

Contents

Basics

1	The Anaesthesia Machine	20
1.1	Patient part or breathing system	21
1.1.1	Non-rebreathing system or rebreathing system?	21
1.1.2	Non-rebreathing system.	22
1.1.3	Rebreathing or circle system.	23
1.2	Anaesthetic machine.	30
1.2.1	High-pressure system.	31
1.2.2	Medium pressure system	32
1.2.3	Low pressure system	33
1.3	Checking the anaesthesia machine.	36
1.3.1	Leak check	38
1.4	Literature	38
2	Monitoring	39
2.1	Non-apparatus monitoring	39
2.1.1	Respiration, pulse and circulation	39
2.1.2	Reflexes and other non-apparatus monitoring	42
2.2	Apparatus monitoring	43
2.2.1	Oesophageal stethoscope	43
2.2.2	Pulse oximeter	44
2.2.3	Non-invasive and invasive blood pressure measurement	47
2.2.4	Electrocardiography	53
2.2.5	Capnography	55
2.2.6	Temperature measurement	58
2.3	Literature	59

3	Stages of general anaesthesia	60
3.1	Stage 1 or analgesia stage	60
3.2	Stage 2 or excitation stage	60
3.3	Stage 3 or surgical stage	61
3.3.1	Stage 3.1: Light anaesthesia	61
3.3.2	Stage 3.2: Surgical tolerance	61
3.3.3	Stage 3.3: Deep anaesthesia	61
3.4	Stage 4 or asphyxia	62
4	Drugs	63
4.1	Basic information on pharmacotherapy	63
4.2	Acepromazine	64
4.3	Alfaxalone	67
4.4	Amantadine	68
4.5	Atipamezole	70
4.6	Atropine	72
4.7	Azaperone	74
4.8	Bupivacaine	76
4.9	Buprenorphine	77
4.10	Butorphanol	79
4.11	Carprofen	81
4.12	Cimicoxib	82
4.13	Detomidine	84
4.14	Dexmedetomidine	86

4.15	Diazepam	88
4.16	Etomidate	91
4.17	Fentanyl	92
4.18	Flumazenil	95
4.19	Gabapentin	97
4.20	Glycopyrrolate	99
4.21	Grapiprant	100
4.22	Isoflurane	102
4.23	Ketamine/S-ketamine	105
4.24	Lidocaine	108
4.25	Medetomidine	111
4.26	Meloxicam	114
4.27	Metamizole	117
4.28	Methadone	119
4.29	Midazolam	121
4.30	Morphine	123
4.31	Naloxone	125
4.32	Pentobarbital	127
4.33	Pethidine (= Meperidine)	129
4.34	Propofol	131
4.35	Remifentanyl	133
4.36	Romifidine	135

4.37	Ropivacaine	137
4.38	Sevoflurane	138
4.39	Thiopental	140
4.40	Tramadol	142
4.41	Xylazine	145

Anaesthesia practice

5	Species-specific anaesthesia	150
5.1	Preanaesthetic examination, categorisation according to ASA classification	150
5.2	Perioperative management	152
5.2.1	Airway management.....	153
5.2.2	Perioperative infusion therapy.....	163
5.2.3	Use of antibiotics.....	166
5.2.4	Protection of the cornea.....	167
5.2.5	Emptying the urinary bladder.....	167
5.3	Dog	168
5.3.1	Preanaesthetic considerations.....	168
5.3.2	Anaesthesia protocols.....	173
5.3.3	Literature.....	178
5.4	Cat	178
5.4.1	Preanaesthetic considerations.....	178
5.4.2	Anaesthesia protocols.....	184
5.4.3	Literature.....	188
5.5	Rabbit	188
5.5.1	Preanaesthetic considerations.....	188
5.5.2	Anaesthesia protocols.....	192
5.5.3	Literature.....	197

5.6	Guinea pig	197
5.6.1	Preanaesthetic considerations	198
5.6.2	Anaesthesia protocols	200
5.6.3	Literature	202
5.7	Ferret	203
5.7.1	Preanaesthetic considerations	203
5.7.2	Anaesthesia protocols	206
5.7.3	Literature	209
5.8	Small rodents	210
5.8.1	Preanaesthetic considerations	210
5.8.2	Anaesthesia protocols	213
5.8.3	Literature	219
5.9	Horse	219
5.9.1	Preanaesthetic considerations	219
5.9.2	Anaesthesia protocols	226
5.9.3	Literature	232
5.10	Cattle	233
5.10.1	Preanaesthetic considerations	233
5.10.2	Anaesthesia protocols	237
5.10.3	Literature	239
5.11	Small ruminants: Sheep, goat	239
5.11.1	Preanaesthetic considerations	240
5.11.2	Anaesthesia protocol	243
5.11.3	Literature	245
5.12	South American camelids	245
5.12.1	Preanaesthetic considerations	245
5.12.2	Anaesthesia protocols	249
5.12.3	Literature	251
5.13	Pig	251
5.13.1	Preanaesthetic considerations	251
5.13.2	Anaesthesia protocols	256
5.13.3	Literature	261

6	Physiology and pathophysiology	262
6.1	Neonatal or paediatric patient	262
6.1.1	Physiology	262
6.1.2	Pharmacology	263
6.1.3	Pre- and perioperative management	263
6.1.4	Anaesthesia protocols	264
6.1.5	Literature	266
6.2	Geriatric patient	266
6.2.1	Physiology	267
6.2.2	Pharmacology	267
6.2.3	Pre- and perioperative management	267
6.2.4	Anaesthesia protocols	268
6.2.5	Literature	270
7	Case management	271
7.1	Gravid patient, Caesarean section	271
7.1.1	Physiology	271
7.1.2	Pre- and perioperative management	272
7.1.3	Anaesthesia	274
7.1.4	Postoperative management – care of the neonates	275
7.1.5	Literature	276
7.2	Small animal patient with cardiac disease	278
7.2.1	Dilated cardiomyopathy (DCM) in the dog	279
7.2.2	Mitral valve insufficiency in the dog	285
7.2.3	Persistent ductus arteriosus (PDA) in the dog	287
7.2.4	Hypertrophic cardiomyopathy (HCM) in the cat	290
7.2.5	Literature	296
7.3	Interventions in and around the eyes	297
7.3.1	Preoperative management	298
7.3.2	Anaesthesia	298
7.3.3	Postoperative management	299
7.3.4	Literature	299

7.4	Dental and maxillofacial surgery procedures	300
7.4.1	Preoperative management	300
7.4.2	Anaesthesia	302
7.4.3	Postoperative management	303
7.4.4	Literature	303
7.5	Dog/cat with epileptic seizures	304
7.5.1	Preoperative management	304
7.5.2	Anaesthesia	305
7.5.3	Postoperative management	306
7.5.4	Literature	307
7.6	Traumatic brain injury/increased intracranial pressure in small animals	307
7.6.1	Preanaesthetic or general management	308
7.6.2	Anaesthesia	310
7.6.3	Postoperative management	313
7.6.4	Literature	314
7.7	Patient with renal problems	314
7.7.1	Preoperative management	315
7.7.2	Anaesthesia	316
7.7.3	Postoperative management	319
7.7.4	Literature	319
7.8	Patient with liver problems: insufficiency and shunt	320
7.8.1	Preoperative management	321
7.8.2	Anaesthesia	323
7.8.3	Postoperative management	326
7.8.4	Literature	326
7.9	Gastric dilatation-volvulus in dogs	326
7.9.1	Preoperative management	327
7.9.2	Anaesthesia	328
7.9.3	Postoperative management	331
7.9.4	Literature	333

7.10	Patient with diabetes mellitus	333
7.10.1	Preoperative management	334
7.10.2	Anaesthesia	334
7.10.3	Postoperative management	336
7.10.4	Literature	336
7.11	Colic in horses	336
7.11.1	Preoperative management	336
7.11.2	Anaesthesia	338
7.11.3	Recovery and postoperative management	342
7.11.4	Literature	343
7.12	Foals	343
7.12.1	Preoperative management	344
7.12.2	Anaesthesia	345
7.12.3	Recovery and postoperative management	348
7.12.4	Literature	349
8	Anaesthetic incidents and complications	350
8.1	Cardiovascular system	350
8.1.1	Hypotension/cardiovascular failure	350
8.1.2	Hypertension	352
8.1.3	Arrhythmias	354
8.1.4	Literature	368
8.2	Respiration	369
8.2.1	Hypoventilation/apnoea	369
8.2.2	Hyperventilation	373
8.2.3	Abnormal waveforms in capnography	375
8.2.4	Hypoxaemia	378
8.2.5	Literature	381
8.3	Temperature	382
8.3.1	Hypothermia	382
8.3.2	Hyperthermia	384
8.3.3	Literature	385

8.4	Electrolytes and acid-base balance	386
8.4.1	Potassium	386
8.4.2	Sodium	390
8.4.3	Acid-base balance and blood gas analysis	392
8.4.4	Literature	396
8.5	Reflux/regurgitation/aspiration	396
8.5.1	Small animals	396
8.5.2	Large animals	398
8.5.3	Literature	398
9	Pain and pain therapy	399
9.1	Signs of pain	400
9.2	Peri- and postoperative pain	404
9.3	Analgesics and postoperative pain management strategies	405
9.3.1	Local anaesthetics	406
9.3.2	Non-steroidal anti-inflammatory drugs (NSAIDs) and similar analgesics	406
9.3.3	Opioids	406
9.3.4	Dissociative anaesthetics: Ketamine	407
9.3.5	Alpha2 agonists	407
9.3.6	Other drugs with analgesic effects	407
9.3.7	Postoperative pain management concepts: Dog and cat	407
9.3.8	Postoperative pain management concepts: Small mammals	409
9.3.9	Postoperative pain management concepts: Horse	411
9.3.10	Literature	413
9.4	Local anaesthesia	413
9.4.1	General considerations	413
9.4.2	Small animals	417
9.4.3	Horses	442
9.4.4	Ruminants	457
9.5	Non-pharmacological analgesic treatment options	469
9.5.1	Literature	470

10	Cardiopulmonary resuscitation (CPR) in small animals	471
10.1	Airways	471
10.2	Breathing	472
10.3	Circulation	472
10.3.1	Cardiac pump	472
10.3.2	Thoracic pump	473
10.3.3	Open cardiac massage	475
10.4	Emergency drugs	475
10.4.1	Which drug is administered when?	477
10.5	ECG and other monitoring	477
10.6	Fluids	478
10.7	Literature	479
11	Euthanasia	480
11.1	Eu thanatos (gr.) = the good death	480
11.2	Owner conversation	480
11.3	How to carry out euthanasia	481
11.3.1	Euthanasia in small animals	481
11.3.2	Euthanasia in horses and other large animals	483
11.4	Confirmation of death	484
11.5	Literature	485

Appendix

12 List of abbreviations 488

13 Further reading 491

Index 493