	Indications	111
1.1.1	Introduction	1.6.3	Laparoscopic equipment	111
1.1.2	History of specific gastrointestinal signs	1.6.4	Biopsy techniques	112
1.1.3	Dietary history	1.6.5	Ancillary procedures	116
1.2	Physical examination	1.6.6	Complications of laparoscopy	118
	<i>Andrea Boari, Paolo Emidio Crisi</i>	1.7	Cytology	118
1.2.1	Introduction		<i>Jelena Palić, Johannes Hirschberger</i>	
1.2.2	General physical examination	1.7.1	Introduction and technique	118
1.2.3	Examination of the gastrointestinal tract ...	1.7.2	Stomach and intestines	119
1.3	Laboratory tests	1.7.3	Liver	122
		1.7.4	Bile	128
1.3.1	Diagnosis of gastric disease	1.7.5	Pancreas	128
	<i>Craig G. Ruaux</i>	1.8	Histopathology	130
1.3.2	Diagnosis of intestinal disorders			
	<i>Craig G. Ruaux</i>	1.8.1	Gastrointestinal tract	130
1.3.3	Diagnosis of liver and biliary tract disease ..		<i>Mark R. Ackermann, Paula Giaretta</i>	
	<i>Ben Harris</i>	1.8.2	Liver and the gallbladder	147
1.3.4	Diagnosis of exocrine pancreatic disorders ..		<i>John Cullen</i>	
	<i>Panagiotis G. Xenoulis, Joerg M. Steiner</i>	1.8.3	Pancreas	156
1.3.5	Molecular-genetics-based laboratory tests ..		<i>Katja Steiger</i>	
	<i>Nicole Luckschander-Zeller,</i>	1.9	Assessment of gastrointestinal (GI)	
	<i>Sabine E. Hammer, Barbara C. Rütgen</i>		motility	162
1.4	Diagnostic imaging		<i>Frédéric P. Gaschen</i>	
	<i>Lorrie Gaschen</i>	1.9.1	Introduction and physiology of GI motility ..	162
1.4.1	Introduction	1.9.2	Indications for assessment of GI motility ...	162
1.4.2	Oropharynx	1.9.3	Available methods for evaluation of	
1.4.3	Esophagus		GI motility	162
1.4.4	Stomach	1.9.4	Clinical evaluation of GI motility	165
1.4.5	Small intestines			
1.4.6	Large intestine			

2	Clinical evaluation of dogs and cats with specific clinical signs	167	2.5.3	Diagnostic approach	193
2.1	Clinical evaluation of patients with acute signs of gastrointestinal disease	167	2.5.4	Treatment and management	194
	<i>Emily N. Gould</i>		2.5.5	Prognosis	197
2.1.1	Introduction	167	2.6	Clinical evaluation of patients with jaundice/icterus	198
2.1.2	Clinical signs consistent with acute gastrointestinal disease	167		<i>Micah A. Bishop</i>	
2.1.3	Differentials for acute gastrointestinal disease	168	2.6.1	Introduction and definitions	198
2.1.4	Patient history	170	2.6.2	Historical assessment and signalment	198
2.1.5	Physical examination	171	2.6.3	Physical assessment	199
2.1.6	Diagnostic testing	171	2.6.4	Diagnostic approach	199
2.2	Clinical evaluation of patients with chronic vomiting	173	II	Clinical nutrition	
	<i>Panagiotis G. Xenoulis</i>		3	Nutritional management of gastrointestinal diseases	203
2.2.1	Introduction	173	3.1	Nutritional principles	203
2.2.2	Causes of chronic vomiting	175		<i>Aarti Kathrani</i>	
2.2.3	Initial database	177	3.1.1	Assessment of nutritional status	203
2.2.4	Diagnostic approach	179	3.1.2	Assessment of diets, feeding plans, and environmental influences	204
2.3	Clinical evaluation of patients with chronic diarrhea	181	3.1.3	Reassessment and monitoring	207
	<i>Barbara Kohn, Christiane Weingart</i>		3.2	Nutritional management of patients with gastrointestinal disease	208
2.3.1	Definition and differentials	181		<i>Aarti Kathrani</i>	
2.3.2	Signalment	183	3.2.1	Enteral feeding	208
2.3.3	Medical history	183		<i>Natalie Hughes, James Howard, Valerie J. Parker</i>	
2.3.4	Clinical examination	184	3.2.2	Placement and management of feeding tubes	213
2.3.5	Laboratory tests	185	III	Diseases of the gastrointestinal tract	
2.3.6	Imaging techniques	186	4	Oral cavity	227
2.3.7	Additional testing	187	4.1	Anatomy and physiology	227
2.4	Clinical evaluation of patients with chronic weight loss	188		<i>Ana C. Castejon-Gonzalez, Alexander M. Reiter</i>	
	<i>Aarti Kathrani</i>		4.2	Diseases of the oral cavity	228
2.4.1	Definition	188	4.2.1	Gingivostomatitis	228
2.4.2	Epidemiology	189		<i>Lara Boland</i>	
2.4.3	Pathophysiology	189	4.2.2	Eosinophilic granuloma complex	231
2.4.4	Historical assessment	189		<i>Lara Boland</i>	
2.4.5	Clinical evaluation	189	4.2.3	Salivary disorders	232
2.4.6	Physical evaluation	189		<i>Ana C. Castejon-Gonzalez, Alexander M. Reiter</i>	
2.4.7	Differential diagnoses	190	4.2.4	Neoplastic conditions of the oral cavity	235
2.4.8	Diagnostic investigations	191		<i>Heather Wilson-Robles</i>	
2.4.9	Treatment	192			
2.5	Clinical evaluation of patients with constipation	192			
	<i>Silke Salavati Schmitz</i>				
2.5.1	Definition	192			
2.5.2	Pathophysiology and differential diagnoses	192			

5	Esophagus	239	7	Small intestine	299
5.1	Anatomy	239	7.1	Anatomy	299
	<i>Joao Felipe de Brito Galvao</i>			<i>Craig G. Ruaux</i>	
5.2	Physiology	240	7.1.1	Introduction	299
	<i>Joao Felipe de Brito Galvao</i>		7.1.2	Gross anatomy of the intestinal tract	299
5.3	Diseases of the esophagus	241	7.1.3	Anatomical features of the small intestine	300
5.3.1	Cricopharyngeus muscle dysfunction	241	7.2	Physiology	301
	<i>Romy M. Heilmann, Stanley L. Marks</i>			<i>Craig G. Ruaux</i>	
5.3.2	Esophagitis	243	7.2.1	Introduction	301
	<i>Joao Felipe de Brito Galvao</i>		7.2.2	Function of the villus	301
5.3.3	Gastroesophageal reflux	245	7.2.3	Gastrointestinal hormones	302
	<i>Joao Felipe de Brito Galvao</i>		7.2.4	Gut-associated lymphoid tissue and immune system	303
5.3.4	Esophageal foreign bodies	246	7.2.5	Intestinal bacteria	304
	<i>Joao Felipe de Brito Galvao</i>		7.3	Small intestinal disease	305
5.3.5	Esophageal strictures	250	7.3.1	Infectious causes of small intestinal disease	305
	<i>Joao Felipe de Brito Galvao</i>		7.3.2	Dietary indiscretion (garbage can intoxication)	327
5.3.6	Esophageal diverticula	255		<i>Melanie Werner, Stefan Unterer</i>	
	<i>Joao Felipe de Brito Galvao</i>		7.3.3	Acute hemorrhagic diarrhea syndrome	327
5.3.7	Airway-esophageal fistula	257		<i>Kathrin Busch, Stefan Unterer</i>	
	<i>Joao Felipe de Brito Galvao</i>		7.3.4	Alterations in the intestinal microbiota (dysbiosis)	330
5.3.8	Esophageal hypomotility/megaesophagus	257		<i>Jan S. Suchodolski</i>	
	<i>Joao Felipe de Brito Galvao</i>		7.3.5	Non-obstructive motility disorders	336
5.3.9	Hiatal hernia	259		<i>Frédéric Gaschen</i>	
	<i>Harry Cridge</i>		7.3.6	Intestinal obstruction	337
5.3.10	Gastroesophageal intussusception	262	7.3.7	Short bowel syndrome	340
	<i>Joao Felipe de Brito Galvao,</i> <i>Lars F.H. Theyse</i>			<i>Anna-Lena Ziese, Stefan Unterer</i>	
5.3.11	Vascular ring anomalies	263	7.3.8	Protein-losing enteropathy	341
	<i>Lars F.H. Theyse</i>			<i>Romy M. Heilmann</i>	
5.3.12	Neoplastic conditions of the esophagus	263	7.3.9	Neoplasia of the small intestine	348
	<i>Katie Z. Wright, Ann E. Hohenhaus</i>			<i>Emma Warry</i>	
6	Stomach	267	8	Large intestine and anorectum	353
6.1	Anatomy	267	8.1	Anatomy	353
	<i>Panpicha Sattasathuchana</i>			<i>Timothy Bolton, Michael S. Leib</i>	
6.2	Physiology	268	8.2	Physiology	355
	<i>Panpicha Sattasathuchana</i>			<i>Michael S. Leib, Timothy Bolton</i>	
6.2.1	Gastric emptying and motility	268	8.2.1	Motility	355
6.2.2	Gastric acid secretion	268	8.2.2	Water and electrolyte transport	356
6.2.3	Gastric mucosal barrier	270	8.2.3	Mucus secretion	356
6.3	Diseases of the stomach	271	8.2.4	Colonic microbiome	356
6.3.1	Acute and chronic gastritis	271	8.2.5	Immune function	358
	<i>M. Katherine Tolbert</i>		8.3	Diseases of the large intestine	359
6.3.2	Motility disorders	280	8.3.1	Acute and chronic colitis	359
	<i>Silke Salavati Schmitz</i>			<i>Michael S. Leib, Timothy Bolton</i>	
6.3.3	Gastric dilatation-volvulus	290	8.3.2	<i>Clostridium perfringens</i> enterotoxigenesis	365
	<i>Lars F.H. Theyse</i>			<i>Michael S. Leib, Timothy Bolton</i>	
6.3.4	Neoplastic conditions of the stomach	291			
	<i>Katie Z. Wright, Ann E. Hohenhaus</i>				

8.3.3	<i>Tritrichomonas</i> <i>blagburni</i> infection	367	9.4.5	Dermatologic signs	408
	<i>M. Katherine Tolbert</i>		9.4.6	Gastrointestinal signs	408
8.3.4	Irritable bowel syndrome	369	9.4.7	Bleeding disorders	408
	<i>Michael S. Leib, Timothy Bolton</i>		9.4.8	Management of main complications of liver disease	409
8.3.5	Fiber-responsive large bowel diarrhea	371	9.5	Diseases of the liver	410
	<i>Michael S. Leib, Timothy Bolton</i>		9.5.1	Hepatotoxins and drug-induced liver injury ..	410
8.3.6	Feline megacolon	372		<i>Adam Gow</i>	
	<i>Andreas H. Hasler</i>		9.5.2	Infectious diseases of the liver	414
8.3.7	Neoplastic diseases of the large intestine ...	379		<i>Penny Watson</i>	
	<i>Emma Warry</i>		9.5.3	Hepatic vascular anomalies	421
8.4	Diseases of the anorectum	382		<i>M. S. Tivers</i>	
8.4.1	Proctitis and rectal prolapse	382	9.5.4	Metabolic diseases of the liver	429
	<i>Lars F.H. Theyse, Romy M. Heilmann</i>			<i>Floris C Dröes and Jonathan A Lidbury</i>	
8.4.2	Rectoanal malformations	384	9.5.5	Inflammatory diseases of the liver	451
	<i>Anna-Lena Ziese, Stefan Unterer</i>			<i>Emma O'Neill and Myles McKenna</i>	
8.4.3	Perianal fistula	386	9.5.6	Developmental disorders of the liver	461
	<i>Adam P. Patterson</i>			<i>Penny Watson</i>	
8.4.4	Rectal and perianal neoplasia	390	9.5.7	Neoplasms of the liver	467
	<i>Emma Warry</i>			<i>Brandan Wustefeld-Janssens, Emma Warry</i>	
9	Liver and biliary tract	395	9.6	Diseases of the biliary tract	471
9.1	Anatomy	395	9.6.1	Extrahepatic biliary obstruction	471
	<i>Randi Gold</i>			<i>Vanna Dickerson, Kelley Thieman Mankin</i>	
9.1.1	Liver structure	395	9.6.2	Gallbladder mucocele	478
9.1.2	Cells of the liver	396		<i>Kelley M. Thieman Mankin,</i>	
9.1.3	Hepatic pigments	397		<i>Vanna M. Dickerson</i>	
9.1.4	Biliary tract structure	398	9.6.3	Cholecystitis/choolangitis	482
9.1.5	Portal circulation	399		<i>Jared A. Jaffey</i>	
9.2	Physiology	400	9.6.4	Cholelithiasis/choleductolithiasis	490
	<i>Randi Gold</i>			<i>Jared Jaffey</i>	
9.2.1	Metabolism	400	9.6.5	Parasitic diseases of the biliary system	492
9.2.2	Bile secretion	401		<i>Jenny Stiller</i>	
9.2.3	Vitamin storage	402	9.6.6	Neoplasms of the biliary system	495
9.2.4	Hemostasis	403		<i>Brandan Wustefeld-Janssens</i>	
9.2.5	Detoxification	403	10	Exocrine pancreas	497
9.2.6	Hematologic and immunologic functions ...	403	10.1	Anatomy	497
9.3	Diagnostic approach to liver disease	403		<i>Jörg M. Steiner</i>	
	<i>Adrian Tinoco-Najera, Jonathan Lidbury</i>		10.2	Physiology	498
9.3.1	Introduction	403		<i>Jörg M. Steiner</i>	
9.3.2	Prevalence and breed predispositions	404	10.3	Diseases of the exocrine pancreas	499
9.3.3	Clinical presentation	404	10.3.1	Pancreatitis	499
9.3.4	Approach to a patient with suspected liver disease	404		<i>Jörg M. Steiner</i>	
9.4	Complications of liver disease	407	10.3.2	Exocrine pancreatic insufficiency	516
	<i>Adrian Tinoco-Najera, Jonathan Lidbury</i>			<i>Jörg M. Steiner</i>	
9.4.1	Icterus	407	10.3.3	Exocrine pancreatic neoplasia	522
9.4.2	Polyuria and polydipsia	407		<i>Katja Steiger</i>	
9.4.3	Portal hypertension and ascites	407	10.3.4	Rare diseases of the exocrine pancreas	526
9.4.4	Hepatic encephalopathy	408		<i>Jörg M. Steiner</i>	

11	Diseases that affect more than one organ of the gastrointestinal tract	531		
11.1	Adverse reactions to food – allergy versus intolerance	531		
	<i>Albert E. Jergens, Elizabeth R. Drake</i>			
11.1.1	Introduction	531		
11.1.2	Terminology	531		
11.1.3	Etiopathogenesis of food allergy	532		
11.1.4	Adverse food reactions	532		
11.2	Chronic inflammatory enteropathies	536		
	<i>Edward Hall and Karin Allenspach</i>			
11.2.1	Introduction and definitions	536		
11.2.2	Etiopathogenesis	537		
11.2.3	Classification	540		
11.2.4	Clinical presentation	543		
11.2.5	Diagnosis	544		
11.2.6	Treatment	547		
11.2.7	Prognosis	550		
11.3	Gastrointestinal lymphoma	551		
	<i>Sina Marsilio</i>			
11.3.1	Introduction	551		
11.3.2	Feline gastrointestinal lymphoma	551		
11.3.3	Canine gastrointestinal lymphoma	555		
11.4	Neuroendocrine tumors of the gastrointestinal tract	557		
	<i>Jörg M. Steiner, Cynthia Ward</i>			
11.4.1	Introduction	557		
11.4.2	Insulinoma	560		
11.4.3	Gastrinoma	566		
11.4.4	Glucagonoma	570		
11.4.5	Gastrointestinal carcinoids	572		
11.4.6	Somatostatinoma	572		
11.4.7	Pancreatic polypeptidoma	573		
11.4.8	Other neuroendocrine tumors of the gastrointestinal tract	573		
11.5	Adipositas/Obesity	573		
	<i>Alexander J. German</i>			
11.5.1	Definition	573		
11.5.2	Is obesity a disease?	574		
11.5.3	Prevalence	574		
11.5.4	Etiology and pathogenesis	575		
11.5.5	Clinical presentation	581		
11.5.6	Differential diagnoses	582		
11.5.7	Diagnosis	582		
11.5.8	Management	588		
11.5.9	Prevention of obesity	594		
	Appendix			
	Index	599		