

I HEMATOLOGY AND BIOCHEMISTRY

Conversions

Psittaciformes

Various Species

Columbiformes

Galliformes

Anseriformes

Ratites

II CLASS AVES:

A LIST OF ORDERS, COMMON
AND SCIENTIFIC NAMES

III DETERMINATION OF METABOLIC SCALING



APPENDIX

Hematology and Biochemistry

CONVERSIONS

Conversion Factors: SI Units/ Gravimetric Units

Analyte	To convert		Multiply by	To convert		Multiply by
	From	To		From	To	
Albumin	g/dl	g/l	10.0	g/l	g/dl	0.1
Ammonia	µg/dl	µmol/l	0.5871	µmol/l	µg/dl	1.7
Bilirubin	mg/dl	µmol/l	17.1	µmol/l	mg/dl	0.059
Calcium	mg/dl	mmol/l	0.25	mmol/l	mg/dl	4.0
Chloride	mEq/l	mmol/l	1.0	mmol/l	mEq/l	1.0
Chloride	mg/dl	mmol/l	0.272	mmol/l	mg/dl	3.5
Cholesterol	mg/dl	mmol/l	0.02586	mmol/l	mg/dl	38.7
Corticosterone	µg/dl	nmol/l	28.9	nmol/l	mg/dl	0.0346
Cortisol	µg/dl	nmol/l	27.59	nmol/l	mg/dl	0.0362
Creatinine	mg/dl	µmol/l	88.4	µmol/l	mg/dl	0.0113
Globulin	mg/dl	g/l	10.0	g/l	mg/dl	0.1
Glucose	mg/dl	mmol/l	0.05551	mmol/l	mg/dl	18.0
Insulin	µU/ml	pmol/l	7.175	pmol/l	µU/ml	0.1296
Iron	µg/dl	µmol/l	0.1791	µmol/l	µg/dl	5.58
Lead	µg/dl	µmol/l	0.04826	µmol/l	µg/dl	20.72
Magnesium	mEq/l	mmol/l	0.5	mmol/l	mEq/l	2.0
Magnesium	mg/dl	mmol/l	0.4114	mmol/l	mg/dl	2.43
Phosphate (inorganic)	mg/dl	mmol/l	0.3229	mmol/l	mg/dl	3.097
Potassium	mEq/l	mmol/l	1.0	mmol/l	mEq/l	1.0
Pressure	mmHg	Pa (pascal)	0.1333	Pa (pascal)	mmHg	7.5
Progesterone	ng/dl	nmol/l	0.032	nmol/l	ng/dl	31.25
Protein	g/dl	g/l	10.0	g/l	g/dl	1.0
Sodium	mEq/l	mmol/l	1.0	mmol/l	mEq/l	1.0
Thyroxine	µg/dl	nmol/l	12.87	nmol/l	µg/dl	0.0777
Triglycerides	mg/dl	mmol/l	0.01129	mmol/l	mg/dl	88.5
Urea	mg/dl	mmol/l	0.167	mmol/l	mg/dl	6.0
Urea nitrogen (BUN)	mg/dl	mmol/l	0.7140	mmol/l	mg/dl	1.4
Urea nitrogen (BUN)	mg/dl	mmol urea/l	0.3670	mmol urea/l	mg/dl	2.72
Uric acid	mg/dl	mmol/l	59.48	mmol/l	mg/dl	0.0168

With the increasing exchange of knowledge between the United States, Europe and other parts of the world with regard to avian clinical chemistry, it is imperative that a uniform system of units be used to avoid confusion. The World Health Assembly recommended the International System of Units (SI, Systeme International d'Unites) for the health professions in 1977. The SI is the result of many decades of international efforts to develop a universally acceptable system. In many countries and many scientific journals, the use of the SI system is mandatory. It seems that the SI has gained more acceptance in European countries than in the USA. Many American veterinary journals still use conventional units (Journal of the Association of Avian Veterinarians) or a mixture of conventional and SI units (Avian Dis-

eases) while European journals use the SI system (Avian Pathology). Until the SI system is used in all scientific papers and handbooks conversion factors are indispensable.

This table is not complete and further information may be obtained from: Units, Symbols and Abbreviations. London, Royal Society of Medicine Services, 1988, ISBN 0905958780.

In the American veterinary literature the units of weight, temperature and pressure used are often different from SI (derived) units and therefore conversion factors for these quantities will also be given.

PSITTACIFORMES

Reference Values for Selected Psittacine Species

Parameter	Budgerigar	African Grey Parrot	Amazon Parrot	Cockatoo	Macaw
TP g/100ml	2.0-3.0	2.6-4.9	3.3-5.3	2.8-4.3	2.5-4.4
Ca mg/100ml	6.4-11.2	7.0-9.5	7.5-9.7	7.6-8.9	6.8-9.9
P mmol/l	0.9-1.9	1.0-5.2	0.8-3.4	1.0-3.6	1.3-4.8
Uric acid mg/100ml	3.0-8.6	3.1-7.0	1.3-5.6	3.5-9.3	2.9-8.5
Crea mg/100ml	0.1-0.4	0.1-0.4	0.1-0.4	0.1-0.4	0.1-0.4
AST U/l	55-154	28-200	35-200	32-180	45-125
ALT U/l	5-20	2-21	4-13	5-12	5-15
LDH U/l	154-271	105-420	65-420	130-353	65-400
CK U/l	54-252	71-408	64-322	27-253	39-384
AP U/l	54-326	24-94	93-311	32-171	25-152
Amyl U/l	187-582	211-519	106-524		276-594
Glu mg/100ml	254-399	224-308	221-300	209-318	230-326
Chol mg/100ml	172-286	217-330	181-310		108-200
Trig mg/100ml	109-271	51-140	59-200		67-125
K mmol/l	2.2-3.7	2.2-3.5	2.1-3.3		2.1-4.5
Na mmol/l	139-159	146-167	127-158		133-160
Cl mmol/l	95-144	110-128	97-127		97-126

Kodak Ektachem®-25°C

Hochleithner M: Reference values for selected psittacine species using a dry chemistry system. J Assoc Avian Vet 3(4):207-209, 1989.

Reference Values in Psittaciformes

Parameter	African Grey Parrot	Amazon Parrot	Cockatoo	Macaw
Urea mmol/l	0.7-2.4	0.9-4.6	0.8-2.1	0.3-3.3
Creatinine µmol/l	23-40	19-33	21-36	20-59
Uric acid µmol/l	93-414	72-312	190-327	109-231
Urea:Uric acid ratio	2.4:15.6	4.4:33	2.7:8.9	5:28
Osmolality mOsm/kg	320-347	316-373	317-347	319-378
Sodium mmol/l	154-164	149-164	152-164	150-175
Potassium mmol/l	2.5-3.9	2.3-4.2	3.2-4.9	1.9-4.1
Ca mmol/l	2.1-2.6	2.0-2.8	2.2-2.7	2.2-2.8
Glucose mmol/l	11.4-16.1	12.6-16.9	12.8-17.6	12.0-17.9
AST U/l	54-155	57-194	52-203	58-206
ALT U/l	12-59	19-98	12-37	22-105
GGT U/l	1-3.8	1-10	2-5	<1-5
LDH U/l	147-348	46-208	203-442	66-166
CPK U/l	123-875	45-265	34-204	61-531
Bile acids µmol/l	18-71	19-144	23-70	25-71
TP g/l	32-44	33-50	35-44	33-53
Albumin:Globulin ratio	1.4:4.7	2.6:7.0	1.5:4.3	1.4:3.9

Recommendations of the German Society for Clinical Chemistry Enzymes 30°C

Lumeij JT, Overduin LM: Plasma chemistry reference values in psittaciformes. Avian Pathol 19:235-244, 1990.

Serum Biochemical Methods (37°C) Used in Determining Reference Values in Psittaciformes

Parameter	Method
Albumin	Modified Doumas Method (Bovine Standard)
ALP	Mod. Bowers and McComb
ALT	Mod. IFCC
AST	Mod. IFCC
T. Bili	Mod. Walters and Gerarde
BUN	Mod. Talke and Schubert
Calcium	Mod. Connerty and Briggs
Chloride	Mod. Schoenfeld and Lewellen
Cholesterol	Enzymatic Method
CK	Mod. Oliver and Rosalki
Creatinine	Kinetic Jaffe
GGT	Mod. Szasz
Glucose	Trinder Glucose (Gilford Reagent)
LDH	Mod. Wacker
Phosphorus	Mod. Daly and Ertingshausen
Total CO ₂	Enzymatic PEPC
Total Protein	Mod. Biuret
Triglyceride	Mod. Fossati and Prencipe
Uric Acid	Mod. Fossati
Sodium	Ion Selective Electrode
Potassium	Ion Selective Electrode

From Clubb SL, et al: J Assoc Avian Vet 4(4):222, 1990.

Serum Biochemical Values for Juvenile Eclectus Parrots

Parameter	30-day Mean (SD)	90-day Mean (SD)	All Mean (SD)
NA (mEq/L)	141 (2)	154 (3)	148 (6)
K (mEq/L)	2.9 (1.0)	2.7 (0.6)	2.8 (0.7)
CL (mEq/L)	105 (3)	115 (3)	111 (5)
CA (mg/dl)	9.5 (0.5)	9.1 (0.4)	9.3 (0.4)
PHOS (mg/dl)	7.9 (0.8)	5.7 (0.9)	6.8 (1.2)
UREA (mg/dl)	1.5 (2.3)	2.0 (3.1)	1.7 (2.4)
CREAT (mg/dl)	0.3 (0.1)	0.4 (0.1)	0.4 (0.1)
UA (mg/dl)	0.8 (0.9)	3.9 (1.5)	2.0 (1.6)
CHOL (mg/dl)	181 (43)	300 (69)	268 (80)
GLUCOSE (mg/dl)	249 (16)	265 (19)	258 (18)
LDH (IU/L)	235 (145)	268 (70)	228 (101)
AST (IU/L)	85 (21)	216 (47)	140 (58)
ALT (IU/L)	4 (3)	7 (3)	4 (3)
ALP (IU/L)	421 (85)	565 (217)	489 (159)
GGT (IU/L)	5 (2)	2 (1)	4 (2)
CK (IU/L)	555 (164)	643 (262)	616 (472)
TP (g/dl)	2.6 (0.4)	2.9 (0.4)	2.9 (0.5)
ALB (g/dl)	1.2 (0.2)	1.3 (0.2)	1.3 (0.3)
GLOB (g/dl)	1.3 (0.3)	1.6 (0.3)	1.5 (0.3)
A:G (ratio)	0.9 (0.1)	0.8 (0.1)	0.9 (0.2)
ALB (Elect) (g/dl)	1.8 (0.5)	2.1 (0.4)	2.2 (0.4)
GLOB (Elect) (g/dl)	0.7 (0.2)	0.7 (0.2)	0.8 (0.2)

From Clubb SL, et al: J Assoc Avian Vet, 4(4):224, 1990.

Hematology Values for Juvenile Eclectus Parrots

Parameter	30-day Mean (SD)	90-day Mean (SD)	All Mean(SD)
RBC (x 10 ⁶ /μl)	1.95 (0.28)	3.22 (0.51)	2.69 (0.67)
HB (g/dl)	8.83 (1.15)	15.42 (2.38)	12.46 (3.01)
HCT (%)	33.7 (4.4)	53.8 (3.0)	43.8 (8.4)
MCV (fl)	174 (25)	169 (27)	166 (26)
MCH (pg)	43.9	49.1 (9.9)	45.5 (10.7)
MCHC (g/dl)	261.(2.5)	28.7 (4.1)	27.7 (5.0)
WBC (cells/μl)	18500 (6900)	10900 (3700)	13700 (6300)
WBC Est (cells/μl)	17000 (6000)	10500 (4000)	13500 (6000)
BANDS (%)	0.2 (1.1)	0.4 (0.9)	0.5 (1.5)
HET (%)	62.8 (7.7)	52.1 (10.2)	53.9 (11.4)
LYMPH (%)	30.4 (6.3)	40.8 (10.4)	39.5 (11.5)
MONO (%)	5.5 (3.0)	5.2 (2.7)	5.0 (2.7)
EOS (%)	0.0 (0.0)	0.1 (0.4)	0.1 (0.3)
BASO (%)	1.2 (1.0)	1.5 (1.0)	1.1 (1.0)
BAND # (cells/μl)	34 (188)	48 (111)	70 (221)
HET # (cells/μl)	11800 (5400)	5900 (2800)	7700 (4800)
LYMPH # (cells/μl)	5500 (2100)	4200 (1200)	5100 (2000)
MONO # (cells/μl)	930 (520)	532 (331)	639 (428)
EOS # (cells/μl)	0	9 (43)	8 (44)
BASO # (cells/μl)	209 (199)	175 (158)	152 (169)
HET: LYMPH (ratio)	2.2 (0.8)	1.4 (0.6)	1.6 (0.8)
PP (Refrac) (g/dl)	2.8 (0.6)	3.9 (0.6)	3.5 (0.8)

From Clubb SL, et al: J Assoc Avian Vet 4(4):223, 1990.

Hematology Values for Juvenile Cockatoos

Parameter	30-day Mean (SD)	90-day Mean (SD)	All Mean (SD)
RBC # (x 10 ⁶ /μl)	196.0(0.22) ^a	2.84 (0.49) ^b	2.53 (0.63)
HB (g/dl)	8.12 (0.83) ^a	14.04 (1.23) ^c	11.43 (2.90)
HCT (%)	30.1 (2.8) ^a	47.6 (4.1) ^c	39.7 (9.0)
MCV (fl)	155 (17) ^a	172 (28) ^b	160 (23)
MCH (pg)	38.9 (11.7) ^a	49.0 (12.9) ^b	43.8 (10.8)
MCHC (g/dl)	24.6 (7.9) ^a	28.5 (6.2) ^{bc}	27.2 (6.1)
WBC# (cells/μl)	13700 (7400) ^a	10000(2800) ^b	12900(6300)
WBC Est (cells/μl)	13200 (6700) ^a	10400 (2800) ^b	13100 (5900)
BAND (%)	1.3 (2.3) ^{ab}	1.3 (2.3) ^{ab}	1.3 (2.3)
HET (%)	54.8 (9.7) ^a	49.0 (8.1) ^b	50.8 (11.7)
LYMPH (%)	36.4 (8.1) ^a	43.6 (8.4) ^b	41.2 (11.9)
MONO (%)	6.9 (3.4) ^a	4.9 (3.4) ^{bc}	5.8 (3.4)
EOS (%)	0 (0)	0 (0.2)	0 (0)
BASO (%)	0.6 (0.9) ^{ac}	1.2 (1.1) ^b	0.9 (1.1)
BAND # (cells/μl)	150 (275) ^a	130 (290) ^a	160 (325)
HET # (cells/μl)	7800 (5000) ^a	4400 (2200) ^b	6500 (4500)
LYMPH # (cells/μl)	4900 (2600) ^a	3900 (2000) ^a	4900 (2500)
MONO # (cells/μl)	880 (530) ^a	440 (450) ^a	690 (525)
EOS # (cells/μl)	0 (0)	0 (0)	0 (0)
BASO # (cells/μl)	67 (130) ^a	115 (130) ^a	100 (140)
HET: LYMPH (ratio)	1.6 (0.6) ^a	1.2 (0.4) ^b	1.4 (0.8)
PP Est (Refrac) (g/dl)	2.3 (0.5) ^a	4.0 (0.8) ^b	3.2 (0.9)

a,b,c = Values for parameters are statistically different (P<0.05) when letters are different.

From Clubb SL, et al: J Assoc Avian Vet 5(1):20, 1991.

Hematology Values for Juvenile Umbrella Cockatoos

Parameter	30-day Mean (SD)	90-day Mean (SD)	All Mean
RBC #(x 10 ⁶ /μl)	1.98 (0.51) ⁿ	2.75 (0.49) ⁿ	2.54
HB (g/dl)	7.9 (1.64) ⁿ	14 (0.92) ⁿ	11.6
HCT (%)	29.5 (5.65) ⁿ	46.9 (2.92) ⁿ	39.3
MCV (fl)	151 (25.6) ⁿ	175 (28.5) ⁿ	158.0
MCH (pg)	35.3 (10.03) ⁿ	51.9 (8.57) ⁿ	43.6
MCHC (g/dl)	21.8 (10.5) ⁿ	29.9 (1.1) ⁿ	27.0
WBC # (cells/μl)	20311 (5717) ^s	10238 (3368) ⁿ	16567.0
WBC Est (cells/μl)	19190 (5127) ^s	10500 (3184) ⁿ	16412.0
BAND (%)	1 (2.57) ⁿ	1.93 (2.76) ⁿ	1.31
HET (%)	58.4 (11.4) ^s	50 (9.7) ⁿ	54.1
LYMPH (%)	34.4 (11.5) ⁿ	41.2 (9.9) ⁿ	38.1
MONO (%)	5.77 (3.1) ⁿ	5.29 (3.27) ⁿ	5.35
EOS (%)	0(0.14) ⁿ	0.07 (0.27) ⁿ	0.02
BASO (%)	0.45 (1.05) ⁿ	1.43 (0.94) ⁿ	1.03
BAND # (cells/μl)	185 (331) ⁿ	192 (368) ⁿ	202.0
HET # (cells/μl)	12041 (4993) ^s	4465 (2595) ⁿ	8917.0
LYMPH # (cells/μl)	6893 (2581) ^s	3663 (2076) ⁿ	5695.0
MONO # (cells/μl)	1118 (624) ^s	492 (529) ⁿ	843.0
EOS # (cells/μl)	0 (0) ⁿ	0 (0) ⁿ	0.00011
BASO # (cells/μl)	83 (181) ⁿ	137 (135) ⁿ	143.0
HET: LYMPH (ratio)	1.83 (1.05) ⁿ	1.33 (0.54) ⁿ	1.64
PP Est (Refrac) (g/dl)	2.69 (0.71) ^s	4.26 (0.55) ⁿ	3.56

s = Mean is statistically different (P<0.05) from the same parameter in all juvenile cockatoos.

n = Mean is not statistically different (P<0.05) from the same parameter in all juvenile cockatoos.

From: Clubb SL, et al: J Assoc Avian Vet 5(1):20, 1991.

Serum Biochemical Values for Juvenile Cockatoos

Parameter	30-day Mean (SD)	90-day Mean (SD)	All Mean (SD)
NA (mEq/l)	139 (3) ^a	150 (3) ^c	145 (6)
K (mEq/l)	4.0 (0.8) ^a	3.1 (0.4) ^b	3.6 (0.7)
CL (mEq/l)	105 (4) ^a	115 (4) ^c	110 (6)
CA (mg/dl)	9.2 (0.6) ^a	9.5 (1.0) ^{ab}	9.6 (0.7)
PHOS (mg/dl)	7.0 (0.6) ^a	5.1 (1.0) ^c	6.1 (1.1)
UREA (mg/dl)	1.6 (1.9) ^a	2.6 (2.5) ^b	2.0 (2.2)
CREAT (mg/dl)	0.31 (0.06) ^a	0.42 (0.07) ^{ab}	0.4 (0.1)
UA (mg/dl)	1.2 (0.9) ^a	5.1 (1.8) ^c	2.9 (2.3)
CHOL (mg/dl)	165 (32) ^a	350 (122) ^b	251 (105)
GLU (mg/dl)	247 (20) ^a	249 (29) ^{a, b}	253 (24)
LDH (U/l)	393 (348) ^a	367 (218) ^a	371 (285)
AST (U/l)	98 (54) ^a	195 (73) ^c	143 (79)
ALT (U/l)	2 (2) ^a	3 (3) ^{ab}	2 (3)
ALP (U/l)	593 (202) ^a	478 (167) ^c	579 (239)
GGT (U/l)	2.35 (1.75) ^a	2.79 (1.54) ^{ac}	2.55 (1.67)
CK (U/l)	595 (205) ^a	368 (156) ^b	510 (235)
TP (g/dl)	2.2 (0.4) ^a	3.1 (0.6) ^b	2.8 (0.7)
ALB (g/dl)	0.8 (0.2) ^a	1.2 (0.3) ^b	1.1 (0.3)
GLOB (g/dl)	1.3 (0.4) ^a	1.9 (0.4) ^b	1.7 (0.5)
A:G (ratio)	0.6 (0.2) ^{ab}	0.6 (0.1) ^b	0.6 (0.2)
PRE ALB (g/dl)	0.4 (0.1) ^a	0.5 (0.2) ^b	0.5 (0.2)
ALB (Elect) (g/dl)	1.1 (0.3) ^a	1.7 (0.5) ^{bc}	1.5 (0.5)
ALPHA GLOB (g/dl)	0.2 (0.1) ^a	0.3 (0.2) ^c	0.2 (0.1)
BETA GLOB (g/dl)	0.3 (0.2) ^a	0.3 (0.1) ^a	0.3 (0.1)
GAMMA GLOB (g/dl)	0.2 (0.1) ^a	0.3 (0.1) ^b	0.3 (0.1)

a,b,c = Values for parameters are statistically different (P) when letters are different.

From Clubb SL, et al: J Assoc Avian Vet 5(1):23, 1991.

Serum Biochemical Values for Juvenile Umbrella Cockatoos

Parameter	30-day Mean (SD)	90-day Mean (SD)	All Mean
NA (mEq/l)	139 (1.78) ^s	149 (2.33) ⁿ	145
K (mEq/l)	4.23 (0.57) ⁿ	3.13 (0.44) ⁿ	3.54
CL (mEq/l)	107 (2.8) ^s	115 (3.2) ⁿ	111
CA (mEq/l)	9.64 (0.39) ^s	9.43 (1.28) ⁿ	9.77
PHOS (mg/dl)	6.5 (0.44) ^s	4.7 (0.87) ⁿ	5.55
UREA (mg/dl)	1 (1.78) ⁿ	1.94 (2.41) ^s	1.61
CREAT (mg/dl)	0.34 (0.07) ⁿ	0.33 (0.04) ^s	0.37
UA (mg/dl)	0.83 (0.36) ^s	4.95 (1.68) ⁿ	2.73
CHOL (mg/dl)	180 (37.1) ^s	427 (70.3) ^s	291
GLU (mg/dl)	244 (18.03) ⁿ	236 (28.24) ^s	244
LDH (U/l)	326 (394) ⁿ	341 (174) ⁿ	325
AST (U/l)	84 (17.7) ⁿ	187 (39.2) ⁿ	136
ALT (U/l)	1.8 (1.7) ⁿ	2.69 (1.58) ⁿ	2.11
ALP (U/l)	426 (100) ^s	404 (104) ^s	440
GGT (U/l)	1.95 (1.73) ⁿ	2.81 (1.33) ⁿ	2.66
CK (U/l)	629 (193) ⁿ	395 (115) ⁿ	517
TP (g/dl)	2.47 (0.41) ^s	3.25 (0.59) ⁿ	3.03
A:G (ratio)	0.6 (0.1)	0.62 (0.08)	0.64
PRE ALB (g/dl)	0.43 (0.12) ⁿ	0.49 (0.13) ⁿ	0.45
ALB (Elect)(g/dl)	1.27 (0.27) ^s	1.86 (0.35) ⁿ	1.69
ALPHA GLOB (g/dl)	0.17 (0.05) ⁿ	0.29 (0.19) ⁿ	0.26
BETA GLOB (g/dl)	0.39 (0.16) ⁿ	0.34 (0.14) ⁿ	0.38
GAMMA GLOB (g/dl)	0.23 (0.06) ⁿ	0.31 (0.11) ⁿ	0.29

s = Mean is statistically different (\geq) from the same parameter in all juvenile cockatoos.

n = Mean is not statistically different (\leq) from the same parameter in all juvenile cockatoos.

From Clubb SL, et al: J Assoc Avian Vet 5(1):22, 1991.

HEMATOLOGY AND BIOCHEMISTRY PSITTACIFORMES

Hematology Values for Juvenile Macaws

Parameter	30-day Mean (SD)	90-day Mean (SD)	All Mean (SD)
RBC# (x 10 ⁶ /μl)	1.9 (0.3) ^a	3.7 (0.5) ^c	2.9 (0.8)
HB (g/dl)	7.7 (0.9) ^a	15.4(1.0) ^c	12.3(3.3)
HCT (%)	30.9(3.3) ^a	49.5(2.5) ^c	41.7(8.4)
MCV (fl)	165.5(25.4) ^a	137(19.2) ^c	149 (24.7)
MCH (pg)	41.7 (6.1) ^a	42.8(5.8) ^a	42.3 (6.2)
MCHC (g/dl)	25.1 (1.9) ^a	31.1(1.3) ^b	28.7 (2.9)
WBC (cells/μl)	19300 (8300) ^{ab}	17700 (4900) ^b	19200 (6900)
WBC Est (cells/μl)	17700 (5100) ^{ab}	18300 (4500) ^{ab}	18600 (5880)
BANDS (%)	0.8 (1.6) ^a	0.3(1.2) ^a	0.6 (1.7)
HET (%)	58.9 (11.1) ^a	53.9 (9.4) ^{ab}	55.3 (10)
LYMPH (%)	33.8(9.7) ^a	41.6 (9.6) ^{bc}	39.0 (10)
MONO (%)	5.9 (3.3) ^a	3.6 (2.0) ^b	4.4 (2.9)
EOS (%)	0 (0) ^a	0.1 (0.2) ^a	0 (0.2)
BASO (%)	0.7 (0.9) ^a	0.6 (1.2) ^{ab}	0.5 (1.0)
BANDS # (cells/μl)	134 (344) ^a	59(230) ^a	110 (313)
HET # (cells/μl)	10200 (7600) ^{ab}	9400 (4000) ^{bc}	10100 (5800)
LYMPH # (cells/μl)	5500 (3100) ^a	7000 (2500) ^b	6800 (3200)
MONO # (cells/μl)	910 (643) ^a	627 (418) ^b	750 (545)
EOS # (cells/μl)	0 (0) ^a	9.3 (51) ^a	4.6 (35)
BASO # (cells/μl)	115 (190) ^a	75 (165) ^{ab}	91 (175)
HET: LYMPH (ratio)	2.0 (1.0) ^{ab}	1.4 (0.6) ^{bc}	1.6 (0.8)
PP (refrac) (g/dl)	1.8 (0.40) ^a	3.5 (0.4) ^c	2.9 (0.8)

a,b,c = Values for parameters are statistically different (P<0.05) when letters are different.

From Clubb SL, et al: J Assoc Avian Vet 5(3):159, 1991.

Hematology Values for Juvenile Blue and Gold Macaws

Parameter	30-day Mean (SD)	90-day Mean (SD)	All Mean (SD)
RBC #(x 10 ⁶ /μl)	1.9 (0.3) ^{an}	3.5 (0.4) ^{cn}	2.7 (0.7)
HB (g/dl)	7.9 (0.9) ^{an}	15 (0.9) ^{cs}	11 (2.9)
HCT (%)	30 (2.7) ^{an}	48 (2.0) ^{cs}	40 (7.7)
MCV (fl)	163 (27) ^{an}	137 (14) ^{bn}	149 (22)
MCH (pg)	43 (7.1) ^{an}	41 (3.7) ^{an}	38 (13)
MCHC (g/dl)	26 (1.6) ^{an}	31 (1.4) ^{cn}	25 (9.5)
WBC # (cells/μl)	19200 (5600) ^{an}	16600 (4300) ^{bn}	18928 (5561)
WBC Est (cells/μl)	18300 (5600)	16800 (4300)	18300 (5600)
BAND (%)	0.36 (1.3) ^{an}	0 (0) ^{an}	0.12 (0.7)
HET (%)	57 (11.6) ^{an}	48 (11) ^{an}	52 (10)
LYMPH (%)	37 (10) ^{an}	47 (11) ^{cn}	42 (10)
MONO (%)	5.3 (2.9) ^{an}	3.8 (2.2) ^{an}	4.3 (2.7)
EOS (%)	0 (0) ^{an}	0 (0) ^{an}	0 (0)
BASO (%)	0.9 (1.1) ^{an}	1.1 (1.7) ^{an}	0.9 (1.3)
BANDS # (cells/μl)	0.36 (1.3) ^{an}	0 (0) ^{an}	0.12 (0.7)
HET # (cells/μl)	11000 (4600) ^{an}	8100 (3000) ^{an}	10000 (3800)
LYMPH # (cells/μl)	7000 (2600) ^{an}	7700 (2600) ^{bn}	8000 (3100)
MONO # (cells/μl)	949 (498) ^{an}	639 (421) ^{an}	756 (446)
EOS # (cells/μl)	0 (0) ^{an}	0 (0) ^{an}	0 (0)
BASO # (cells/μl)	194 (245) ^{an}	156 (256) ^{an}	154 (229)
HET: LYMPH (ratio)	1.75 (0.85) ^{an}	1.19 (0.77) ^{an}	1.38 (0.69)
PP Est (refrac) (g/dl)	1.87 (0.2) ^{an}	3.62 (0.5) ^{cn}	2.86 (0.8)

a,b,c = Values for parameters are statistically different (P<0.05) when letters are different.

s = Mean is statistically different (P<0.05) from the same parameter in all juvenile macaws.

n = Mean is not statistically different (P<0.05) from the same parameter in all juvenile macaws.

From: Clubb SL, et al: J Assoc Avian Vet 5(3):159, 1991.

Serum Biochemistry Values for Juvenile Macaws

Parameter	30-day Mean (SD)	90-day Mean (SD)	All Mean (SD)
NA (mEq/L)	137 (1.4) ^a	151.1 (2.5) ^c	145 (6.2)
K (mEq/L)	3.3 (0.5) ^a	2.7 (1.0) ^b	2.9 (0.8)
CL (mEq/L)	101 (4) ^a	112 (3) ^c	106 (5.5)
CA (mg/dl)	9.5 (0.5) ^a	10 (0.5) ^b	9.9 (0.5)
PHOS (mg/dl)	7.3 (0.6) ^a	5.6 (0.6) ^c	6.5 (1.0)
UREA (mg/dl)	1.0 (1.7) ^a	3.4 (2.2) ^c	2.4 (2.3)
CREAT (mg/dl)	0.4 (0.1) ^a	0.4 (0.1) ^a	0.4 (0.1)
UA (mg/dl)	0.6 (0.4) ^a	3.9 (1.2) ^c	2.3 (2.1)
CHOL (mg/dl)	119 (37.2) ^a	231 (48.9) ^c	165 (62.0)
GLU (mg/dl)	264 (32) ^a	290 (27) ^b	281 (30)
LDH (U/l)	131 (75) ^a	114 (55) ^a	138 (84)
AST (U/l)	84-(17) ^a	127 (36) ^b	104 (31)
ALT (U/l)	3 (2) ^a	4 (2) ^a	3 (2)
ALP (U/l)	1072 (346) ^a	786 (276) ^b	970 (397)
GGT (U/l)	2.0 (1.0) ^a	1.2 (1.2) ^b	1.8 (1.2)
CK (U/l)	596 (330) ^{ab}	442 (280) ^b	550 (312)
TP (g/dl)	1.7 (0.3) ^a	3.0 (0.3) ^c	2.6 (0.6)
ALB (g/dl)	0.7 (0.2) ^a	1.4 (0.2) ^c	1.2 (0.3)
GLOB (g/dl)	0.8 (0.4) ^a	1.5 (0.4) ^c	1.3 (0.6)
A:G (ratio)	0.7 (0.4) ^a	0.9 (0.1) ^b	0.8 (0.3)
PRE ALB (g/dl)	0.2 (0.1) ^a	0.5 (0.1) ^c	0.3 (0.1)
ALB (Elect) (g/dl)	1.0 (0.3) ^a	1.8 (0.3) ^c	1.5 (0.4)
ALPHA GLOB (g/dl)	0.2 (0.1) ^a	0.3 (0.1) ^a	0.3 (0.1)
BETA GLOB (g/dl)	0.3 (0.1) ^a	0.4 (0.1) ^a	0.3 (0.2)
GAMMA GLOB (g/dl)	0.2 (0.1) ^a	0.3 (0.2) ^a	0.3 (0.1)

a,b,c = Values for parameters are statistically different (P<0.05) when letters are different.

Clubb SL, et al: J Assoc Avian Vet 5(3):159-160, 1991.

Serum Biochemical Values for Juvenile Blue and Gold Macaws

Parameter	30-day Mean (SD)	90-day Mean (SD)	All Mean (SD)
NA (mEq/l)	136 (1.25) ^{an}	150 (2.44) ^{cn}	142 (6.07)
K (mEq/l)	3.20 (0.49) ^{an}	2.20 (0.15) ^{bn}	2.71 (0.64)
CL (mEq/l)	98.8 (2.31) ^{as}	111 (1.90) ^{cn}	104 (5.37)
CA (mg/dl)	9.7 (0.24) ^{an}	10.2 (0.25) ^{bn}	10 (0.47)
PHOS (mg/dl)	7.2 (0.64) ^{an}	5.6 (0.50) ^{cn}	6.6 (0.85)
UREA (mg/dl)	1.2 (1.78) ^{an}	2.5 (2.07) ^{an}	1.9 (2.18)
CREAT (mg/dl)	0.3 (0.06) ^{an}	0.4 (0.07) ^{bn}	0.4 (0.07)
UA (mg/dl)	0.6 (0.4) ^{an}	3.4 (0.9) ^{bn}	1.9 (2.5)
CHOL (mg/dl)	114 (30) ^{an}	251 (64) ^{cn}	164 (66.6)
GLUCOSE (mg/dl)	266 (33) ^{an}	299 (22) ^{bn}	288 (31)
LDH (U/l)	136 (69) ^{an}	97 (21) ^{an}	144 (98)
AST (U/l)	88 (19) ^{an}	127 (18) ^{bn}	101 (24)
ALT (U/l)	3 (2) ^{an}	4 (2) ^{abn}	4 (3)
ALP (U/l)	1225 (300) ^{as}	950 (315) ^{cs}	1200 (390)
GGT (U/l)	2.0 (0.9) ^{an}	0.9 (0.9) ^{bn}	1.7 (1.2)
CK (U/l)	498 (162) ^{an}	330 (85) ^{an}	540 (267)
TP (g/dl)	1.7 (0.2) ^{an}	2.9 (0.4) ^{bn}	2.5 (0.7)
ALB (g/dl)	0.7 (0.1) ^{an}	1.4 (0.2) ^{bn}	1.2 (0.3)
GLOB (g/dl)	0.8 (0.3) ^{an}	1.4 (0.5) ^{bn}	1.3 (0.6)
A:G (ratio)	0.8 (0.1) ^{an}	0.9 (0.1) ^{an}	0.8 (0.2)
PRE ALB (g/dl)	0.2 (0.1) ^{an}	0.5 (0.1) ^{cn}	0.3 (0.1)
ALB (Elect) (g/dl)	1.0 (0.3) ^{an}	1.8 (0.3) ^{bn}	1.5 (0.4)
ALPHA GLOB (g/dl)	0.2 (0.1) ^a	0.3 (0.1) ^a	0.3 (0.1)
BETA GLOB (g/dl)	0.3 (0.1) ^a	0.4 (0.1) ^a	0.3 (0.2)
GAMMA GLOB (g/dl)	0.2 (0.1) ^a	0.3 (0.2) ^a	0.3 (0.1)

a,b,c = Values for parameters are statistically different (P<0.05) when letters are different.

s = Mean is statistically different (P<0.05) from the same parameter in all juvenile macaws.

n = Mean is not statistically different (P<0.05) from the same parameter in all juvenile macaws.

From Clubb SL: J Assoc Avian Vet 5(3):161, 1991.

VARIOUS SPECIES

The Determination of Several Enzymes of Blood Plasma in Different Bird Species

Species	AST	ALT	LDH	AP
Green-cheeked Amazon Parrot	107.96 ± 22.66	9.15 ± 2.34	266.54 ± 75.03	122.3 ± 51.68
Blue-fronted Amazon Parrot	130.48 ± 19.75	15.9 ± 4.3	244.42 ± 76.32	129.48 ± 24.48
African Grey Parrot	63.23 ± 14.46	9.77 ± 3.33	209.19 ± 33.66	47.6 ± 14.12
Budgerigar	101.89 ± 15.2	14.96 ± 4.48	104.7 ± 28.43	194.12 ± 62.92
Homing Pigeon (Male)	46.01 ± 10.94	18.12 ± 3.51	65.51 ± 27.92	196.48 ± 56.35
Homing Pigeon (Female)	33.29 ± 11.44	16.95 ± 2.37	105.3 ± 60.32	225.07 ± 98.96

Monotest Boeringer Mannheim, Temperature not specified. From Baron HW: Vet Diss, München, 1980.

Uric Acid Concentrations in Blood Plasma

Species	Uric Acid in mmol/l
Budgerigar	0.284 ± 0.056
Blue-fronted Amazon Parrot	0.54 ± 0.057
Green-cheeked Amazon Parrot	0.280 ± 0.052
African Grey Parrot	0.315 ± 0.088
Pigeon	0.239 ± 0.029
Eagle	0.514 ± 0.044
Goshawk	0.498 ± 0.050
Common Buzzard	0.526 ± 0.049

Urica-quant®, Boeringer Mannheim. From Baumann CR: Vet Diss, München, 1980.

Protein Electrophoresis in Raptors

Parameter	Red Kite	American Kestrel	Montagu's Harrier	Barn Owl
Albumin	1.6 ± 0.5	1.6 ± 0.3	1.8 ± 0.31	1.6 ± 0.6
Alpha 1	0.26 ± 0.14	0.06 ± 0.06	0.50 ± 0.13	0.43 ± 0.24
Alpha 2	0.22 ± 0.12	0.06 ± 0.06		
Beta	0.21 ± 0.16	0.33 ± 0.01	0.24 ± 0.06	0.18 ± 0.07
Gamma	0.43 ± 0.24	0.58 ± 0.12	0.29 ± 0.04	0.42 ± 0.06
A:G Ratio	1.50 ± 0.73	1.34 ± 0.29	1.95 ± 0.37	1.95 ± 0.38

Hernandez, M. Blood chemistry in raptors. Proc European Assoc Avian Vet 1991, 411-419.

Normal Hematologic and Biochemical Values in Toucans

Cornelissen H.

Parameter	Value
RBC (10 ³ /mm ³)	2.5-4.5
WBC 10 ³ /mm ³)	4.0-10.0
PCV (%)	45-60
Buffy Coat (%)	0-1
Hets (%)	35-65
Lymphs (%)	25-50
Basos (%)	0-5
Eosins (%)	0-4
Thromb	present
Calcium (mg/dl)	10-15
Glucose (mg/dl)	220-350
LDH (U/l)	200-400
AST (U/l)	130-330
TP (g/l)	30-50
UA (mg/dl)	4-14
Iron (µg/dl)	<350
TIBC (µg/dl)	<550

Reference Values from Various Species

Parameter	Captive Bald Eagle	Cuban Amazon Parrot	Quaker Parrots	Blue & Gold Macaw	Hyacinth Macaw
AST (U/l)	101 ± 4.7	201 ± 79		197-297	87-160
ALT (U/l)	10.1 ± 1.5		0-21	99-263	
AP (U/l)		41 ± 21	219-823	162-580	
CK (U/l)	32.9 ± 1.9	217 ± 130			260-563
LDH (U/l)	120 ± 7.2	237 ± 155		183-664	62-89
Cholinesterase	663 ± 32				
Creatinine (mg/dl)				0.3-0.5	0.3-0.5
Uric acid (mg/dl)		2.8 ± 1.5		4-10.1	3.4-10.4
Cholesterol (mg/dl)				139-202	88-109
Glucose (mg/dl)		251 ± 43		286-332	255-324
TP (g/dl)		3.9 ± 0.7	3.8-5.0	3.3-5.6	2.7-3.6
Sodium (mEq/l)		149 ± 7		138-153	144-152
Potassium (mEq/l)		2.7 ± 0.7		5.0-10.4	2.3-6.2
Calcium (mg/dl)		9 ± 0.7		8.8-12.3	
Ionized Calcium (mg/dl)				4.6-6.2	
Phosphor (mg/dl)		2.0 ± 0.9		1.9-2.6	
Iron (µg/dl)				79-135	
BUN (mg/dl)		1.7 ± 2.0		1-5	
Bilirubin (mg/dl)				0.1-0.2	

See references 12, 18, 23, 60, 67 from Chapter 11.

Blood Chemistry in Canary Finches

Parameter	Mean Value	SD	P _{2.5} -P _{97.5}
Ca (mg/dl)	7.99	1.84	5.1-13.4
P (mg/dl)	3.28	1.21	1.6-5.6
Na (mmol/l)	139.2	8.18	125-154
Cl (mmol/l)	108.88	8.85	93-123
K (mmol/l)	3.58	0.69	2.7-4.8
Gluc (mg/dl)	345.88	30.27	291-391
Trig (mg/dl)	184.78	55.46	120-312
Crea (mg/dl)	0.48	0.25	0.1-1
NH ₃ (mmol/l)	221.18	110.42	87-467
ALT (U/l)	11.58	7.92	2-30
AST (U/l)	98.93	34.73	45-170
LDH (U/l)	1582.63	325.72	1580-1816 ^{male} 1300-1632 ^{female}
AP (U/l)	265.05	79.62	146-397
Chol (mg/dl)	165.45	44.52	110-286
Amyl (U/l)	481.78	141.84	277-787
CK (U/l)	302.1	106.94	177-556
TP (g/dl)	2.84	0.75	2.0-4.4
Uric (mg/dl)	8.93	3.31	4.3-14.8

Kodak Ektachem@-25°C. From Schöpf A, Vasicek L: Proc Europ Assoc Avian Vet, Vienna, 1991, pp 437-439.

COLUMBIFORMES

Plasma Chemistry Reference Values for Racing Pigeons

Parameter	P2.5-P97.5
Sodium (mmol/l)	141-149
Potassium (mmol/l)	3.9-4.7
Calcium (mmol/l)	1.9-2.6
Magnesium (mmol/l)	1.1-1.8
Inorganic phosphorus (mmol/l)	0.57-1.33
Chloride (mmol/l)	101-113
Plasma iron ($\mu\text{mol/l}$)	11-33
Iron binding capacity ($\mu\text{mol/l}$)	30-45
Osmolality (mOsm/kg)	297-317
Glucose (mmol/l)	12.9-20.5
Creatinine ($\mu\text{mol/l}$)	23-36
Urea (mmol/l)	0.4-0.7
Uric acid ($\mu\text{mol/l}$)	150-765
Urea:Uric acid (ratio)	1.8 ± 1.8 (mean \pm sd)
CPK (U/l)	110-480
AP (U/l)	160-780
AST (U/l)	45-123
ALT (U/l)	19-48
GLDH (U/l)	0-1
LDH (U/l)	30-205
Bile acids ($\mu\text{mol/l}$)	22-60
GGT (U/l)	0-2.9
Total protein (g/l)	21-33
Albumin:Globulin (ratio)	1.5-3.6
Prealbumin (g/l)	1-4
Alpha globulin (g/l)	2-3
Beta globulin (g/l)	3-6
Gamma globulin (g/l)	1-3

Thyroxine before and 16 h after stimulation with 2 U/kg TSH, 6-35/100-300 nmol/l
 Corticosterone before and 90 min after stimulation with 250 $\mu\text{g/kg}$ ACTH,
 0.2-1.24/2.22-11.2 $\mu\text{g/dl}$
 Recommendations of the German Society for Clinical Chemistry, Enzymes 30°C.
 From: Lumeij JT: PhD Thesis, Utrecht University, 1987.

Blood Cells of Domestic Pigeons

Type Cell	Number
Erythrocytes ($\times 10^{12}/\text{l}$)	3.1-4.5
Leukocytes ($\times 10^9/\text{l}$)	13.0-22.3 morning<evening
Heterophils ($\times 10^9/\text{l}$)	4.3-6.2
Eosinophils ($\times 10^9/\text{l}$)	0.1-0.3
Basophils ($\times 10^9/\text{l}$)	0.1-0.5
Lymphocytes ($\times 10^9/\text{l}$)	10.9-12.2
Monocytes ($\times 10^9/\text{l}$)	0.4-1.1
Thrombocytes ($\times 10^9/\text{l}$)	7.0-27.0
Hemoglobin (mmol/l)	8.1-9.9
Hematocrit (vol %)	42.5

Plasma Enzyme Activities from Clinically Normal Domestic Pigeons*Vogel C.*

Breed	LDH	MDH	AST	ALT	AP	CPK
Racing Pigeon (Male)*	161.4 ± 6.6	85.7 ± 21.9	29.3 ± 9.4	5.8 ± 1.9	47.0 ± 36.3	27.8 ± 13.8
Racing Pigeon (Female)*	121.2 ± 36.2	67.4 ± 14.6	26.7 ± 8.3	5.7 ± 1.7	41.0 ± 13.8	19.1 ± 3.3
Cologne Tumbler (Male)*	142.9 ± 20.1	103.0 ± 0.1	26.4 ± 11.6	6.2 ± 1.5	43.0 ± 1.4	40.5 ± 7.1
Cologne Tumbler (Female)*	119.2 ± 12.2	100.2 ± 19.0	24.8 ± 4.3	5.9 ± 1.4	36.1 ± 0.1	30.9 ± 15.6
Modenas (Male)*	155.6 ± 29.4	83.6 ± 26.3	64.1 ± 15.4	36.1 ± 4.3	6.1 ± 1.4	41.9 ± 9.0
Modenas (Female)*	147.2 ± 49.0			35.6 ± 0.6	6.0 ± 2.8	40.0 ± 12.7
Lynx (Male)**	105.3 ± 60.3	105.6 ± 19.7	33.3 ± 11.4	16.9 ± 2.4	225.1 ± 99.0	24.4 ± 3.9
Lynx (Female)**	65.3 ± 32.5	78.7 ± 9.6	46.1 ± 10.9	18.1 ± 3.5	196.5 ± 56.4	32.4 ± 11.9

* mU/ml

** U/l

Blood Parameters for Non-domestic Pigeons*Vogel C.*

Parameter	Rock Pigeon	Eastern Turtle Dove
Erythrocytes (10 ⁶ /mm ³)	3.7	3.0-4.1
PCV (%)	50.0	
Hb (g %)	16.5	13.9
Leukocytes (mm ³)		11.1
Heterophils (%)	39.0	17.9
Lymphocytes (%)	53.0	70.8
Monocytes (%)	5.0	4.9
Eosinophils (%)	1.0	2.6
Basophils (%)	2.0	3.8
Thrombocytes (mm ³)		19.1

GALLIFORMES

Hematology of Selected Gallinaceous Birds, Differential*Schales C., Schaless K.*

Species	Heterophils (%)	Lymphocytes (%)	Monocytes (%)	Basophils (%)	Eosinophils (%)
Domestic Fowl	19.8-32.6	45.0-75.0	8.1-16.5	1.7-4.3	1.5-2.7
Domestic Turkey	43.4	50.6	1.9	3.2	0.9
Pheasant	48.0	34.0	8.0	10.0	1.0
Guineafowl	43.5	36.2	8.4	4.5	7.4
Common Quail	33.8-50.0	40.0-46.0	1.0-2.0	0.8-3.0	1.0-4.0
Japanese Quail	20.8-52.0	40.0-73.6	1.0-2.7	0.2-3.0	1.0-4.3

Note: In both, Curassows and Guans, hemolysis occurs in EDTA tubes. It is not known whether or not this in vitro hemolysis exists in other gallinaceous birds. From: Gylstorff I: Handbuch der Geflügelphysiologie, 1983, pp 280-393; Wallach JD, Boever WJ: Diseases of Exotic Animals, 1983, pp 830-889.

Hematology of Selected Gallinaceous Birds, Blood Parameters *Schales C., Schaless K.*

Species	RBC (10^6 /ml)	PCV (%)	Hb (g %)	MCV (μm^3)	WBC (10^3 /ml)
Domestic Fowl	2.2-3.3	24-43	8.9-13.5	120-137	19.8-32.6
Domestic Turkey	2.3-2.8	36-41	10.3-15.2	129	23.5-26.8
Pheasant	2.2-3.6	28-42	8.0-18.9	104-150	
Guineafowl	1.7-2.8	39-48	11.4-14.9		15.5
Peafowl	2.1	33-41	12.0		
Common Partridge	1.8-3.3	28-34	7.4-11.8	117-155	
Rock Partridge	2.6	37	11.1		
Bobwhite Quail	3.4-5.4	38	11.6-15.8		
Common Quail	3.8-5.4	40-53	12.9-15.8		16.2-24.0
Japanese Quail	3.3-4.1	37-46	10.7-15.8		19.7-25.0
Chachalaca	2.7	35-45			

RBC = Red blood cells, PCV = Packed cell volume, hematocrit, Hb = Hemoglobin, MCV = Mean cell volume (erythrocytes), WBC = White blood cells
 From Gylstorff I: Handbuch der Geflügelphysiologie, 1983, pp 280-393; Gylstorff I, Grimm F: Vogelkrankheiten, 1987; Vollmehaus B, Sinowatz F: Anatomie der Vögel, 1992, pp 159-175.

Blood Chemistry of Selected Gallinaceous Birds

Species	Total Protein (g %)	Albumin (g %)	Globulin (g %)	Creatine (mg %)	Uric Acid (mg %)	Glucose (mg %)	Cholesterin (mg %)	Ca (mg %)	P (mg %)	Na (mEq/l)	K (mEq/l)
Domestic Fowl	3.3-5.5	1.3-2.8	1.5-4.1	0.9-1.8	2.5-8.1	227-300	86-211	13.2-23.7	6.2-7.9	131-171	3.0-7.3
Domestic Turkey	4.9-7.6	3.0-5.9	1.7-1.9	0.8-0.9	3.4-5.2	275-425	81-129	11.7-38.7	5.4-7.1	149-155	6.0-6.4
Pheasant	6.9	5.2	1.7		2.3-3.7	335-397			164-172		
Guineafowl	3.5-4.4				2.9-5.1					149-157	
Common Quail	3.4-3.6									180	1.4
Bobwhite Quail								14.1-15.4			
Japanese Quail		1.2-1.9									
Peafowl					1.8-3.7	273-357				154-162	
Rock Partridge					2.5-4.2	270-312				145-163	
Chachalaca					3.7-7.9	235-345				158-164	

From Gylstorff I: Handbuch der Geflügelphysiologie, 1983, pp 280-393; Gylstorff I, Grimm F: Vogelkrankheiten, 1987; Vollmehaus B, Sinowatz F: Anatomie der Vögel, 1992, pp 159-175.

Dimension of Erythrocytes in Galliformes

Species	Long Diameter (μm)	Short Diameter (μm)	Thickness (μm)
Domestic Fowl	10.7-13.0	6.5-7.9	2.4-3.8
Domestic Turkey	15.0-15.5	7.0-7.5	
Pheasant	10.6-11.0	4.0-6.8	
Guineafowl	12.0	6.0	
Peafowl	12.5	7.0	
Common Quail	11.2	6.2	
Rock Partridge	11.3	6.4	

From: Gylstorff I: Handbuch der Geflügelphysiologie, 1983, pp 280-393; Sturkie P: Avian Physiology, 1986, pp 102-121.

Sedimentation Rate of Erythrocytes of Selected Gallinaceous Birds (mm) Tubes Slanted

Species	10 min	30 min	60 min	120 min
Domestic Fowl	0.80-1.35	2.06-5.30	3.86-10.5	7.0-18.05
Pheasant			17.2	32.6

Sturkie P: Avian Physiology, 1986, pp 102-121.

ANSERIFORMES

All tables in this section compiled by Olsen J.

Leukocyte Percentages in Adult Mallards during Different Reproductive States (Mean \pm SD)*

Reproductive State	Lymphocytes	Heterophils	Basophils	Monocytes	Eosinophils
Females					
PE	60 \pm 1.4	35 \pm 1.5	2.2 \pm 0.2	2.2 \pm 0.3	0.7 \pm 0.15
EL	58 \pm 3.0	37 \pm 3.0	3.2 \pm 0.5	1.8 \pm 0.2	0.8 \pm 0.30
INC	62 \pm 1.5	33 \pm 1.7	3.0 \pm 0.4	1.9 \pm 0.2	0.2 \pm 0.07
MOLT	68 \pm 2.1	28 \pm 2.4	2.1 \pm 0.5	1.8 \pm 0.5	0.1 \pm 0.08
PR	57 \pm 1.6	37 \pm 1.4	3.2 \pm 0.3	3.2 \pm 0.3	0.2 \pm 0.06
Males					
PE	58 \pm 1.8	36 \pm 1.9	3.4 \pm 0.4	1.9 \pm 0.2	0.9 \pm 0.18
EL	59 \pm 3.0	36 \pm 3.1	2.6 \pm 0.4	1.9 \pm 0.2	0.6 \pm 0.18
INC	66 \pm 1.4	29 \pm 1.4	2.2 \pm 0.3	2.5 \pm 0.3	0.2 \pm 0.17
MOLT	67 \pm 1.9	27 \pm 2.0	2.9 \pm 0.4	2.9 \pm 0.4	0.3 \pm 0.10
PR	54 \pm 1.6	38 \pm 1.5	3.6 \pm 0.3	3.6 \pm 0.3	0.4 \pm 0.10

* PE (Pre-egg laying); EL (Laying); INC (Incubating); MOLT (Molting); PR (Postreproductive). Males were classified in the same reproductive state as the female with whom they were paired until they began the post-reproductive molt.

Modified from: Fairbrother A, O'Loughlin D: J Wildl Dis 26(1):78-82, 1990.

HEMATOLOGY AND BIOCHEMISTRY ANSERIFORMES

Hematology of Selected Anseriformes (Mean±SD)

Species	RBC (10 ⁶ /mm ³)	PCV (%)	Hg (g/dl)	MCV (μ ³)	MCH (μg)	MCHC (%)	RBC size (μ)	WBC (10 ³ /mm ³)	Heterophil x10 ³ /mm ³	Lymph x10 ³ /mm ³	Monocytes x10 ³ /mm ³	Basophil x10 ³ /mm ³	Eosinophil x10 ³ /mm ³
American Black Duck	2.78 ± 0.22	40.24 ± 4.21	12.96 ± 1.36	144.68 ± 9.96	46.60 ± 3.00	32.23 ± 1.16		19.70 ± 6.60	4.86 ± 1.37	13.03 ± 1.53	1.46 ± 0.99	0.16 ± 0.15	0.22 ± 0.16
Wood Duck	2.79 ± 0.28	45.54 ± 3.41	14.95 ± 1.22	164.24 ± 14.43	54.08 ± 6.74	32.99 ± 3.7		23.58 ± 5.72	8.45 ± 2.59	13.28 ± 1.77	1.05 ± 0.68	0.41 ± 0.23	0.51 ± 0.06
Canvas-back*	2.5-2.6 2.61-3.51 2.61 ± 0.4	51.4-53.0 46.3-60.4 47.0 ± 6.2	13.8-18.1 15.2 ± 2.0	165-209	47-63	28-31	6.6x12.7						
Red Head	2.78 ± 0.3	44.0 ± 7.1	13.5 ± 1.8										
Lesser Scaup*	2.4-2.5 2.45 ± 0.13 2.84	56.5-58.0 57.1 ± 3.1 47.0	16.0				7.5x13.0						
Greater Scaup	2.27 ± 0.7	43.0 ± 1.4	15.9 ± 2.0										
Ring-necked Duck*	2.50 2.54	49.1 47.0	14.3										
Bufflehead*	2.6-2.7 2.64	53.9-54.7 54.3											
Ruddy Duck	2.30 ± 0.3	43.0 ± 3.4	14.6 ± 1.7										
Canada Goose*	1.6-2.6 2.15-2.82	38-58 41.7-56	12.7-19.1	145-174 168.1-229.5	53.7-70	28-29 27.6-34.7	6.9x13.2	13.0-18.5	23.0-42.8	47.8	5.1	2.4	1.9
Aleutian Canada Goose**	2.6±0.4	42±3	(M)13.48±2.01 (F)12.8±1.81		(M)32.5±5.4 (F)30.6±3.9	(M)5.2±0.8 (F)4.6±0.7							
Snow Goose white phase blue phase	2.24 2.25	45.7 46	14.5 14.0					20.1±4.71	7	12.3	0.2	0.1	0.5
Nene Goose**	2.6±0.2	46±2	(M)15.25±0.74 (F)15.72±0.60		(M)32.5±2.7 (F)34.7±1.7	(M)5.6±0.3 (F)6.3±0.5							
Embden Goose**	2.6±0.3	38±3	(M)12.30±2.23 (F)10.49±1.22		(M)32.2±6.4 (F)29.0±2.9	(M)5.0±0.9 (F)4.2±0.7							
Tule White-fronted Goose**	2.9±0.2	43±2	(M)14.76±1.54 (F)15.43±0.76		(M)34.6±1.2 (F)35.6±0.6	(M)4.9±0.4 (F)5.6±0.4							
Trumpeter Swan		41.6±2.6				32.6-36.4							

* Variations in reference values have resulted from different studies. See Chapter 46, Anseriformes.^{61,62,78,79,100,113}

** (M) male, (F) female.

Serum Chemistry Values of Selected Anseriformes (Mean \pm SD)

	American Black Duck	Canada Goose*	Aleutian Canada Goose**	Tule White-fronted Goose**	Nene Goose**	Embden Goose**	Canvas-back	Lesser Scaup	Ringneck Duck	Bufflehead	Trumpeter Swan
Total Protein (g/dl)	4.32 \pm 0.42	5.36 \pm 0.27 4.26 \pm 0.13	4.80 \pm 0.7	4.4 \pm 0.4	4.4 \pm 0.7	4.4 \pm 1.0	3.6-6.8 4.2-4.6	4.2-4.5	3.2-4.0	3.6-4.1	4.5 \pm 0.49
Albumin (g/dl)	3.10 \pm 0.36 3.04 \pm 0.30	2.18 \pm 0.13 1.53 \pm 0.05	2.1 \pm 0.2 2.0 \pm 0.2	1.7 \pm 0.2 1.8 \pm 0.2	1.7 \pm 0.2 1.9 \pm 0.2	1.5 \pm 0.2 1.9 \pm 0.7	2.08	1.89	1.68	1.72	
Globulin (g/dl)	1.21 \pm 0.52		2.8 \pm 0.6	2.7 \pm 0.3	2.6 \pm 0.5						
A/G ratio	2.71 \pm 0.77		0.76 \pm 0.13	0.64 \pm 0.08	0.71 \pm 0.09						
Glucose (mg/dl)	175.83 \pm 26.5	219.5 \pm 12.39 320.33 \pm 28.4	210 \pm 31 236 \pm 41	221 \pm 28 249 \pm 30	185 \pm 10 192 \pm 12	230 \pm 31 215 \pm 43	180-549				
Calcium (mg/dl)		9.22 \pm 0.27 10.57 \pm 0.69	10.2 \pm 0.7 10.4 \pm 0.5	10.1 \pm 0.6 10.3 \pm 0.4	10.0 \pm 0.6 10.5 \pm 0.5	10.1 \pm 0.6 10.8 \pm 1.8					
Phosphorus (mg/dl)	3.23 \pm 1.15		2.8 \pm 0.9 2.9 \pm 0.6	3.6 \pm 0.6 3.4 \pm 0.8	2.4 \pm 0.7 2.4 \pm 0.7	3.3 \pm 1.3 3.5 \pm 0.7					
Sodium (mEq/l)			142 \pm 4	146 \pm 5	146 \pm 3	140					
Chloride (mEq/l)			105 \pm 4	112 \pm 23	99 \pm 4	101					
Potassium (mEq/l)			3.4 \pm 0.6	3.3 \pm 0.6	2.5 \pm 0.4	3.1					
Uric acid (mg/dl)		6.05 \pm 0.59 5.75 \pm 0.39	8.3 \pm 2.3	10.8 \pm 1.0	8.0 \pm 1.6	7.5 \pm 1.9					
Creatinine (mg/dl)			0.8 \pm 0.3	0.9 \pm 0.2	0.8 \pm 0.2	0.8					
Blood urea nitrogen (mg/dl)	1.49 \pm 0.36		3 \pm 2	3 \pm 1	2 \pm 1	4 \pm 1					
AAT (U/l)	55.9 \pm 29.7 18.6 \pm 8.2		75 \pm 19	98 \pm 18	45 \pm 17	106 \pm 62					
ALP (U/l)	20.9 \pm 11.7 131.8 \pm 36.7		72 \pm 43	78 \pm 44	33 \pm 8	33 \pm 14					
LDH (U/l)	312.8 \pm 83.5 244.7 \pm 81.8		301 \pm 80	361 \pm 196	256 \pm 68	659 \pm 319					
GGT (U/l)			2 \pm 3	1 \pm 1	2 \pm 2	1					
SGPT (U/l)			43 \pm 11	50 \pm 9	37 \pm 7						
SGOT (U/l)			75 \pm 17 76 \pm 21	104 \pm 15 89 \pm 19	40 \pm 13 49 \pm 18	125 \pm 82 91 \pm 39					
Amylase (U/l)			570 \pm 184	454 \pm 201	824 \pm 32	653					
Total Bilirubin (mg/dl)			0.20 \pm 0.07	0.51 \pm 0.30	0.12 \pm 0.04	0.19 \pm 0.14					
Iron μ g/dl			234 \pm 72	276 \pm 90		261					
Total lipids (g/dl)	1.43 \pm 0.18		1.38 \pm 0.67	1.69 \pm 0.64	1.45 \pm 0.48						
Triglyceride (mg/dl)		258 \pm 60.83 145.2 \pm 25.37	151 \pm 28	215 \pm 51	163 \pm 42						
Total cholesterol		239.25 \pm 9.91 307 \pm 30.9	172 \pm 28 172 \pm 29	134 \pm 14 130 \pm 10	230 \pm 33 233 \pm 23	123 \pm 24 162 \pm 94	260 - 366				

* Line 1 = spring; Line 2 = fall

**Line 1 = male; Line 2 = female

Modified from references: 15,27,32,61,75,79,111

Serum Chemistry and Enzyme Values, Non-reproductive Adult Mallards

Assay	Male		Female	
	Mean	SD	Mean	SD
TPR (g/dl)	3.8	0.7	4.2	0.5
ALB (g/dl)	1.5	0.4	1.7	0.2
GLU (mg/dl)	185.0	47.0	215.0	34.0
AMY (U/l)	2631.0	630.0	2766.0	684.0
CHE (U/l)	794.0	249.0	812.0	197.0
ALT (U/l)	26.3	8.0	29.9	9.9
AST (U/l)	16.2	4.3	15.8	4.7
GGT (U/l)	7.7	4.2	8.0	4.8
ALP (U/l)	26.3	8.0	44.2	22.7
LDH (U/l)	199.0	83.0	147.0	80.0
CA (mg/dl)	9.4	1.9	9.8	1.1
MG (mEq/l)	1.8	0.4	1.8	0.3
PHOS (mg/dl)	2.9	1.0	3.0	1.0
UA (mg/dl)	4.0	1.3	4.5	1.8
CRN (mg/dl)	0.25	0.08	0.28	0.07
BITO (mg/dl)	0.16	0.05	0.16	0.04
BIDI (mg/dl)	0.07	0.01	0.07	0.01

Modified from: Fairbrother A: J Wildl Dis 26(1):67-77, 1990.

Abbreviations for Anseriforme Appendix Table

TPR (total protein), ALB (albumin), GLU (glucose), AMY (amylase), CHE (cholinesterase), ALT (alanine aminotransferase), AST (aspartate aminotransferase), ALP (alkaline phosphatase), LDH (lactic dehydrogenase), CA (calcium), MG (magnesium), PHOS (phosphorus), UA (uric acid), CRN (creatinine), BITO (total bilirubin), BIDI (direct bilirubin).

Serum Chemistry and Enzyme Values for Adult Female Mallards of Differing Reproductive States

Assay	Pre-egg laying		Egg laying		Incubating		Molt	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
TPR (g/dl)	5.6	2.9	6.3	1.2	4.4	0.6	4.5	1.2
ALB (g/dl)	2.0	0.3	2.3	0.2	1.6	0.2	1.7	0.2
GLU (mg/dl)	238.0	21.0	258.0	51.0	211.0	53.0	199.0	30.0
AMY (U/l)	3058.0	527.0	3821.0	741.0	2700.0	626.0	2346.0	1012.0
CHE (U/l)	1337.0	280.0	1563.0	592.0	1002.0	266.0	894.0	219.0
ALT (U/l)	31.0	10.3	34.2	19.4	30.6	13.1	41.1	17.1
AST (U/l)	18.0	3.4	23.7	6.7	22.1	7.4	22.6	12.6
GGT (U/l)	19.8	19.8	199.6	283.0	7.5	4.7	20.8	36.9
ALP (U/l)	63.6	56.8	124.9	56.7	34.3	15.8	36.0	18.1
LDH (U/l)	165.0	50.0	177.0	57.0	215.0	107.0	268.0	2.2
CA (mg/dl)	14.0	4.1	21.9	5.6	10.3	2.0	10.6	4.2
MG (mEq/l)	2.3	0.5	3.6	0.8	1.6	0.3	1.6	0.5
PHOS (mg/dl)	4.6	1.7	8.1	2.4	3.7	1.0	4.1	2.2
UA (mg/dl)	5.2	1.1	9.1	5.1	5.5	1.7	4.9	1.7
CRN (mg/dl)	0.34	0.06	0.33	0.15	0.42	0.15	0.33	0.08
BITO (mg/dl)	0.23	0.08	0.43	0.28	0.20	0.11	0.21	0.05
BIDI (mg/dl)	0.07	0.04	0.15	0.22	0.06	0.04	0.06	0.01

Modified from: Fairbrother A, O'Loughlin D: J Wildl Dis 26(1):78-82, 1990.

Serum Chemistry and Enzyme Values for Adult Male Mallards of Differing Reproductive States

Assay	Pre-egg laying		Egg laying		Incubating		Molt	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
TPR (g/dl)	4.6	0.6	4.5	0.8	4.2	0.5	3.9	0.8
ALB (g/dl)	1.8	0.2	1.6	0.2	1.7	0.3	1.5	0.3
GLU (mg/dl)	234.0	33.0	233.0	32.0	199.0	26.0	185.0	29.0
AMY (U/l)	3123.0	583.0	2869.0	614.0	3203.0	785.0	2991.0	748.0
CHE (U/l)	1326.0	344.0	1380.0	399.0	984.0	470.0	983.0	452.0
ALT (U/l)	34.6	9.4	35.8	13.1	27.6	12.1	28.4	19.2
AST (U/l)	17.3	4.0	20.5	8.0	20.8	15.7	18.1	8.1
GGT (U/l)	8.5	7.6	10.6	12.6	9.3	6.0	16.5	36.0
ALP (U/l)	40.2	25.3	44.1	44.8	38.4	48.0	35.3	44.2
LDH (U/l)	168.0	66.0	219.0	107.0	263.0	203.0	202.0	152.0
CA (mg/dl)	10.9	1.0	11.0	1.9	9.9	1.0	9.3	2.2
MG (mEq/l)	2.0	0.2	2.0	0.4	1.8	0.4	1.8	0.9
PHOS (mg/dl)	3.7	0.9	3.6	0.9	2.8	0.5	3.1	1.4
UA (mg/dl)	5.2	1.2	5.2	1.5	5.7	1.9	4.7	2.3
CRN (mg/dl)	0.35	0.08	0.36	0.10	0.34	0.12	0.30	0.12
BITO (mg/dl)	0.22	0.09	0.20	0.09	0.18	0.04	0.20	0.08
BIDI (mg/dl)	0.07	0.02	0.06	0.01	0.07	0.02	0.08	0.05

Modified from: Fairbrother A: J Wildl Dis 26(1):67-77, 1990.

Serum Chemistry and Enzyme Values for Juvenile Mallards

Assay	Age 5 days		Age 18 days		Age 42 days		Age 58 days	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
TPR (g/dl)	3.4	0.6	4.3	1.3	4.0	0.8	3.2	1.0
ALB (g/dl)	1.4	0.2	1.5	0.3	1.6	0.4	1.4	0.4
GLU (mg/dl)	239.0	54.0	215.0	93.0	189.0	27.0	186.0	45.0
AMY (U/L)	3230.0	760.0	3984.0	1297.0	3005.0	302.0	2395.0	699.0
CHE (U/L)	1423.0	696.0	984.0	559.0	827.0	253.0	818.0	248.0
ALT (U/L)	21.3	9.1	30.5	10.5	26.1	7.0	23.9	7.1
AST (U/L)	22.3	7.4	88.5	54.1	9.4	5.1	17.4	5.7
GGT (U/L)	1.2	2.8	4.6	3.6	5.3	5.7	6.1	3.6
ALP (U/L)	411.0	89.0	386.0	194.0	217.0	32.0	185.0	47.0
LD-L (U/L)	425.0	153.0	629.0	251.0	169.0	70.0	233.0	83.0
CA (mg/dl)	13.0	10.3	9.6	1.7	10.9	1.6	8.4	1.8
MG (mEq/L)	2.8	0.8	1.8	0.7	2.0	0.2	1.6	0.5
PHOS (mg/dl)	7.9	2.8	7.6	1.3	6.2	1.3	5.0	1.7
UA (mg/dl)	12.2	5.4	10.9	3.8	4.0	0.7	4.0	1.8
CRN (mg/dl)	0.47	0.42	0.55	0.65	0.28	0.10	0.21	0.11
BITO (mg/dl)	0.40	0.11	0.43	0.31	0.20	0.0	0.17	0.05
BIDI (mg/dl)	0.08	0.02	0.10	0.04	0.06	0.0	0.06	0.02

Modified from: Fairbrother A: J Wildl Dis 26(1):67-77, 1990.

RATITES

Hematological and Biochemical Values for Ratites
Stewart J.

Parameter	Ostrich		Emu		Cassowary	
	Mean	SD	Mean	SD	Mean	SD
WBC ($\times 10^3/\mu\text{l}$)	5.5	1.9			18.0	4.5
Heterophils (%)	62.6	7.6			77.7	25.8
Lymphocytes (%)	34.1	7.0			19.7	10.4
Monocytes (%)	2.8	1.3			2.4	2.4
Eosinophils (%)	0.3	0.5				
Basophils (%)	0.2	0.5				
PCV (%)	32.0	3.0			50.8	3.7
RBC ($\times 10^6/\mu\text{l}$)	1.7	0.4			2.1	0.3
Hb (g/dl)	12.2	2.0			14.5	0.5
MCV (fl)	174.0	42.0			245.0	41.0
MCHC (g/dl)	33.0	5.0			28.5	1.6
MCH (pg)	61.0	16.0			70.0	11.5
Total protein (g/dl)	3.7	0.7	4.2	0.5	6.1	0.5
Osmolality (mOsm/kg)	286.0	49.0				
Glucose (mg/dl)	250.0	70.0	158.0	22.0	208.0	47.4
Triglycerides (mg/dl)	90.0	45.0	325.0	591.0	180.0	72.0
Cholesterol (mg/dl)	97.0	45.0	104.0	31.0	80.0	16.0
BUN (mg/dl)	2.4	0.6	2.5	0.9	9.3	0.6
Uric acid (mg/dl)	8.2	2.7	4.7	2.0	6.0	0.6
Calcium (mg/dl)	9.2	2.4	10.5	1.3	11.4	0.2
Phosphorus (mg/dl)	4.8	1.2	5.4	1.0	5.0	0.1
Sodium (mEq/l)	147.0	34.0			149.0	2.1
Potassium (mEq/l)	3.0	0.8			4.1	1.0
Chloride (mEq/l)	100.0	16.0			108.0	0.0
Magnesium (mEq/l)	2.2	0.8			2.3	0.3
ALP (U/l)	575.0	248.0	84.0	44.0		
ALT (U/l)	2.0	1.7	15.4	4.3	80.0	21.0
AST (U/l)	131.0	31.0	104.0	24.0	698.0	532.0
GGT (U/l)	1.5	2.9	4.4	3.4		
LDH (U/l)	1565.0	660.0	240.0	91.0	1060.0	516.0
CK (U/l)	688.0	208.0	264.0	170.0		



Class Aves:

A List of Orders, Common and Scientific Names

APTERYGIFORMES

Kiwi *Apteryx* sp.

STRUTHIONIFORMES

Cassowary *Casuaris* spp.
Emu *Dromiceius novaehollandiae*
Greater Rhea *Rhea americana*
Lesser Rhea *Pterocnemia pennata*
Ostrich *Struthio camelus*

TINAMINIFORMES

Tinamou *Eudromia* spp.
Bustard (Houbara) *Chlamydotis undulata*

GRUIFORMES

Blue Crane *Tetrapteryx paradisea*
Brolga *Grus rubicunda*
Crowned Crane *Balearica pavonina*
Demoiselle Crane *Anthropoides virgo*
Hooded Crane *Grus monacha*
Manchurian Crane *Grus japonensis*
Sandhill Crane *Grus canadensis*
Sarus Crane *Grus antigone*
White-naped Crane *Grus vipio*

RALLIFORMES

Coot (European) *Fulica atra*

CHARADRIIFORMES

Sanderling (eroliinae) *Crocetha ulba*
Turnstone *Arenaria interpres*

LARIFORMES

Black-headed Gull *Chroicocephalus ridibundus*
Herring Gull *Larus argentatus*
Kittiwake (Black -legged) *Rissa tridactyla*

ALCIFORMES

Black Guillemot *Cephus grylle*

SPHENISCIFORMES

Fairy Blue (Little) Penguins *Eudyptula minor*
Humboldt penguin *Spheniscus humboldti*
Jackass Penguin *Spheniscus demersus*

PELECANIFORMES

Brandt's Cormorant *Phalacrocorax penicillatus*
White Pelican *Pelecanus onocrotalus*

COLUMBIFORMES

Pigeons

Crowned (Blue) Pigeon *Goura cristata*
Nicobar Pigeon *Caloenas nicobarica*
Pheasant Pigeon *Otidiphaps nobilis*
Rock-Pigeon (Racing, King) *Columba livia*
Tooth-billed Pigeon *Didunculus strigirostris*
Wood-Pigeon *Palumbus palumbus*

Doves

African Collared Dove *Streptopelia roseogrisea*
Collard (African) Dove *Streptopelia roseogrisea*
Emerald Dove *Chalcophaps indica*
Galapagos Dove *Nesopelia galapagoensis*
Luzon Bleeding-heart *Gallicolumba luzonica*
Mourning Dove *Zenaida macroura*
Zenaidura
Namaqua Dove *Oena capensis*
Plain-breasted Ground Dove
Columbigallina minuta
Turtle-Dove *Streptopelia turtur*

PSITTACIFORMES

Lovebirds

Black-cheeked Lovebird *Agapornis nigrigenis*
Black-collared Lovebird *Agapornis swindermanus*

Black-winged Lovebird *Agapornis taranta*
Fischer's Lovebird *Agapornis fischeri*
Grey-headed Lovebird *Agapornis canus*
Lilian's (Nyassa) Lovebird *Agapornis lilianae*
Masked Lovebird *Agapornis personatus*
Red-faced Lovebird *Agapornis pullarius*
Rosy-faced Lovebird *Agapornis roseicollis*

Macaws

Blue and Yellow (Gold) Macaw *Ara ararauna*
Buffon's Macaw *Ara ambigua*
Green-winged Macaw *Ara chloroptera*
Hyacinth Macaw *Anodrohychnus hyacinthinus*
Illiger's Macaw *Ara maracana*
Military Macaw *Ara militaris*
Red-shouldered Macaw *Diopsittaca nobilis*
Scarlet Macaw *Ara macao*
Yellow-collared Macaw *Ara auricollis*

Conures

Australian Conure *Enicognathus ferrugineus*
Blue-crowned Conure *Thectocercus acuticaudatus*
Brown-throated Conure *Eupsittula pertinax*
Cactus Conure *Eupsittula cactorum*
Dusky-headed Conure *Eupsittula weddellii*
Finsch's Conure *Psittacara finschi*
Golden Conure *Guaruba guarouba*
Green-cheeked Conure *Pyrhura molinae*
Green Conure *Psittacara holochlora*
Maroon-bellied Conure *Pyrhura frontalis*
Mitted Conure *Psittacara mitrata*
Nanday Conure *Nandayus nenday*
Painted Conure *Pyrhura picta*
Patagonian Conure *Cyanoliseus patagonus*
Peach-fronted Conure *Eupsittula aurea*
Pearly Conure *Pyrhura perlata*
Slender-billed Conure *Enicognathus leptorhynchus*
Sun Conure *Aratinga solstitialis*
White-eyed Conure *Psittacara leucophthalma*

Parakeets

Alexandrine Parakeet *Psittacula eupatria*
Blossom-headed Parakeet *Psittacula roseata*
Blyth's Parakeet *Psittacula caniceps*
Derbyan Parakeet *Psittacula derbiana*
Grey-cheeked Parakeet *Brotogeris pyrrhoptera*
Monk (Quaker) Parakeet *Miopsittia monachus*
Moustached Parakeet *Psittacula alexandria*
Orange-chinned Parakeet *Brotogeris jugularis*
Red-fronted (Kakariki) Parakeet *Cyanoramphus novaezelandiae*
Rose-ringed Parakeet *Psittacula krameri*
Yellow-fronted (Kakariki) Parakeet *Cyanoramphus auriceps*
Black-headed Caique *Pionites melanocephalus*
White-bellied Caique *Pionites leucogaster*

Parrots

African Grey Parrot *Psittacus erithacus*
Amboina King Parrot *Alisterus amboinensis*

Australian King Parrot *Alisterus scapularis*
Barraband's Parrot *Gypopsitta barrabandi*
Black Parrot *Coracopsis nigra*
Blue-bonnet *Psephotus haematogaster*
Blue-winged Parrot *Neophema chrysostoma*
Bourke's Parrot *Neopsephotus bourkii*
Budgerigar *Melopsittacus undulatus*
Eastern Rosella *Platyercus eximius*
Eclectus Parrot *Eclectus roratus*
Elegant Parrot *Neophema elegans*
Golden-shouldered Parrot *Psephotus chrysopterygius*
Great-billed Parrot *Tanygnathus megalorhynchus*
Green Rosella *Platyercus caledonicus*
Green-winged King Parrot *Alisterus chloropterus*
Ground Parrot *Pezoporus wallicus*
Hawk-headed Parrot *Deropteryx accipitrinus*
Kakapo *Strigops habroptilus*
Mulga Parrot *Psephotus varius*
Night Parrot *Geopsittacus occidentalis*
Northern Rosella *Platyercus venustus*
Orange-bellied Parrot *Neophema chrysogaster*
Paradise Parrot *Psephotus pulcherrimus*
Pennant's Rosella *Platyercus elegans*
Pileated Parrot *Pionopsitta pileata*
Princess Parrot *Spathopterus alexandrae*
Red-capped Parrot *Purpurecephalus spurius*
Red-rumped Parrot *Psephotus haematotonotus*
Red-winged Parrot *Aprosmictus erythropterus*
Regent Parrot *Spathopterus anthoepus*
Ringneck Parrot *Barnardius zonarius*
Scarlet-chested Parrot *Neophema splendida*
Short-tailed Parrot *Graydidascalus brachyurus*
Superb Parrot *Polytelis swainsonii*
Thick-billed Parrot *Rhynchopsitta pachyrhyncha*
Timor Red-winged Parrot *Aprosmictus jonquillaceus*
Turquoise-Parrot *Neophema pulchella*
Vasa Parrot *Coracopsis vasa greater*
Western Rosella *Platyercus icterotis*

Amazon parrots

Blue-fronted Amazon *Amazona aestiva*
Cuban Amazon *Amazona leucocephala*
Festive Amazon *Amazona festiva*
Green-cheeked Amazon *Amazona viridigenalis*
Hispaniolan Amazon *Amazona ventralis*
Lilac-crowned Amazon *Amazona finschi*
Mealy Amazon *Amazona farinosa*
Orange-winged Amazon *Amazona amazonica*
Puerto Rican Amazon *Amazona vittata*
Red-spectacled Amazon *Amazona pretrei*
Red-lore Amazon *Amazona autumnalis*
Tucuman Amazon *Amazona tucumana*
Vineaceous Amazon *Amazona vinacea*
White-fronted Amazon *Amazona albifrons*
Yellow-lore Amazon *Amazona xanholora*
Yellow-crowned Amazon *Amazona ochrocephala*
Yellow-billed (Jamacian) Amazon *Amazona collaria*
Yellow-shouldered Amazon *Amazona barbadensis*
Yellow-faced Amazon *Amazona xanthops*

Fig parrots

Desmarest's Fig Parrot *Psittaculirostris desmarestii*
Double-eyed Fig Parrot *Opopsitta diophthalma*
Edward's Fig Parrot *Psittaculirostris edwardsii*
Salvadori's Fig Parrot *Psittaculirostris salvadorii*

Pionus parrots

Blue-headed Parrot *Pionus menstus*
Bronze-winged Parrot *Pionus chalcopterus*
Dusky Parrot *Pionus fuscus*
Plum-crowned Parrot *Pionus tumultuosus*
Red-billed Parrot *Pionus sordidus*
Scaly-headed Parrot *Pionus maximiliani*
White-capped Parrot *Pionus senilis*
White-headed Parrot *Pionus seniloides*

Poicephalus parrots

Brown-headed Parrot *Poicephalus cryptoxanthus*
Cape Parrot *Poicephalus robustus*
Jardine's Parrot *Poicephalus guilielmi*
Meyer's Parrot *Poicephalus meyeri*
Niambian Parrot *Poicephalus crassus*
Red-bellied Parrot *Poicephalus rufiventris*
Ruppell's Parrot *Poicephalus rueppellii*
Senegal Parrot *Poicephalus senegalus*
Yellow-faced Parrot *Poicephalus flavifrons*

Lories

Black-capped Lory *Lorius lory*
Black Lory *Chalcopsitta atra*
Blue-streaked Lory *Eos reticulata*
Cardinal-Lory *Chalcopsitta cardinalis*
Chattering Lory *Lorius garrulus*
Dusky Lory *Pseudeos fuscata*
Duivenbode's Lory *Chalcopsitta duivenbodei*
Ornate Lory *Trichoglossus ornatus*
Purple-bellied Lory *Lorius hypoinochrous*
Purple-naped Lory *Lorius domicella*
Rainbow-Lory *Trichoglossus haematodus*
Red Lory *Eos bornea*
Violet-necked Lory *Eos squamata*
Yellow-streaked Lory *Chalcopsitta sinillata*

Lorikeets

Goldie's Lorikeet *Psitteuteles goldiei*
Little Lorikeet *Glossopsitta pusilla*
Scaly-breasted Lorikeet *Trichoglossus chlorolepidotus*
Varied Lorikeet *Psitteuteles versicolor*

Cockatoos

Black Cockatoo *Calyptorhynchus funereus*
Blue-eyed Cockatoo *Cacatua ophthalmica*
Ducorps's Cockatoo *Cacatua ducorps*
Galah *Eolophus roseicapillus*
Gang-gang Cockatoo *Callocephalon fimbriatum*
Glossy Cockatoo *Calyptorhynchus lathami*
Goffin's Cockatoo *Cacatua goffini*
Lesser Sulfur-crested Cockatoo *Cacatua sulphurea*
Little (Slender-bill) Corella *Cacatua sanguinea*
Long-billed Corella *Cacatua tenuirostris*
Mitchell's Cockatoo *Cacatua leadbeateri*
Palm Cockatoo *Probosciger aterrimus*
Red-vented Cockatoo *Cacatua haematuropygia*
Red-tailed Cockatoo *Calyptorhynchus magnificus*

CLASS AVES: A LIST OF ORDERS, COMMON AND SCIENTIFIC NAMES

Salmon-crested Moluccan Cockatoo
Cacatua moluccensis
Sulfur-crested Cockatoo *Cacatua galerita*
White Umbrella Cockatoo *Cacatua alba*
Cockatiel *Nymphicus hollandicus*
Kaka *Nestor meridionalis*
Kea *Nestor notabilis*

ANSERIFORMES

Subfamily Anseranatinae

Tribe Anseranatini

Cuban (Black-billed) Whistling (tree)
Duck *Dendrocygna arborea*
Eyton's (Plumed) (Grass) Whistling Duck
Dendrocygna eytoni
Fulvous Whistling Duck *Dendrocygna bicolor*
Javan (Lesser) Whistling Duck
Dendrocygna javanica
Magpie Goose *Anseranas semipalmata*
Northern Black-bellied (Red-billed)
Whistling Duck *Dendrocygna autumnalis*
Spotted Whistling Duck *Dendrocygna guttata*
Wandering (East Indian) Whistling Duck
Dendrocygna arcuata
White-Backed (African) Whistling Duck
Thalassornis
White-faced Whistling Duck
Dendrocygna viduata

Leuconotus

Tribe Anserini

(Swans and True Geese)

Bar-headed Goose *Eulabeia indica*
Barnacle Goose *Branta leucopsis*
Bewick's Swan *Olor bewickii*
Black-necked Swan *Sthenelides melancoryphus*
Black Swan *Chenopsis atrata*
Brent (Russian) (Dark-Bellied) *Brant bernicla*
Canada (Atlantic) Goose *Branta canadensis*
Coscoroba Swan *Coscoroba coscoroba*
Emperor Goose *Phalacrocorax canagica*
Freckled (Monkey) Duck *Stictonetta naevosa*
Graylag (Domestic) Goose (Western)
Anser anser
Lesser White-fronted Goose *Anser erythropus*
Mute Swan *Cygnus olor*
Nene (Hawaiian) Goose *Branta sandvicensis*
Pink-footed Goose *Anser brachyrhynchus*
Red-breasted Goose *Ruffibrenta ruficollis*
Ross's Goose *Chen rossii*
Snow (Lesser) (Blue) Goose *Chen caerulescens*
Swan Goose *Anser cynoides*
Trumpeter Swan *Olor buccinator*
Western (Yellow-billed) Bean Goose *Anser fabalis*
Whistling Swan *Olor columbianus*
White-fronted (European) Goose *Anser albifrons*
Whooper Swan *Olor cygnus*

Sub-Family Antinae

Tribe Tadornini

(Shelducks and Sheldgeese)

Abyssinian Blue-winged Goose
Cyanochen cyanopterus
Andean Goose *Chloephaga melanoptera*
Ashy-headed Goose *Chloephaga poliocephala*
Australian Shelduck *Casarca tadornoides*
Cape Barren (Cereopsis) Goose *Cereopsis novaehollandiae*
Common (European) Shelduck *Tadorna tadorna*
Crested Shelduck *Pseudotadorna cristata*
Egyptian Goose *Alopochen aegyptiacus*

Kelp (Patagonian) (Lesser) Goose
Chloephaga hybrida
Magellan (Lesser) (Upland) Goose
Chloephaga picta
Orinoco Goose *Neochen jubatus*
Paradise (New Zealand) Shelduck
Casarca variegata
Radjah Shelduck (Moluccan)
(Black-Backed) *Radjah radjah*
Ruddy-headed Goose *Chloephaga rubidiceps*
Ruddy Shelduck *Casarca ferrugina*
South African (Cape) Shelduck *Casarca cana*
Spur-winged (Gambian) Goose
Plectropterus gambensis

Tribe Cairinini (Perching Ducks)

African (South) Black Duck *Melananas sparsa*
African Pygmy Goose *Nettapus auritus*
American (Baldpate) Wigeon *Mareca americana*
Australian Shoveler *Spatula rhynchotis*
Australian Wood Duck (Maned Goose)
Chenonetta jubata
Bahama (Lesser) (Northern
White-Cheeked) Pintail *Paecilonetta bahamensis*
Baikal Teal *Nettion formosum*
Blue-winged (Prairie) Teal *Spatula discors*
Brazilian (Lesser) Teal *Amazonetta brasiliensis*
Brown (Chillian) Pintail *Dafila georgica*
Brown (New Zealand) Teal *Nettion aucklandicum*
Cape (South African) Shoveler *Spatula capensis*
Cape Teal *Nettion capense*
Chestnut Teal *Nettion castaneum*
Chiloe Wigeon *Mareca sibilatrix*
Cinnamon (Northern) Teal *Spatula cyanoptera*
Common (European Green-Winged) Teal
Nettion crecca
Common (Northern) Shoveler *Spatula clypeata*
Common (Northern) Pintail *Dafila acuta*
Cotton (Indian) Pygmy Goose (Cotton
Teal) *Nettapus coromandelianus (albipennis)*
European (Eurasian) Wigeon *Mareca penelope*
Falcated Duck *Eunetta falcata*
Gadwall (Gray Duck) *Chaulelasmus streperus*
Garganey *Querquedula querquedula*
Green Pygmy Goose *Nettapus pulchellus*
Grey Teal (East Indian) *Nettion gibberifrons*
Hartlaub's Duck *Pteronetta hartlaubii*
Hottentot Teal *Punanetta hottentota*
Knob-billed (Old World Comb) Duck
Sarkidiornis melanotos
Madagascan (Bernier's) Teal *Nettion bernieri*
Mandarin Duck *Dendrocygna galericulata*
Muscovy Duck *Cairina moschata*
Red (Argentine) Shoveler *Spatula platalea*
Red-billed Pintail *Paecilonetta erythrorhyncha*
Ringed Teal *Callonetta leucophrys*
Silver (Northern) (Versicolor) Teal
Punanetta versicolor
South American (Chilean Speckled) Teal
Nettion flavirostre
White-winged Wood Duck *Asarcornis scutulatus*
Wood Duck (North American) (Carolina
Duck) *Aix sponsa*

Tribe Anatini (Dabbling Ducks)

American (North) Black Duck *Anas fulvigula*
Blue (Mountain) Duck *Hymenolaimus malacorhynchus*
Bronze-winged (Spectacled) Duck
Specularias specularis

Crested (Patagonian) Duck *Lophonetta specularioides*
Falkland Flightless Steamer-Duck
Tachyeres brachypterus
Flying Steamer Duck *Tachyeres patachonicus*
Grey Duck (New Zealand) *Anas superciliosa*
Hawaiian Duck (Koloa) *Anas wyvilliana*
Laysan Teal *Anas laysanensis*
Magellanic Flightless Steamer-Duck
Tachyeres pterenes
Mallard (Northern) (Domestic) Duck
(*Anas platyrhynchos*)
Marbled Teal *Marmaronetta angustirostris*
Meller's Duck *Anas melleri*
Philippine Duck *Anas luzonica*
Pink-eared (Zebra) Duck
Malacorhynchus membranaceus
Salvadori's Duck *Salvadorina waigiensis*
Spot-billed (Indian) Duck *Anas poecilorhyncha*
Australian Wood Duck (Maned Goose)
Torrent (Chilean) Duck *Merganetta armata*
Yellow-billed (South African) Duck *Anas undulata*

Tribe Aythya (Pochards)

Australasian (White-Eye) (Hardhead)
Pochard *Aythya australis*
Baer's Pochard (Siberian White-Eye)
Aythya baeri
Canvasback *Aythya valisineria*
Common (Ferruginous) (White-Eyed)
Pochard *Aythya nyroca*
European (Eurasian) Pochard *Aythya ferina*
Greater (European) Scaup *Aythya marila*
Lesser Scaup *Aythya affinis*
Madagascan (White-Eye) Pochard *Aythya innotata*
New Zealand Scaup (Black Teal) *Aythya novaeseelandiae*
Pink-headed Duck *Rhodonessa caryophyllace*
Red-Crested Pochard *Netta rufina*
Redhead Duck *Aythya americana*
Ring-necked Duck *Aythya collaris*
Rosy-bill (Rosy-billed) Pochard *Metopiana peposaca*
Southern (South American) Pochard
Phaeoaythya erythrorhynchos
Tufted Duck *Aythya fuligula*

Tribe Somateria (Eiders)

Common (European) Eider *Somateria mollissima*
King Eider *Somateria spectabilis*
Spectacled (Fischer's) Eider *Somateria fischeri*
Steller's Eider *Polysticta stelleri*

Tribe Mergina (Sea Ducks)

Auckland Island Merganser *Mergus australis*
Barrow's Goldeneye *Glaucionetta islandica*
Black (European) Scoter *Melanitta nigra*
Brazilian Merganser *Mergus octosetaceus*
Bufflehead *Bucephala albeola*
Common (European) Goldeneye
Glaucionetta clangula
Goosander (Curasian) *Mergus merganser*
Harlequin (Atlantic) Duck *Histrionicus histrionicus*
Hooded Merganser *Lophodytes cucullatus*
Labrador Duck *Camptorhynchus labradorius*
Long-tailed (Oldsquaw) Duck *Clangula hyemalis*
Red-breasted (Common) Merganser
Mergus serrator
Scaley-sided (Chinese) Merganser *Mergus squamatus*
Smew *Mergellus albellus*
Surf Scoter *Melanitta perspicillata*
White-winged (European) (Velvet) Scoter
Melanitta fusca

Tribe Oxyurini (Stiff-Tailed Ducks)

Black-headed Duck *Heteronetta atricapilla*
Blue-billed (Australian) Duck *Oxyura australis*
Lake (Argentine) (Ruddy) (Blue-billed)
Duck *Oxyura vittata*
Maccoa Duck *Oxyura maccoa*
Masked Duck *Oxyura dominica*
Musk Duck *Biziura lobata*
Ruddy Duck (North American) *Oxyura jamaicensis*
White-headed Duck *Oxyura leucocephala*

RAPTORS

American Kestrel (Sparrow Hawk)
Tinnunculus sparverius
Bald Eagle *Haliaeetus leucocephalus*
Barn Owl *Tyto alba*
Common (European) (Rock) Kestrel
Tinnunculus tinnunculus
Common Buzzard *Buteo buteo*
Eagle Owl *Bubo bubo*
Eastern Turkey Vulture *Cathartes aura*
European Sparrow Hawk *Accipiter nisus*
Forest Eagle Owl *Bubo nipalensis*
Golden Eagle *Aquila chrysaetos*
Goshawk *Accipiter gentilis*
Great Horned Owl *Bubo virginianus*
Grey Eagle Buzzard *Geranoaetus melanoleucus*
Griffon Vulture *Gyps fulvus*
Little Owl *Athene noctua*
Long-eared Owl *Asio otus*
Merlin (Pigeon) Hawk *Aesalon columbarius*
Peregrine Falcon *Hierofalco peregrinus*
Prairie Falcon *Hierofalco mexicanus*
Red Kite *Milvus milvus*
Red-necked Falcon *Chiquera chiquera*
Rough-legged Buzzard *Buteo lagopus*
Saker Falcon *Hierofalco cherrug*
Screech Owl *Megascops asio*
Striped Owl *Asio flammeus*
Snowy Owl *Nyctea scandiaca*
South American Black-collared Hawk
(Fishing Buzzard) *Busarellus nigricollis*
Striped Owl *Asio clamator*
Tengmalm's Owl *Aegolius funereus*
Ural Owl *Strix uralensis*

CICONIIFORMES

Black Stork *Ciconia nigra*
Cattle Egret *Bubulcus ibis*
Greater Adjutant Stork *Leptoptilos dubius*
Grey Heron *Ardea cinerea*
Hermit Ibis *Geronticus eremita*
Marabout Stork *Leptoptilos crumeniferus*
Night Heron (Black-Crowned) *Nycticorax nycticorax*
Striated Heron *Butorides striatus*
White Stork *Ciconia ciconia*
Yellow-crowned Night Heron *Nyctanassa violacea*

GALLIFORMES

Brush-Turkey *Alectura lathami*

Numidinae

Crested Guineafowl *Guttera pucherani*
Domestic Guineafowl *Numida meleagris forma domestica*
Helmeted Guineafowl *Numida meleagris*
Plumed Guineafowl *Guttera plumifera*
Vulturine Guineafowl *Acryllium vulturinum*

Pavoninae

Congo Peafowl *Afropavo congensis*
Green Peafowl *Pavo muticus*
Indian Peafowl *Pavo cristatus*

Meleagridinae

Common Turkey *Meleagris gallopavo*
Domestic Turkey *Meleagris gallopavo forma domestica*
Oscillated Turkey *Meleagris ocellata*

Argusianinae

Bronze-tailed Peacock-Pheasant
Polyplectron chalcurom
Crested Argus *Rheinardia ocellata*
Great Argus *Argusianus argus*
Grey Peacock-Pheasant *Polyplectron bicalcaratum*
Palawan Peacock-Pheasant *Polyplectron ephanum*

Phasianinae

Bar-tailed Pheasant *Calophasis humiae*
Blue-eared Pheasant *Crossoptilon auritum*
Brown-eared Pheasant *Crossoptilon mantchuricum*
Bulwer's Wattled Pheasant *Lophura bulweri*
Cheer Pheasant *Catreus wallichii*
Common (Ring-necked) Pheasant
Phasianus colchicus
Copper Pheasant *Graphephasianus soemmeringii*
Elliot's Pheasant *Calophasis ellioti*
Golden Pheasant *Chrysolophus pictus*
Lady Amherst's Pheasant *Chrysolophus amherstiae*
Mikado Pheasant *Calophasis mikado*
Reeve's Pheasant *Syrmaticus reevesii*
Salvadori's Pheasant *Lophura inornata*
Siamese Fireback *Lophura diardi*
Silver Pheasant *Lophura nythemera*
Swinhoe's Pheasant *Lophura swinhoii*

Lophophorinae

Himalayan Monal *Lophophorus impejanus*

Pucrasinae

Koklass *Pucrasia macrolopha*

Ithagininae

Blood Pheasant *Ithaginis cruentus*

Gallinae

Domestic Fowl *Gallus gallus formadomestica*
Red Junglefowl *Gallus gallus*

Tragopaninae

Satyr Tragopan *Tragopan satyra*

Ptilopachinae

Stone Partridge *Ptilopachus petrosus*

Percidinae

Black Francolin *Francolinus francolinus*
Chinese Bamboo Partridge *Bambusicola thoracica*
Chukar Partridge *Alectoris chukar*
Common Partridge *Perdix perdix*
Common Quail *Coturnix coturnix*
Himalayan Snowcock *Tetraogallus himalayensis*
Japanese Quail *Coturnix japonica*
Jungle Bush Quail *Perdica asiatica*
Painted Quail *Coturnix chinensis*
Redlegged Partridge *Alectoris rufa*
Rock Partridge *Alectoris graeca*
Roulroul (Crested Wood Partridge)
Rollulus roulroul

Odontophorinae

Bobwhite Quail *Colinus virginianus*
California Quail *Callipepla californica*
Gambel's Quail *Callipepla gambelii*
Scaled Quail *Callipepla squamata*

Tetraoninae

Black Grouse *Lyrurus tetrix*
Blue Grouse *Dendragapus obscurus*
Common Capercaille *Tetrao urogallus*
Hazelhen (Common) *Tetrastes bonasia*
Prairie Chicken *Tympanuchus cupido*
Red Grouse *Lagopus lagopus scoticus*
Ruffed Grouse *Bonasa umbellus*
Sage Grouse *Centrocercus urophasianus*
Sharp-tailed Grouse *Tympanuchus phasianellus*
Spruce Grouse *Falcapennis canadensis*
Willow Ptarmigan (-Grouse) *Lagopus lagopus*

Cracidae

Black-billed Turaco *Tauraco schuetti*
Common Piping Guan *Aburria pipile*
Great Curassow *Crax rubra*
Guinea Turaco *Tauraco persa*
Helmeted (Northern) Curassow *Pauxi pauxi*
Lady Ross's Turaco *Musophaga rossae*
Purple-crested Turaco *Tauraco porphyreolophus*
Razor-billed Curassow *Mitu mitu*
Wattled Curassow *Crax globulosa*
White-crested Turaco *Tauraco leucolophus*

UPUPIFORMES

Hoopoe *Upupa epops*

CAPRIMULGIFORMES

Indian Edible-nest Swiftlet *Collocalia unicolor*
Quetzal *Pharomachrus mocinno*
Tawny Frogmouth *Podargus strigoides*

PASSERIFORMES

African Silverbill *Euodice cantans*
American Bare-eyed Thrush *Planesticus nudigenis*
American Goldfinch *Spinus tristis*
American Tree-Sparrow *Spizella arborea*
Antbirds and gnateaters *Formicariidae*
Apostle-bird *Struthidea cinerea*
Ashy (Brown-eared) Bulbul *Hemixos flavala*
Australian Magpie *Gymnorhina tibicen*
Avadavat (Strawberry-Finch, Red Munia)
Amandava amandava
Barn-Swallow *Hirundo rustica*
Bearded Manakin *Manacus manacus*
Bengalese (Society) Finch *Lonchura domestica*
Birds of Paradise *Paradisaeidae*
Black (Pied) (Pied Bell-Magpie)
Currawong *Strepera graculina*
Black-eared Wheatear *Oenanthe hispanica*
Black-faced Cuckoo-Shrike *Coracina novaehollandiae*
Black-faced Babbler *Turdoides melanops*

Black-throated Grass-(Parson-)Finch
Poephila cincta
Blackbird (Common) *Merula merula*
Blue jay *Cyanocitta cristata*
Blue Tit *Cyanistes caeruleus*
Blue Waxbill (Angola Cordon-bleu)
Uraeginthus angolensis
Broad-tailed (Long-tailed) Paradise
Whydah *Steganura interjecta*
Brown-headed Cowbird *Molothrus ater*
Brown Tree-Creeper *Climacteris picumnus*
Bushlark (Horsfield's, Cinnamon)
Miraflora javanica
Canary *Serinus canaria*
Cape May Warbler *Dendroica tigrina*
Cardinal (Crested) *Paroaria coronata*
Catbird *Dumetella carolinensis*
Cedar Waxwing *Bombicilla cedrorum*
Chaffinch *Fringilla coelebs*
Chatham Islands Robin (-Flycatcher)
Miro traversi
Common Bullfinch *Pyrrhula pyrrhula*
Common Cardinal *Cardinalis cardinalis*
Common Raven *Corvus corax*
Cowbird *Molothrus aeneus*
Crested Lark *Galerida cristata*
Crested Oropendola *Psarocolius decumanus*
Crimson Finch *Neochmia phaeton*
Cuban (Grassquit) Finch *Tiaris canora*
Cutthroat Finch *Amadina fasciata*
Diamond Firetail (Diamond Sparrow)
Stagonopleura guttata
Double-barred Finch *Stizoptera bichenovii*
Eastern Bluebird *Sialia sialis*
European Goldfinch *Carduelis carduelis*
European Robin *Erithacus rubecula*
Fox Sparrow *Passerella iliaca*
Glossy (Superb) Starling *Lamprospereos superbus*
Golden-collared Manakin *Manacus mitellinus*
Golden-headed Manakin *Pipra erythrocephala*
Goldfinch *Carduelis carduelis*
Gouldian Finch *Chloebia gouldiae*
Great Tit *Parus major*
Green Avadavat *Stictospiza formosa*
Green Catbird *Ailuroedus crassirostris*
Greenfinch *Carduelis chloris*
Greenfinch *Chloris chloris*
Grey-headed Wheatear *Oenanthe moesta*
Hawaiian Crow *Corvus tropicalis*
Hawfinch *Coccothraustes coccothraustes*
Hooded Siskin *Spinus magellanicus*
House Sparrow *Passer domesticus*
Jackdaw *Coleus monedula*
Java Sparrow (Rice Bird) *Padda oryzivora*
Large-billed Seed Finch (Suriname Finch,
Twa twa's) *Oryzoborus crassirostris*
Long-tailed (Shaft-tailed) Grass-Finch
Poephila acuticauda
Magpie *Pica pica*
Melba Finch (Grey-naped Pytilia) *Pytilia melba*
Mockingbird *Mimus polyglottos*

Mynah (Hill) birds *Gracula religiosa*
Nutmeg Mannikin (Spice-Finch) (Spotted
Munia) (Rice-bird) *Lonchura punctulata*
Orange-cheeked Waxbill *Estrilda melpoda*
Painted Firetail *Emblema picta*
Pekin Robin *Leiothrix lutea*
Pied wagtail *Motacilla alba*
Pin-tailed Parrot-Finch *Erythrura prasina*
Purple Grackle *Quiscalus quiscula*
Red (hooded) Siskin *Spinus cucullatus*
Red-breasted Flycatcher *Erythrosterina parva*
Red-capped Manakin *Pipra mentalis*
Red-cheeked (Cordon-blue) Blue Waxbill
Uraeginthus bengalus
Red-headed Barbet *Eubucco bourcierii*
Red Wattlebird *Anthochaera carunculata*
Red-winged Pytilia (American Aurora
finch, Crimson-winged Waxbill) *Pytilia phoenicoteria*
Rock Robin *Petroica archboldi*
Rook (European) *Corvus frugilegus*
Rothschild's (Bali) Myna *Leucospars rothschildi*
Rufous-sided Towhee *Pipilo erythrophthalmus*
Rufous-tailed Weaver *Histurgops ruficauda*
Siberian Rubythroat *Calliope calliope*
Silvereye *Zosterops lateralis*
Siskin (Euroasian) *Spinus spinus*
Sky-lark *Alauda arvensis*
Spotted Pardalote *Pardalotus punctatus*
Starling (Common) *Sturnus vulgaris*
Superb Lyrebird *Menura novaehollandiae*
Swainson's (Olive-backed) Thrush
Catharus ustulatus
Tree Sparrow (Eurasian) *Passer montanus*
Ultramarine Grosbeak *Cyanoloxia cyanea*
Vesper Sparrow *Poocetes gramineus*
Violaceous Euphonia *Euphonia violacea*
Waxwing (Bohemian) *Bombicilla garrulus*
Weebill *Smicrornis brevirostris*
Welcome Swallow *Hirundo neoxena*
White-rumped Canary *Ochrospiza leucopygia*
White-throated Sparrow *Zonotrichia albicollis*
Wood Thrush *Hylocichla mustelina*
Yellow-backed (Orange-winged) Pytilia
(Red-faced Waxbill) *Pytilia afra*
Yellow-tufted (Helmeted) honeyeater
Lichenostomus melanops rance cassidex
Zebra Finch *Taeniopygia guttata*

II

Determination of Metabolic Scaling

Step-by-step Technique for Determining Metabolic Scaling

Harrison G.

One may determine the quantity of an enteral nutritional product for a bird from information supplied in Chapter 15. This mathematical calculation requires a scientific calculator. The following is offered to assist one not familiar with such calculations.

Required Data and Formulas

$BMR = K(W_{kg}^{0.75})$ = Basic Metabolic Rate.

K = a theoretical constant for kcal required per 24 hours and varies with the species of bird. K is 129 for passerines and 78 for non-passerines.

$MER = 1.5 \times BMR$ = Metabolizable Energy Requirement.

W_{kg} is the weight of the bird in kg.

To determine the BMR:

1. Divide the bird's weight in grams by 1000 to determine the W_{kg} .
2. With this number entered in the calculator, press the y^x function key.
3. Input 0.75. Then push =.
4. Multiply the number determined in step 3 by the K value for the bird (78 if it is a psittacine bird).
5. This number is the BMR for the patient in kcal/day.

To determine the quantity of enteral nutrient required:

1. Multiply the calculated BMR by 1.5.
2. This number is the MER in kcal per day.
3. Determine the total kcal/day of nutrients required, by multiplying the MER by the stress factor (see Table 15.4).
4. Determine the mls/day of enteral nutrient to use (see Table 15.5) by dividing the value determined in line 3 by the Calories (kcal)/ml in the enteral formula selected.
 - a. Example: ISO cal contains 1 kcal/ml. The value determined in line 3 would be divided by 1 and the resulting number would be the ml/day of this product that the patient should receive.
 - b. Example: ISO cal HCN contains 2 kcal/ml. The value determined in line 3 would be divided by 2 and the resulting number would be the ml/day of this product that the patient should receive.
5. The volume of enteral formula/feeding is determined by dividing the total number of mls required (answer from line 4) by the number of feedings per day (generally four to six).

Index

Letters following page numbers indicate the following:
c=color figure, t=table, f=figure.

- A** Abdominal
air sacs, 351 (see anatomy overlay)
effusion, causes of, 255
mass, 255, 302, 735, 1132
Abdominal distention, 168, 665c, 516f,
821, 890, 1136
in hens, 768, 771, 774
in ratites, 1292c
Abdominal hernia, 316, 518, 1132
and egg binding, 761, 763f
Abdominocentesis, 201f, 518, 770, 771,
1076, 1221
Abducent nerve (CN VI), 726
Abscesses, 684, 1113
Acanthocephalan, 1013, 1193, 1232
Accipitridae, 106
Acepromazine, cardiac effects of, 711
Acetic acid, for papillomas, 887
Acetylcholine, 740, 741
inhibitors, 737, 740
Acetylcholinesterase, 740, 741, 1050,
1051
Acetylcysteine, 458, 686
Acetylsalicylic acid, 458
Achilles tendon, medial luxation of, 164,
1258f, 1324
Acholeplasma, 1053
Achromatosis, 617, 847
Acid-fast organisms, 222t, 973, 974,
detection of, 484t
Acinar atrophy, zinc toxicosis, 1265
Acinetobacter, 964
Acrylic, dental, 1148
ACTH, adrenal corticotrophic hormone,
458, 584, 598
Actinobacillus, 961, 963, 991
and ocular disease, 686
in Galliformes, 1232
Activated charcoal, 415, 458
Acuaria, in Passeriformes, 1195
Acyclovir, 458, 537, 579, 862
for herpesvirus, 878, 943
Adenine arabinoside, 1185
Adenocarcinoma, 770
Adenoma, 770
in Galliformes, 904, 905, 1232
Adenovirus, 903-908
control of, 940t
diagnosis of, 907
gross lesions with, 904
Group I, 904
Group III, 907
in pigeons, 905
in Psittaciformes, 869c, 906
in waterfowl, 906
inclusion bodies of, 125, 903, 904, 908
latent, subclinical, 904
species-specific considerations, 904
transmission of, 903
Adhesion, and egg binding, 760
Adjuvants, and muscle necrosis, 113, 127
paramunity inducers, 113
Adrenal gland, 597, 598
Adrenal insufficiency, ACTH, 458
Adrenalin, 1214
Advertising, 132
Aedes spp. and togavirus, 915
Aegyptianella, rule-out list, 1063
in Galliformes, 1232
in Passeriformes, 191, 1192, 1193
Aeromonas, 958
in Galliformes, 1232
in Ramphastidae, 1282
vs *Clostridium* dermatitis, 978
Aerophagia, treatment of, 825
Aerosol therapy (see nebulization)
Aflatoxin, 50, 69, 553, 784, 787, 910,
1043, 1266 (see mycotoxin)
follicular atresia and, 749
in Anseriformes, 536, 1265
Aflatoxin B1, hepatotoxin, 1043
clinical pathology with, 1043
preventing, 1043
and breeding, 787
African Black Ostrich, 1297
African Grey Parrot, 438, 459, 464, 592
biochemistry values, 1329t
ECGs, 703f, 704f, 705, 706f, 707f, 708f
cardiomegaly and, 710
constricted toes, 831
feather picking and, 635
hypocalcemic syndrome, treatment, 411
papillomas in, 886
regurgitation and, 827
seizures in, 706, 857
viral diseases in, 824, 886, 890, 895, 911,
927
vitamin D₃, caution, 469
AG ratio (see albumin/globulin ratio)
Age, 30
in Anseriformes, 1244t, 1252
Agencies, regulatory, United States, 143
Aggression, 465, 1179, 1204, 1230
in Anseriformes, 1252
in Galliformes, 1230
in Passeriformes, 1179
in relationship to enclosure, 1179
Air
bronchograms, 252
cell, 754
conditioners, diseases and, 58
drill, 1161
filtration systems, 37, 137
pressure, 1204
Air sac, 252, 294, 304-306, 333, 351, 361,
365, 567, 572, 579, 1105
air flow entering, 570f
anesthesia, 1074t, 1108, 1118
cannula, 396, 1108, 1118, 1272
esophageal, in Galliformes, 1222
in canaries, 1187
in Galliformes, 1221
in Psittaciformes vs Passeriformes, 1174
rupture, 409 (see emphysema,
subcutaneous)
Air sac mite, 1180, 1215
Air sacculitis, 253, 317, 352, 390, 571f,
576, 885, 1189
treatment of, 390, 579
with chlamydia, 989
with influenza virus, 930
with mycoplasma, 1054, 1058
Airlines, cargo bins, temperature of, 136
Airplane wing, in waterfowl, 848
AIV (see avian influenza virus)
ALAD (see delta-aminolevulinic acid
dehydratase)
Alanine aminotransferase (ALT, GPT),
228, 1244, 1335t
Albumin (ALB), 530, 589, 1244
and egg production, 754
Albumin/globulin (AG) ratio, 238
with coronavirus, 915
Alcaligenes, 959, 982
Alcohol, 458
Aldosterone, 597, 712
Alfalfa, 68 (see hay)
for ratites, 1306
for ducklings, 1250
Algae, blue-green, 1265 (see spirulina)
and feather coloration, 847
hepatotoxin, 1033
in Anseriformes, 1265
Alimentary tract, cytology of, 209
disorders, neonate, 825
in Galliformes, 1221
and disease, 482
Alkali poisoning, 1263
Alkaline phosphatase (AP), 524, 1335t
for diagnosis of polyomavirus, 890
Alkaline water, *C. botulinum* in, 1263
Allergy, 621t, 632, 965f, 1033
(see hypersensitivity)
Allometric scaling, 437
Allopurinol, 458, 554
in Red-tailed Hawks causing gout, 239
Almonds, toxicity, 1198
Aloe vera, 458, 464, 623
Alpha-chloralose, in Anseriformes, 1260
Alpha-tocopherol, 84 (see vitamin E)
Altricial, young, 506, 802, 805, 1172
Aluminum hydroxide, 113
Aluminum sulfate, 1038
Alveolitis, allergic, 1202
Alysiella filiformis, 210, 218c
Amazon foot necrosis, 631c, 965, 966f
Amazon parrot
biochemistry values, 1329t, 1335t
drugs and, 443, 448
ECG in, 705, 707
epilepsy in, 410, 738
herpesvirus in, 878
human bonding with, 29
Mycobacterium in, 975
obesity in, 844
papillomas in, 886, 887
poxvirus and, 872
Streptococcus in, 970

- viral disease in, 872, 875, 876, 878, 890, 911
- Amazon punctate keratitis, 687
- Amazon tracheitis virus, 875-877
- Amikacin, 390, 447, 458
toxicity of, 1046
- Amino acid
feather picking and, 846
protein and, 81, 82
profile, formulated diets, 76
solution, 393
synthesis, in Galliformes, 1223
vitamin interactions, 67
- Amino-nicotinamide, 746
- Aminoglycoside, 438, 446, 447
therapeutic dose of, 442
pharmacology of, 437
toxicity of, 446, 1046
renal damage from, 442, 446, 553
- Aminoloid, 458
- Amitriptyline HCL, 458
- Ammonia, 530, 542
immune response, 1048
lymphocyte function, 1048
aspergillosis and, 1001
- Ammonium solution, 458
- Amoxicillin, 458, 1187
- Amphotericin B, 455, 459, 1003, 1005, 1134, 1189, 1282
for *Candida*, 999
pharmacology of, 451
toxicity of, 1004, 1046
- Ampicillin, 445, 459
for treatment of *Salmonella*, 955
- Amprolium, 459, 1191
- Amputation
of comb, wattle, 1233
of leg, toe, wing, 1133
- Amylase, 231, 232, 485, 1244
- Amyloidosis, 120, 362, 536, 552
in Anseriformes, 536, 1263
- Amyloidosis, in Passeriformes, 1198
- Anabaena* algae, 1265
- Anaerobic bacteria, 462, 466
- Anafranil, 461
- Analgesic, 459, 463, 1094, 1095
- Anamnesis (medical history), 145
- Anastomosis, circumferential, 1097
- Anatidae (see Anseriformes)
- Anatiformes, and viral diseases, 922, 933
- Anatomy (see anatomy overlay)
abnormalities in male, 774
digestive, in ratites, 1292c
endoscopic, 328
in Anseriformes, 1241t
in Columbiformes, 1202
in Galliformes, 1219
in Passeriformes, 1173
in Ramphastidae, 1277
in ratites, 1286
reproductive, 755
skin, 612f
- Ancobon, 463
- Anemia, 188, 398, 399, 461, 464, 535, 542
adenovirus and, 904, 908
dietary management of, 858
hypochromic, regenerative, 1035
in ducks, 936, 1251
in Passeriformes, 1188, 1193, 1196
non-regenerative and PBFV virus, 899
viral diseases and, 911, 915, 916
- with zinc toxicosis, 1039
with organochlorine, 1050
with *Aegyptianella*, 1062
with *Chlamydia*, 989
- Anesthesia, 383, 1066 (see isoflurane, halothane, methoxyflurane)
agents, 138, 1066-1068
equipment, 1067, 1070, 1071, 1072f, 1073f
cardiac effects of, 711
in Anseriformes, 1260, 1262t
in Columbiformes, 1213
blood collection, 1074
blood solubility, 1068
coagulopathy, 1075
contraindications for, 1067, 1076
delivery of inhalant, 1073
doxapram hydrochloride, 1080
effects with isoflurane, 1074
emergencies, 1073, 1074, 1079, 1080
endoscopy, 1074
fasting, 851, 1077
field use, 1067
fluid therapy, 1074f, 1076, 1077
hepatic damage from, 1068
hyperventilation, 1079
induction, 1073
injectable, 1066, 1069, 1070, 1260, 1262
intubation, 1068
IPPV, 401, 1068
ketamine, 1069
long-term general, 1074
minimum alveolar concentration, 1068
monitoring, 1074, 1078t, 1079
nitrous oxide, 1069
nosocomial infections, 1071
obesity and, 1076
open system, 1068
out-of-circuit, 1070
paCO₂ levels, 1074
patient evaluation, 1074, 1075t, 1076
physiologic effects of inhalant, 248, 1067
pre-anesthetic, 1069, 1079
recovery, 1067
respiratory and cardiac arrest, 1068, 1080
respiratory rate, 1077t, 1079
risk classifications, 1075
scavenging system, 1068, 1072
short-term restraint, 1074
sinus bradycardia, causes of, 706
tank systems, 1071f
temperature, effects of, 1074
- Angel wing in Anseriformes, 1257f
- Angiography, 260, 698f
- Angiotensin, converting enzyme, inhibitors, 714
I, cardiac effects, 712
II, cardiac effects, 712, 714
- Angular limb deformity, in ratites, 1161, 1298, 1324
- Anhimidae, screamers, 1238
- Animal bites, emergency treatment, 412, 414
- Animal protein, and Anseriformes, 1246
- Anisocytosis, 194c
hemorrhagic conure syndrome with, 934
- Anisodactyly foot, 1172
- Ankyloblepharon, 679, 822
- Ankylosis, postsurgical, 1139
- Anophthalmia, 822
- Anseranatinae (Magpie Goose), 1238
- Anseriformes, 345, 508, 609, 1160, 1237-1275
air sac cannulation of, 1272
algal toxins, 1265
amyloidosis in, 1263
anesthesia in, 1260, 1262
artificial insemination of, 776
beak repair of, 1272
body weight data of, 1240t
botulism in, 1263
bumblefoot in, 1262
capture myopathy in, 1263
castration of, 1274
chick management, 1253, 1254
clinical pathology and, 1211, 1341t-1344t
diagnostic facilities for, 1262t
defenses of, 1244
disease in, 1262-1266, 1264t, 1267t, 1268t
ducklings, diet for, 1248t
egg-related peritonitis, 1266
endocarditis, 714
energy requirements in, 1249
fertilizers and, 1266
frostbite in, 1243
gender determination, 778
growth rate, egg production in, 1243
hatching of, 1253
heart rate in, 1243
hematology in, 1340t, 1341t
housing for, 1244
incubation of, 1240-1243t, 1253
joint ankylosis, 1269
lead poisoning in, 1035, 1264
lymphocytes, 1244
Mycobacterium in, 972
mycotoxicity in, 1264
myopathy, 1263
neonatal problems, 1255, 1256
nutrition of, 1250-1258, 1252t
ocular disease and, 685
oil-contamination of, 1263
parasites and, 769, 1253
phallus, 756
pipping in, 1253
pododermatitis in, 1262
procaine penicillin in, 467
proventricular dilatation, 1269
reproductive status of, 1243, 1244, 1252
respiration rates, 1243
Salmonella sp. in, 1257
stress in, 1257
surgery of, 1269-1274, 1270f-1272f, 1275f
toxin exposure, 1266
tumors, 1266
viral disease and, 744
zinc toxicosis, 1264
- Ant, 459, 624f, 720
- Anterior chamber, of eye, 673, 676f
- Anthelmintics, 1045
- Anthrax, in ratites, 1309
- Antibiotic, 1114 (see antimicrobial therapy)
aspergillosis and, 1001
bacteria, resistance and, 442, 443
beta lactam, safety of, 442
blood levels and, 388
Candida infections and, 999
condition at site of infection, 437

INDEX

- flora, alimentary, adverse effects on, 442
 food-based, 439
 indiscriminate use of, 50
 inhibiting immune systems, 114
 intramuscular injection, 440
 intraosseous injection, advantages, 440, 441
 intravenous injection, 440
 minimal inhibitory concentration (MIC), 435
 nebulization, 441
 oral administration, 439
 over-the-counter (OTC), 442
 prophylactic use of, caution, 114
 resistant organism, 435
 septicemia and, 388
 subcutaneous injections, 440
 susceptibility of bacteria, 435, 436f, 455
 tissue penetration and, 437
 topical medications, 441
 toxicity, 441, 442, 1046
 treatment failure, 442
 vitamin deficiencies, 852
 water-based, 438
- Antibodies**, 115, 121, 754
- Anticoagulant**, 176-178, 224, 230, 771, 1135
- Antifungal therapy**, 450-456, 999t, 1114
- Antigen detection**, chlamydia, 992t
- Antigen ELISA**, 121
- Antigen-expressing tumors**, 127
- Antigens**, 114
- Antigout**, 461
- Antihistamines**, 637
- Anti-inflammatory**, 461, 463
- Antimalarial drugs**, 1193
- Antimicrobial therapy**, 127, 434-456 (see antibiotics, specific agents)
 resistance to, 434
 routes of administration of, 438-441
 selection of, 435t
 spectrum of, 435-437
 susceptibility to, 455t
 toxicity of, 441-442
- Antineoplastic therapy**, prednisolone, 600
- Anting**, 608
- Antioxidant**, 77, 84
- Antipyretic**, 463, 465, 467
- Antisense RNA therapy**, 127
- Antitoxin**, botulism, 1264
- Antitussive**, 459
- Aortic rupture**, 859
 in ratites, 1295c, 1307
 malnutrition and, 849
- AP** (see alkaline phosphatase)
- Aplastic anemia**, human, 450
- Apnea**, 1073, 1074, 1079, 1080
- Apomorphine**, 503
- Appetite stimulant**, 465
- Apteria**, 614f
- Aquatic environments**, 460
- Aqueous flare**, 673
- Aracar**, 957, 1279
- Arachidonic acid**, 81
- Arachnoid**, 724
- Arbovirus**, 915, 916
 zoonotic potential of, 919t
- Arginine deficiency**, 633
- Arginine vasotocin (AVT)**, 583, 752
 and egg binding, 760
- Argus pheasant**, 1231
- Arrhythmia**, 401, 705, 714, 715t, 1044
 adrenalin-induced, 713
 atrioventricular node and, 709
 in pigeons, 461
 ventricular, 708
- Arsenic (Ar) toxicosis**, signs of, 536, 1040
- Arthritis**, 251, 982
 in ratites, 1309, 1310c
 postsurgical, 1138
 with mycoplasma, 1054
- Arthropod**
 as disease vector, 1061, 1062
 in Galliformes, 1232
 in Passeriformes, 1195
- Arthus phenomenon**, 120
- Articular gout**, 214, 221c, 540, 547, 651, 850
- Artificial insemination**, 757, 776, 777, 1231
 electroejaculation for, 776
 in Anseriformes, 1253
 in Columbiformes, 1211
 in Psittaciformes, 776
- Ascarid**, 769, 1011f, 1021, 1283
 in Passeriformes, 1194
 piperazine for, 467
- Ascites**, 515-517, 523, 537, 1197
 adenovirus and, 907
 diets, low-sodium for, 518
 heart and, 710, 713
 in Ramphastidae, 1280
 malnutrition and, 849
 reproductive disease and, 770
- Ascorbic acid**, 82, 88 459 (see vitamin C)
- Aspartate aminotransferase (AST, GOT)**, 229, 890, 911, 916, 1244, 1298, 1335t
- Chlamydia** and, 989
- polyomavirus** and, 890
- infectious disease** and, 890, 911, 915, 916, 989
- Aspergilloma**, in thoracic air sac, 1003f
- Aspergillosis**, 309, 345, 366, 459, 462, 463, 464, 526c, 535f, 544, 565, 599, 625, 997, 1001
 air sac hyperinflation and, 1002
 brooder pneumonia, 1000
 clinical findings with, 450, 684, 1002t
 clinical pathology, 1002t
 CNS signs with, 741
 cytology of, 212c, 218c
 diagnosis of, 1003
 heart and, 704
 histopathology and, 1002t
 in Anseriformes, 1257, 1266
 in Passeriformes, 1189
 in ratites, 1314
 malnutrition and, 849
 prevention of, 452, 1004
 sinusitis and, 558
 therapy for, 452-455t, 1003, 1004t
- Aspergillus**, 575, 1000, 1043
 in Galliformes, 1232
 orchratoxin and, 1044
- Asphyxiation**, malnutrition and, 846
- Aspiration**, sample collection, 200, 407, 565, 828
 of sinus, 202, 345, 1038
 tube feeding, 392
- Aspirin**, 458, 1095
 anticoagulant, 771
- Association of Avian Veterinarians (AAV)**, 131
- AST** (see aspartate aminotransferase)
- Astrovirus vs rotavirus**, 913
- AT** (see Amazon tracheitis virus)
- Atabrine**, 468
- Ataxia**, 736-738
 CNS toxins and, 739, 740, 1035, 1042, 1044, 1050
 hemorrhagic conure syndrome and, 934
 in Anseriformes, 1265, 1266
 manganese and, 859
 parasites and, 742
 viral disease and, 743, 744, 890, 916, 930
- Atelectasis**, 252
- Atherosclerosis**, 252, 371, 495, 707, 710, 718-720
 clinical signs of, 720
 dietary fat and, 851
 ECG, 707f
 malnutrition, 849
 neurologic signs of, 736
 retrospective study of, 718t
- Atoxoplasma**, 191, 194c, 529, 533, 1016
 in Passeriformes, 1190, 1191t
 in chicks, 825
 cytology of, 221c
- Atresia** (see choanal atresia)
 congenital, of oviduct, 772
 of ovary, 749
- Atrial arrhythmias**, 707
 fibrillation, 707, 714
 flutter, 708
 tachycardia, 707, 708
- Atrioventricular dissociation**, 709
 heart block, 709, 710
 nodal escape, ducks, 707
 node arrhythmias, 709
 valve, 695, 712
- Atrophic rhinitis**, 57, 160, 558, 577 (see granuloma, rhinolith)
- Atropine**, 459, 711
 antidote for organophosphate toxicity, 711, 1051
 for heart block, 706, 709, 710
- Auditory evoke potentials**, 723
- Augustifolia purpurea**, 462
- Auscultation**, respiratory sounds, 571
- Australian Grass Finch**, 1186
- Autochthonous flora**, 111, 465, 965, 968, 976, 978, 980
- Autoimmune reaction**, 119, 940
- Automated cell counters**, use of, 179
- Autonomic nervous system**, 727f
- Aves**, list of names, 1346
- Aviadenovirus** (see adenovirus)
- Avian encephalomyelitis (AE)**, 937
- Avian influenza virus (AIV)**, fowl plague, 707, 776, 929, 931, 1237, 1309
 vs *Chlamydia*, 990
- Avian reticuloendotheliosis virus**, 936
- Avian viral serositis** (see viral serositis)
- Aviary**, 37
 bully bird, removal from, 37
 design, 51-54f
 disease management in, 52, 60, 137, 1176
 emergency care of birds, 59
 for Columbiformes, 1207
 free flight, for Passeriformes, 1178

- health maintenance program, 52, 56
 mixed species, 37
 nest boxes, 52
 ventilation fans, 53
 visitors, biosecurity of, 46, 47
 water, 52
- Aviculture, veterinary services for, 46
 Aviculturist, breeder vs hobbyist, 46
 first aid kit for, 59, 60t
- Avihepadnavirus, oncogenic properties, 910
- Avipoxvirus (see poxvirus)
- Avipro, 459
- Avocado toxicity, 38, 1041, 1198
- Avulsion
 of brachial plexus, 734, 735f
 of bronchi, 1108
- Azithromycin, 449, 450, 459
- Azole antifungals, 451-452, 1004
- Azomycin, 461
- B** B vitamins, 462, 545, 856
 with renal disease, 850
- B-cell, 113, 117, 118
- Bacillus*, 978
- Bacteremia (see bacterial infections)
- Bacteria, 119, 979t, 949-1006 (see specific bacteria)
 characteristics of, 979t
 clinically significant, 979t
 control and therapeutics, 980t
 differential diagnosis of, 982t
 disinfectants for, 979t
 endotoxins and, 1033
 gram-negative, significant, 950-964, 954t
 gram-positive, significant, 965-982
 in Anseriformes, 1267t
 in chicks, 823
 in Columbiformes, 1208, 1215t
 in crop, 826
 in Galliformes, 1232t
 in Ramphastidae, 1282
 in Passeriformes, 1187
 in ratites, 1303t
 in respiratory tract, 575
 in seed, 951
 incubation periods of, 979t
 shedding of, 954t
 transmission of, 979t
 zoonotic potential of, 972t
- Bacterial
 infections (bacteremia), 393, 550, 950
 neuropathies, 744
 taxonomy, 949
- Bacteroides, 953
- Bailey's hexaxial system, 700, 701t
- Baldness, in canaries, 637
- Ball bandage, technique, 431, 432t
- Banamine, 463
- Band, leg
 closed, 41, 49
 injuries from, 422-423
 removal of, 40, 42, 43f
 metal, frostbite and, 413
- Bandage
 figure-of-eight, 428f, 429f
 interdigitating, 432f
 layers, 420-422
 Robert-Jones, 1140
 splint and external coaptation, 1145
- Barium (see contrast media)
- Barbules, 615f
- Basal metabolic rate (BMR), 394, 1083
 in Passeriformes, 1173
- Basophilic rubricyte (see rubricyte)
- Basophils, 112, 190, 193
- Bathing, 39, 1224
- Bauer's and Gridley stains, 1005
- Baylisascaris*, 742, 1022, 1315
- Baypamun, as viral therapy, 943
- Beak, 161, 164, 166, 484, 485f, 523,
 609-611, 618, 743, 728, 1220
 anatomy, physiology of, 484, 609-611, 777
 defects of, 293, 590, 789, 837, 891, 1164f
 flaking, causes of, 161, 846
 growth of, 610f
 in Anseriformes, 1272
 injury, repair of, 1162
 neonate, problems with, 611, 836, 837,
 1165
 rubber, 590
 trimming of, 41f, 1224
- Bees, 624
- Behavior, 74, 96-107
 biting, 106, 849
 breeding, 97, 98f, 99f, 100, 782, 787,
 1129, 1209
 communal nesters, 100
 diet and, 74, 104
 favoring one person, 107
 feather picking, 106, 635f
 house training, 104
 in Columbiformes, 1204
 masturbatory, 772, 775, 778
 mimicking ability of, 1174
 model-rival training, 101-102
 modification, 29, 104-105, 464, 772
 negative reinforcement, 102
 ostriches, 1301
 positive reinforcement, 102
 problems, 101, 104-107, 775
 screaming, 106
 steps to modification of, 106t
 training, 101-107
 weaning, begging, natural, 101
- BELISA test, for chlamydia, 993
- Beltsville poultry semen extender, 1253
- Benadryl, 462
- Benzene hexachloride, 1316
- Benzoin, 1262
- Beta carotene, 83, 618, 1113
- Biatrial enlargement, 704
- Bicarbonate, 241, 389, 1077
- Bigeminy, 708
- Bile acids, 232, 522, 525, 530, 737, 1057
 indication for liver biopsy, 347
- Bile duct
 carcinoma of, 657, 887
 cystic dilatation of, 362c
 in Galliformes, 1223
 hyperplasia, 658
- Bile salts, 81, 523, 525
- Bilirubin, 232, 243
- Biliverdinuria, 150, 173c, 523, 549, 905,
 1001
- Bill tip organ, 609, 611f
- Biochemistry, 223-245, 1328t-1345t (see specific parameter)
 acid phosphatase, 241
 analytic accuracy, 223-225
 anticoagulant, lithium heparin, 224
 bicarbonate, 241
- bile acids, 232
 blood collection, 239
 blood gases, 241
 calcium, 233
 cholesterol, 233
 copper, 241, 242
 creatinine, 224, 225, 234
 creatinine kinase, CK (CPK), 229
 delta-aminolevulinic acid dehydratase,
 241
 diagnostic tests, specifics, 223
 electrolytes, 227, 239
 electrophoresis, 237
 enzyme activity, elevated, 228t
 enzymology, 226
 gamma glutamyl transferase (GGT), 230
 glucose, 234, 243
 glutamate dehydrogenase (GLDH), 230
 heparin (GGT), effect on, 230
 histology, relationship to, 225-226
 hormones, 227
 international system of units (SI), 226,
 1328t
 interpretation guides for, 225, 226
 iron, 235
 ketones, 243
 lactate dehydrogenase (LDH), 230
 lipase, 236
 metabolic increases, causes, 231t
 metabolites, 227
 phosphorous, 235
 plasma ammonia, 231
 plasma dye clearance test, 242
 plasma vs serum, 224
 potassium, 224, 240
 reference intervals, 225, appendix
 sodium, 240
 specific gravity, 242
 samples for, 228t
 total iron binding capacity (TIBC), 236
 total protein, 236
 triglycerides, 238
 urea, 239
 uric acid, 239
 urinalysis, 242-244
- Biopsy, 325, 346-354, 532, 1116
- Biotin, 72, 87, 536, 857, 1251, 1298
 feather picking and, 846
 skeletal deformities and, 848, 857
- Bipolar radiosurgery (see radiosurgery)
- Bird (see companion bird, free-ranging
 bird)
- Bird's nest soup, 485
- Birnavirus, infectious bursal disease,
 914, 1232
- Bismuth subsalicylate, 459
- Bite, from cats (see cat bite)
- Biting lice, in Passeriformes, 1197
- Biting birds, 106, 849
- Biting midges, *Culicoides* spp., 1192
- Black flies, 1193
- Black locust, 1041
- Black spot in Passeriformes, 1192
- Black Stork, herpesvirus in, 875, 884
- Blackbird, as disease vector, 958, 1005
- Blastoderm, 764c, 775
- Blastodisc, 764c, 775
- Blastomyces, fluconazole and, 454
- Bleeding (see hemorrhage)
- Blepharodema, with PMV-1 pigeon, 926
- Blindness, 587, 689, 728, 736, 1001

INDEX

- causes of, 689
 CNS toxins and, 739, 1035, 1050
 cryptococcosis and, 1004
 mycoplasmosis and, 1056
 listeriosis and, 976
 toxoplasmosis and, 688, 742
- Blood**
 ammonia, 737
 bacteria in, 950
 cell, 181, 186 (see hematology)
 cell count, reproduction and, 753t
 chemistry, 1328t-1345t (see biochemistry, enzymology)
 collection, 177f, 178f, 179f, 180f, 239, 385f, 1181, 1204
 culture, 697, 950
 feather, 38, 399
 feces (see hematochezia)
 fluke, 742, 1194
 gas, 241, 1079
 glucose level in, 738
 in urine, 243
 loss, 398, 399, 400, 414
 parasites, diagnosis of, 190, 194, 533, 1010, 1018t, 1019, 1192
 Passeriformes and, 1192
 pressure, depressed, 1266
 ring, 764
 spot, 764c, 767e
 transfusion, 400, 401, 1040
 viral diseases and, 824
 volume, 176, 400, 1204
- Blowflies and botulism**, 739
- Blue-necked Ostrich**, 1297
- BMR (see basal metabolic rate)**
- Body temperature**, 1203, 1243
- Body weight**, in Anseriformes, 1241t
 in Galliformes, 1128
 in Psittiformes, 818t
- Bollinger bodies**, 486, 679, 865, 873, 1185
- Bond, human-animal**, 18, 19
- Bone**
 congenital, abnormalities, 250
 cutter, 1133
 disease, 251, 324, 1144
 graft, 1145
 healing, 1140f
 neoplasia, characterized by, 251
 ossification, 1142
 scanning, 325
- Bone marrow**
 biopsy aspiration, needles for, 191
 suppression in humans, 460
 suppression, with mycotoxin, 1044
 with *Mycobacterium*, 973
- Border Canaries**, 1179
- Bordetella**, 959
 in Galliformes, 1232
- Borrelia**, in Galliformes, 1232
- Botulism**, 739, 977, 1264 (see *Clostridium*)
 diagnosis of, 977-978
 in Anseriformes, 1263
 in ratites, 1309
 therapy of, 740
 vs lead toxicity, 1035
- Bougienage**, 1113
- Boutons**, for diagnosis of *Clostridium*, 977
- Bowed legs**, in ducklings, 1251
- Bowel, fluid-filled**, radiology, 255
- Bowls, food and water**, 58
- Bowman's layer**, 676
- Brachial plexus**, 374, 726, 735f
- Bradycardia**, 702, 706, 711, 740
- Braghathism**, 611, 1166
- Brain**, 369, 372, 465, 724f, 725f
- Brazil nuts**, 536, 1043, 1266
- Breathing, shallow and labored (see dyspnea)**
- Breeders**
 culled, 47
 fancy pigeons, 1201
 periodic, equatorial climates, 752
- Breeding (see theriogenology, 748-804)**
 aflatoxin and, 787
 age in ducks, 1252
 aggressive behavior, 781
 average clutch size, 775
 behavioral characteristics, 47, 775, 778, 783
 causes of infertility, 786
 dimetridazole toxicity and, 1045
 disease and, 1054f
 enclosures, 783
 environment and, 775f, 780-784, 788
 fertility, 775, 785
 hatchability, 775, 786
 in Columbiformes, 463, 1209
 in Passeriformes, 1176t
 in ducks, 1252
 incubation and, 788, 789
 lighting effects in, 1175
 mate preference, 781
 nests, 783
 nutrition, 72, 784, 788
 pair-bonding, 782, 1209
 parental factors, 787
 physical and medical characteristics, 784
 pre-incubation factors, egg storage, 788
 record-keeping, 785
 sexual maturity, 779
 underproduction, 775
 visual stimuli, 781
- Brewer's yeast**, in ducklings, 1251
- Bristles**, 615
- Brodifacoum toxin**, 1051
- Bromsulphalein**, 242
- Bronchitis virus, infectious**, 768
- Bronchograms, air**, 252
- Bronchi**, 561, 567
- Brood box**, for Anseriformes, 1254f
- Brooder pneumonia (see aspergillosis)**
- Brooder room management**, 1253
- Brood patch**, 608, 634, 1219
- Brooding behavior**, 584
- Brotogeris**, with *Mycobacterium*, 973
- Brown-eared Pheasant**, 1231, 1235
- Bruising**, 169
- Brush Turkey**, 1229
- Budgerigar**, 20, 75, 235, 462, 464, 465, 518, 782, 807, 1329t
 feather duster, 873
 goiter in, 846
 fledgling disease (BFD), 885, 888, 890
 herpesvirus in, 875, 878, 880, 882
 obesity in, 844
 papillomas in, 886
 paramyxovirus, 927-928
 PBFd in, 895
 poxvirus in, 873
 reovirus in, 912
- Bufflehead Duck, breeding in**, 1252
- Bulk laxative (see hemicellulose)**
- Bull Finch, toxin in**, 464
- Bumblefoot**, 164, 425-427, 462, 631c
 cardiac effects of, 714
 classification and causes, 425-427, 426t, 632
 in Anseriformes, 1244, 1250, 1262
 malnutrition and, 425f, 848f
 prevention of, 426
 treatment, 426-427
Staphylococcus in, 967
- Bundle branch block, left and right**, 710
- Bunyamwera group**, 919
- Bupivacaine**, 1133
- Buprenorphine hydrochloride**, 1095
- Burlap (hessian)**, 1176
- Burn**, 412-414, 623, 626, 628c
- Bursa of Fabricius, cloacal bursa**, 509
- Butorphanol tartrate**, 459
- C** **Cachexia, emergency treatment**, 414
- CaEDTA (see calcium disodium ethylene diamine tetracetate)**
- Caffeine**, 1044
- Cage (see housing)**
- Caique**, 30, 886
- Calamus**, 158, 619, 1245
- Calcitonin (CT)**, 587
- Calcium (Ca)**, 75, 89, 90, 233, 459, 461, 462, 1244
 abnormal eggs and, 773
 absorption, bone mobilization, 753
 blood levels of, 75, 1252
 body stores and, 737
 chronic egg laying and, 772
 dietary, 250, 811, 850, 854, 857, 1046
 egg binding and, 75, 758, 759, 849
 excess, renal effects of, 850, 858, 1046
 feather quality and, 846
 hemorrhagic conure syndrome and, 934
 metabolic disease, 758
 metabolism and, 587, 753, 789f
 nephropathy and, 592
 phosphorous, ratio of, 66, 858
 skeletal deformities and, 848
 supplementation, in Anseriformes, 1258
- Calcium carbonate**, 72
- Calcium disodium ethylene diamine tetracetate (CaEDTA)**, 400, 1037-1038
- Calcium disodium versenate**, 459, 1037
- Calcium gluconate**, 542, 737
- Calcium oxalate crystals, with ethylene glycol toxicity**, 1044
- Calcium-binding proteins**, 75
- California encephalitis virus**, 919
- Callus formation**, 1140
- Caloenadidae**, 1201
- Caloric requirements, and supportive care**, 394
- Camphor spirits**, 1262
- Campylobacter**, 514, 959-960, 1189
 in Galliformes, 1232
 in Passeriformes, 1179
 in ratites, 1309
- Canada Goose**, 1257
 disease in, 872, 928, 1269
- Canary**, 74, 463, 758, 762, 1183, 1185, 1186, 1189, 1193, 1195
 atoxoplasma in, 1191

- bacteria in, 957, 970, 976
Candida in, 999
 color varieties, 1183
 cross-fostering, 806
 dominant white lethal factor, 1184
 feather cysts, 1098
 feathers in, 846, 1184
 fungal disease in, 1005
 malnutrition in, 1177f
 megabacteria in, 982
 mycotoxins in, 1043
 myocarditis and encephalopathy in, 909
 nutrition, 1177
 ocular disease and, 687, 688
 parasites in, 1191, 1194, 1196, 1197
 plant toxicity in, 1042
 poxvirus vaccine in, 872
 reproduction in, 768, 1175, 1176t
 toxoplasmosis and, 688, 742
 viral disease in, 164, 872, 873, 875, 927, 931, 933, 1059, 1185
- Cancer, liposomes, 127
 human lung, 1202
- Candida*, 1186
 clinical signs of, 999
 culture media for, 999
 cytology of, 218c
 in Galliformes, 1232
 in Passeriformes, 1188, 1189
 in Ramphastidae, 1282
 in ratites, 1314
 secondary to antibiotic therapy, 999
 treatment, 452-454, 467, 999t
- Candling, 785, 791, 795
- Canker, 491
- Cannibalism, 1233, 1279
- Cannon nets, 1260
- Canthexanthin, 1178
- Canthoplasty, inferior ectropion, 1100
- Canvasback Duck, 1239, 1246
- Cape Barren Goose, 1239, 1252
- Capercaillie, 1220
- Capillaria, 463, 464, 465, 496, 1012f, 1023, 1283
 clinical signs of, 486
 in Passeriformes, 1188, 1194
- Caprillic acid, 459
- Capsicum annum*, 1041
- Captive breeding, reintroduction, 22
- Captopril, 714
- Capture myopathy, in Anseriformes, 1263
- Capture nets, 1260
- Carbamate, toxicosis, 737, 1051
- Carbaryl, 59, 459, 1050, 1316 (see Sevin dust)
- Carbofuran, toxicity, 1051
- Carbohydrate, 78, 851, 603t
- Carbon dioxide
 in incubation, 1229
 laser, 1131
- Carbon monoxide, 1049, 1198
- Cardiac
 arrest, 711, 1080
 arrhythmias (see arrhythmias)
 depressants, 711
 disease, evaluation of (see cardiology)
 glycosides, 714
 monitoring, in Anseriformes, 1261 (see anesthesia)
 silhouette, 252, 697
- Cardiac-induced ascites, 696
- Cardiogenic shock vs congestive heart failure, 712
- Cardiohepatic syndrome, 716
- Cardiology, 695-722
- Cardiomegaly, 252, 313, 401, 696, 710, 717t
- Cardiomyopathy, 518, 716, 717
- Cardiopulmonary resuscitation (CPR), 401
- Cardiovascular
 diseases, 711-713
 effects of conditions or agents, 705t
 system, 252 (see anatomy overlay)
- Carnidazole, 459, 1209
- Carotene, 846
- Carotenoid pigments, 83, 523, 1177, 1178
- Carpometacarpus, surgical approach to, 1153
- Carrot, as an undigestible cellulose, 1178
- Cartilage, 1143
- Caryospora, 1012f
- Cassia occidentalis*, 1307
- Cassowary, 506, 1284, 1286, 1291, 1320
 artificial insemination in, 776
 characteristics of, 1285, 1345t
 digestive anatomy of, 1289
 plant toxicity in, 1042
- Cast, cellular, 549 (see urinalysis)
- Castling material, 1148
- Castration, in waterfowl, 1274
- Cat, as disease vector, 741, 984, 1191, 1194, 1207
- Cat bite, *Pasteurella* and, 412, 459, 962, 1189
- Cataract, 687, 688, 1101-1103
 canaries and, 1184
 familial and, 822
 in ratites, 1292c, 1316
 removal of, 1102f
- Catecholamine, 597
 cardiac effects of, 711
- Catheter, Foley, 1108
- Cave Swiftlet, 485
- Cebocephaly, 746
- Ceca, 509, 953, 1202
 in Galliformes, 1223
 in ratites, 1289
 cecal tonsil, 116, 506
- Cefotaxime, 446, 459
- Cefoxitin, 460
- Ceftriaxone, 460
- Celiotomy, 1118f, 1121, 1129
- Cell, 181 (see cytology)
 hemic, 205
 inflammatory, 206
 macrophages, 206
 manual counter, use of, 179
 mesenchymal, 206
 respiratory epithelial, cytology of, 218c
 sertoli, 756
- Cellulose, undigestible fiber, 81
- Central European tick-borne encephalitis virus, 919
- Central nervous system (see CNS)
- Centrorhynchus, 1012f
- Cephalexin, 460
- Cephalosporin, pharmacology of, 446, 1046
- Cephalothin, 460
- Cephradine, 460
- Cephalac, 465
- Cere, 160, 609, 770, 1202, 1221
- Cere, color changes in, 774
 brown hypertrophy of, 609, 631c, 651f, 653f
 gender determination and, 778
- Cerebellum, 724
- Cerebrovascular accidents, 736
- Cerelose, 496
- Cereopsis Geese, 1243, 1257
- Ceroid, 856
- Certificate of Veterinary Examination, 136
- Cervical spinal cord lesion, clinical signs of, 729
- Cervicocephalic air sac, 558, 1107 (see anatomy overlay)
- Cessation of ovarian activity, 465
- Cestodes, 468
 in Galliformes, 1232
 in Passeriformes, 1194
 in ratites, 1314t
- Chalazae, 754
- Chandelera, 742, 1315
- Channel-billed Toucan, 1276, 1277f
- Charcoal, activated, 38, 1038, 1265
- Chelation therapy, 459, 1035, 1037, 1038t (see lead, zinc)
 toxicosis, signs of, 1037
- Chemical cautery, 1113
- Chemistry (see biochemistry)
- Chemosterilant, temporary, 784
- Cherries, 1042
- Chewing lice, in Passeriformes, 1197
- Chick (see neonatology)
- Chicken (see Galliformes)
- Chicken anemia agent, 895
- Chicken, obese strain, 119
- Chicken splenomegaly virus, adenovirus, 903
- Chlamydia*, 313, 352, 459, 462, 529, 532, 533, 984, 989c, 1215
 antibody tests, 992
 antigen detection systems, 991, 992t
 cardiac effects of, 718
 chicks and, 823
 clinical pathology of, 989t
 clinical signs of, 989
 cloacal swabs for, 991
 CNS signs and, 745
 control of, 46, 47, 995 (see doxycycline, tetracycline)
 cytology of liver and, 215, 221c
 decreased A/G ratio, 238
 disinfectants for, 987
 hepatomegaly, radiographs, 991f
 histopathology, differential diagnosis, 990
 in Columbiformes, 1216f
 in Galliformes, 1232
 in Passeriformes, 1187
 in Ramphastidae, 1282
 in ratites, 989, 1303t, 1314
 incubation period, 988
 infection cycle, 985, 986f
 mycoplasma and, 1058
 ocular disease and, 683c, 685
 pancreatic necrosis and, 990
 PMV-1 pigeon, 926
 reovirus and, 911
 serovar, 985

INDEX

- treatment of, 50, 467, 993, 994
vs aspergillosis, 1003
vs influenza virus, 931
vs mycoplasma, 1060
zoonotic potential and, 995
- Chlamydiazyme test, 992
- Chloramphenicol, 437, 450, 460, 1046, 1187
- Chlorhexidine, 439, 460, 759, 912, 1003, 1190
- Chloride, 239-240, 849
- Chlorinated biphenyl, 518
- Chlorine, 92, 460, 1061
- Chlorine dioxide, 940
- Chloromycetin succinate, 1262
- Chloroquine phosphate, 460, 1192
- Chlortetracycline (CTC), 439, 447, 448, 460, 994t
- Choana, 344, 485, 487 (see anatomy overlay)
- Choanal atresia, 163f, 297, 576, 577, 684, 823
- Chocolate toxicity, 38, 1044
- Cholecalciferol, 83
- Cholera antiserum, human, 960
- Cholesterol, 233, 234, 465
cardiac effects of, 270
- Choline chloride, 66, 67, 88, 536, 857
high fat diet and, 88
in Pekin ducklings, 1251
in Anseriformes, 1246
malnutrition and, 857
skeletal deformities and, 848
- Cholinesterase, (CHE), 741, 1243
inhibitor toxicosis, 467
- Chorioallantoic membrane, 792
- Chromaffinoma, 601
- Chromosomal abnormalities, 787, 792
- Chronic ulcerated dermatitis (CUD) (see dermatology)
- Ciconiiformes (bitterns, herons), 933, 1238
- Cigarette smoke, 576, 1001, 1033, 1047
- Cimetidine, 460
- Ciprofloxacin, 444, 461
- Circadian rhythm, 225, 235, 752
- Circling, 72, 689, 739, 742, 745, 928, 1035
- Circovirus, 894-903, 1232
- Circulatory disorders, 535 (see cardiology)
- Cisterna magna, 724
- CITES (see Convention on International Trade in Endangered Species)
- Citreoviridin, 741
- Citrobacter, 955, 1188
- CK levels, 229, 743
- Claforan, 459
- Clamazolam, 1214
- Clarithromycin, 449
- Claviceps purpurea*, in Anseriformes, 1265
- Clavicular air sac, 1272 (see anatomy overlay)
- Clavulanic acid, penicillin, 445
- Clazuril, 461
- Clearview chlamydia, latex agglutination test, 992
- Clematis, 1041
- Client communication, 132, 134
- Clinafarm, 462
- Clindamycin, 449, 461
- Clinical chemistry values, 1243, 1328t-1345t
- Clips, hemostatic, 1131
- Cloaca, 150, 211, 347, 657, 760
anatomy of, 762f
constriction, 1125
distended, causes of, radiology, 255, 317
impaction of, 495c, 511
in ostrich, 1290f
malnutrition and, 769
problems in chicks, 769
prolapse, 404, 495c, 510, 762, 769, 886, 1125
papular lesions, with poxvirus, 872
Vasa Parrot and, 769
- Cloacal
bursa, 116, 368, 509, 1211, 1290
gland, 757
lips, in Columbiformes, 1210
papillomas, 404, 461, 495c, 536, 657f, 769, 886f, 887 (see papillomas)
promontory, in Passeriformes, 1178
stricture, 511, 769
- Cloacitis, 510, 769
with mycoplasma, 1057
- Cloacolith, 769
with papilloma, 887
- Cloacopexy, 1125f, 1127
- Clomipramine HCl, 461
- Clonic leg twitches, 736
- Clorox, 460, 1048
- Clorsulon, 460
- Clostridium*, 362, 496, 851, 976
C. botulinum, 739, 740, 976, 978, 1263, 1035
C. botulinum in Anseriformes, 1263
C. perfringens, in Passeriformes, 1188
in Galliformes, 884, 1263
in ratites, 363c, 1310c
- Clotrimazole, 452
- Clubs, bird, 132
- Clutch
double, 772
size, 775, 1209, 1227t
synchronization, in Galliformes, 1228
- CNS signs, 976, 982t
herpesvirus in pigeons, 881
in oil-contaminated Anseriformes, 1263
viral diseases and, 904, 927
with salt toxicity, 1044
- CO₂ level and hatching, 795
- Coagulopathy, 638, 687, 1075
- Coal tar products, 518
- Coastal sulci, 561
- Cobactin, 974
- Cobalt, malnutrition, 858
- Coccidia, 459, 461, 464, 466, 468, 507, 551, 852, 883, 1015, 1023, 1190, 1283
in chicks, 825
in Columbiformes, 1208
in Passeriformes, 1191
in Ramphastidae, 466, 468
- Coccidioides, fluconazole and, 454
- Coccidiostat, 1225
- Cochlosoma, 1173, 1179, 1190
- Cockatiel, 20, 75, 462, 465
color mutations of, 30
development of, 764
Giardia and, 732
megabacteria in, 982
papillomas in, 886
paralysis syndrome in, 732
spirochetes in, 961
stifle luxation in, 836f
viral disease in, 878, 895, 927
- Cockatoo, 38, 75, 437, 448, 453, 462, 463, 465, 558f, 1331t
aggression of, 757f
biochemistry values in, 1329t, 1332t
drug sensitivity in, 468
feather picking, 635
viral disease in, 875, 878, 890, 894, 895, 923, 938
- Cockroach, as disease vector, 742, 1195
- Cod liver oil, in ducklings, 1251
- Codostomum*, 1011f
- Coelomic cavity, 514t
- Colchicine, 461, 536
- Coligranulomatosis, Hjarre's disease, 508, 951
- Colinus, herpesvirus in, 875, 883, 884
- Colitis, 492c
- Collagen production, inhibitors of, 461
- Collapsing globe, 1103
- Collared Aracaris, 1282
- Colloid solutions, 384
- Collyriculum*, in Passeriformes, 1194
- Color flow doppler, 697, 713
- Color mutations, 30
- Colored foods, problems of, 1177
- Columbidae, 1201
- Columbiformes, 465, 468, 1200-1217 (see pigeon)
Aegyptianella in, 1062
artificial insemination in, 776
biochemistry values in, 1337t, 1338t
gender determination in, 778
Mycobacterium in, 972
parasitic infections in, 825
hematology of, 1337t, 1338t
poxvirus in, 872
reproduction in, 751, 756
retrovirus in, 933
rickettsia in, 1061
- Coma, 411, 414
- Comb, 1219
- Commercial food products (see formulated diets, nutrition)
- Communication, parrot, 96
- Companion bird, characteristics of, 29t, 30
common diseases of, 22, 32t
misguided reasons for choosing, 27t
selection of, 27
taming, 29 (see behavior modification)
- Complement fixation, diagnosis of aspergillosis, 1003
- Compounding pharmacist, 462
- Compresses, moist, 1097
- Compressive lesions of CNS, 734
- Compulsive obsessive behavior, 464
- Computed tomography (CT), 246, 250, 326, 723, 726, 734
- Conchae, 557, 1105
- Concussion, 733
- Congenital abnormalities, 684, 745, 822, 1321, 1324
- Congestive heart disease, 706, 711, 714, 715t, 715f
vs cardiogenic shock, 712
- Conjunctival flora, 685t
- Conjunctival scrapings, 675

- Conjunctivitis, 683c, 685-686
 in Passeriformes, 214f, 1186
 parasites and, 686, 742
 sinusitis and, 1106
 toxins and, 1047
 viral disease and, 881, 905, 908, 912, 921, 927, 931
 with *Chlamydia*, 989, 990f
 with mycoplasma, 1054, 1058
 Conservation, veterinarian's role, 17
 Constipation, renal, 850
 Constricted toe syndrome, 632, 831, 832c, 1097f-1098
 Constricting fibers, 631, 1097
 Contracecum, 1011f
 Contrast media, 257, 258, 260, 403, 1038
 enema, 507
 for gastric foreign bodies, 828
 transit time delayed, 258
 Conure, 74, 75, 635, 669, 875, 878, 886, 934
 Conure bleeding syndrome (erythemic myelosis), 75, 400, 669, 934
 treatment of, 75
 Convention on International Trade in Endangered Species (CITES), 22, 49
 Conversion factors, 469t, 1328t
 Convulsions, 724
 Convulsions, 229, 587, 733, 736, 860, 906, 920, 930 (see seizures, tremors)
 CNS toxins and, 741, 1035, 1050
 in Anseriformes, 1265
 Coordination of movement, 724
 Copper (Cu), 72, 93, 241, 461, 462, 859
 toxicosis, 504, 774, 1039-1040, 1265
 and feather quality, 847
 deficiency, 849, 1038, 1307
 Copper Pheasant, 1231
 Coprodeum, 509, 1211 (see anatomy overlay)
 Copulation, 1129
 Coracoid, 1156, 1158f (see anatomy overlay)
 Cormorant, 465
 Cornea, 213, 686
 Corneal
 edema, 1103
 keratinization, salt, 860
 ulcers, 679, 686, 1100, 1282 (see keratitis)
 Coronavirus, 914-915
 Creosol, 518
 Crimean-Congo hemorrhagic fever virus, 919
 Crop, 167, 202, 482, 490
 anatomy 489, 490, 1203
 bra, 391, 827f
 burn, 401, 497, 812f, 826, 835c, 1113, 1114f, 1116
 burn, repair of, 826, 1116f
 cytology, 218c, 482
 emptying, delayed, 732-809, 890
 emptying, increased, 998
 impaction, causes of, 496, 845, 998
 in Columbiformes, 1203, 1209
 in Galliformes, 1222
 inflation of, 167, 825
 lavage of, 403, 414
 milk, 115, 490, 584, 751, 1058, 1209
 pendulous, 496
 peristalsis of, 167, 809
 pH of, 150, 211
 sour, ingluvitis, 825, 998, 1216
 stasis, 740, 825, 826, 827c, 845
 surgery of, 1113
 wall, thickened, 1210
 Cross-fostering, 785, 806, 1179, 1180
 Crow, as disease vector, 920, 959
 Crown vetch, 1042t
 Crustaceans, 464, 1045
 Cryopreservation, of semen, 777
 Cryosurgery, 887, 1113
Cryptococcus, 452, 454, 456, 463, 464, 466, 575, 1004
 ocular disease and, 684
 in Passeriformes, 1189
 zoonosis and, 1005
Cryptophthalmus, 684, 822
Cryptosporidia, 576, 1016t
 conjunctivitis and, 686
 in Passeriformes, 1190, 1192, 1198
 viral diseases and, 897, 910
 CT scan (see computed tomography)
Culex annulirostis, as disease vector, 915, 917, 934
Culicoides spp., biting midges, 912, 1192, 1315
Culiseta melanura, with togavirus, 915
 Culling, of breeding birds, 47, 61
 Culmen, 484
 Culture
 deficiencies of, 121 (see bacteria)
 for *Chlamydia*, 992
 Cuprimine, 462 (see D-penicillamine)
 Curassow (see Galliformes)
 Curled toe syndrome, 733, 789, 1251
 riboflavin deficiency, 856
 in ratites, 1292c
 Cushing pattern, 1124
 Cushing's syndrome, 598
 Customs service, 143
 Cuticle, 754
 Cuttlefish bone, consumption of, 38
 Cyanide, poisoning, 1042, 1198
 Cyanocobalamin (see vitamin B₁₂)
 Cyanosis, 1039, 1265
 Cyclophosphamide, as CNS toxin, 746
 Cyclopia, 746
 Cystadenocarcinoma, cytology of, 218c
 Cystic follicular degeneration, 798c
 Cystic ovaries, 769, 770
 Cystine, in Anseriformes, 1250
 Cyst, feather (see feather cyst)
Cytodites nudus, 1195
 Cytology, 199-222 (see cells)
 abdominal fluid, 208
 abdominocentesis, 201c
 acid-fast stain, procedures, 222t
 air sacs, 212
 alimentary tract, 209-211
 aspergillosis, 212f
 bacterial abscess, 210
 centrifugation, distortion of cells, 201
 classification of cellular responses, 205
 goblet cell, 218c
 cloacal, 211
 corneal, 213
 crop, 210, 218c, 482
 esophagus, 210
 flow charts, 216, 217
 hemoperitoneum, 218c
 heterophilic inflammation, 218c
 heterophils, degenerate, definition of, 210
 hyperplasia, squamous, example of, 210
 infection vs neoplasia, 206f
 inflammation, 206, 207
 internal organs, 214
 intestine, 211
 kidney, 215
 lung, 212, 218c
 mesothelial, 218c
 mynah bird, 218c
 neoplasia, 207, 213, 215, 221c
 oral cavity, 218c
 pericardial or peritoneal effusions, 697
 peritonitis, egg-related, 218c
 pox, 213, 221c
 respiratory tract, normal, 211
 sedimentation devices, 201f
 septic inflammation, 218c
 sinus, 202f, 211, 218c
 skin, 212
 smears, spreading, 201
 smears, contact, 204
 spleen, 215, 221c
 stains, 205t
 synovial fluid, 214
 techniques, squash-preparation, 200
 tissue hyperplasia, examples of, 207
 tissue imprints, 376
 tracheal wash, 211, 221c
 uterus, 211
 Cytomegalovirus, 1186
Cytophaga, new duck disease, 964
- D** D-penicillamine, 461, 462, 1037, 1038
 D-tubocurarine, 674, 728, 1101
 Dacryocystitis, 684
 Dactylaria, 741, 1232
 Dancing, in Passeriformes, 1178
 Dandelion, 1226
 DDE, toxin, 1050
 DDT, toxin, 1050
 Dead-in-shell, 733, 774, 801
 Deafness, CN VIII and, 728
 Debeaking, 916, 1226, 1233
 Defense (see immune system)
 nonspecific, 110
 specific, 114-116
 Deflighting, Anseriformes, 1269
 Degenerative joint disease, 424, 1146f
 Dehydration, 384t, 402t, 698f, 738
 Deletocephalus, 1011f
 Delta-aminolevulinic acid dehydratase (ALAD), 241, 1034, 1037
 Demineralization, 737 (see rickets)
 Demyelination, EMG, 730
Dendritobilharzia, 742, 1266
 Denervation, EMG and, 730
 Department of the Interior, 143
 Dependovirus, 908
 Depigmentation, of feather, lysine and, 74
 Depluming mange, in canaries, 1197
 Depo-medrol, 465
 Depolarization wave, ECG, 697
 Depression, 739, 743, 824, 890
 Dermacentor, as disease vector, 1061
Dermanyssus gallinae, 59, 808, 1193, 1196
 Dermatitis, 462, 625-627, 632, 982t
 bacterial disease and, 624, 625f

INDEX

- fungal disease and, 607, 609, 610, 611, 624, 625
 gangrenous, with *Clostridium*, 977
 granulomas, with *Mycobacterium*, 975
 in Galliformes, 1219, 1251
 malnutrition and, 846, 848
 nicotine and, 1033
 pantothenic acid and, 856
 parasitic disease and, 624, 631c
 periocular, 680c
 riboflavin and, 856
 stress-related, 626
 viral disease and, 623, 632
 zinc and, 859
- Dermatology, 11, 605-639 (see feather, integument)
 achromia, malnutrition, 617
 aerofoil, effect of, 615
 alular patagium, 611
 beak, 609-611
 biopsy and diseased feathers, survey of
 histologic lesions, 633t
 bumblefoot, causes of, 631c, 632
 burns, 626, 628c
 canary, male baldness, 637
 chronic ulcerative dermatitis (CUD),
 164c, 626f, 627f, 631c, 632, 635
 collar, use of, 637f
 constricted toe syndrome, 632
 database, 622t
 digits, necrotic, 631c
 disease, investigation of, 621
 lipids, dermal sources of, 611
 liver disease, 637
 malnutrition, 607, 615, 617, 625f, 626,
 627
 molt, 620, 621
 mutilation, flock, mate, 634
 pathological terms used in, 633t
 PBFD virus, 628c
 polyfolliculitis, 638
 regions of body, 612f
 self-mutilation, 631c, 636, 637f
 skin, 608, 609, 611
 stress marks, 628c, 633, 634f
 uropygial gland, 613f, 614
 wasp, stings from, 624, 631c
- Dermatomycoses in Passeriformes,
 1005, 1189
- Dermoplasty, 1115
- Detergent, oil exposure and, 413
- Determinate layers, 783
- Devocalization, 1111
- Dewlap, 607, 1219
- Dexamethasone, 386, 461, 599, 600, 1262
 neuromuscular disease and, 734, 736
 peritonitis and, 771
 suppression test, 598
- Dextran, 384
- Dextrose solution, 393, 461, 738
- Diabetes insipidus, 584
- Diabetes mellitus, 235, 771, 1283
- Diagnostic test, limitations of, 121 (see
 specific test)
- Diaphragm, 567
- Diaphysis, 1142
- Diarrhea, 149, 150, 404, 465, 740, 742,
 744
 cryptococcosis and, 1004
 database, 404
 emergency treatment for, 414
- hemorrhagic conure syndrome and, 934
 in Anseriformes, 1266
 in Passeriformes, 1188-1190
 lead poisoning and, 1264
 malnutrition and, 845
 parasites and, 1062, 1194
 viral disease and, 877, 906, 908, 911-913,
 922, 926, 927, 931, 935, 938, 942
- Diathesis, exudative, 855 (see vitamin E)
- Diazepam, 411, 461, 737, 738, 1038, 1213
- Diazinon, toxin, 1050
- Dicheilonema, in ratites, 1314
- Dichlorvos pest strip, 1050, 1195, 1197
- Dicrocoelid, 1011f
- Didunculidae, 1201
- Diet, 534, 788, 842, 1043, 1178, 1233,
 1246 (see feed)
 anti-flagellates, 1225
 Arctic circle waterfowl, 1257
 bacterial contamination of, 57, 951
 clogging, 78
 coccidiostat, in Galliformes, 1225
 deficiency of seeds, 842
 dyspnea and, 1001f
 energy content and, 66
 formulated (see formulated diets)
 grit, in Galliformes, 1225, 1226
 hand-feeding neonate, 811t
 hepatopathies, 845
 high-carbohydrate, 737
 high-fat, low calcium, 753
 high-protein, effects of, 849
 high-quality protein, 737
 in Anseriformes, 814, 1247
 in Columbiformes, 1206t
 in ducklings, 1248t
 in Galliformes, 1225
 in ratites, 1289
 leg problems and, 1324
 organic vs conventional, 842, 1049
 pesticides in, 773
 storage of, 57
- Dietary guidelines, need for 70
- Diethylstilbestrol, 461
- Diff-Quik stain, 221c, 999
- Diffenbachia, 1041
- Digit necrosis, 1187, 1243
- Digitalis, toxicity, 714
- Digits, 1187, 1221, 1243
- Digoxin, 461, 518, 706, 713, 714, 718
 toxicity and, 709
- Dihydrocholecalciferol, 587
- Dihydrostreptomycin, 461
- Dilated cardiomyopathy, 705t
- Dimercaprol (British Anti-Lewisite -
 BAL), 461, 1038
- Dimethyl sulfoxide (DMSO), 46, 419,
 461, 469, 762, 1262, 1264
 semen preservation and, 777
- Dimetridazole, 461, 741, 1187, 1190,
 1193, 1209
 toxicity and, 1045
- Dimorphism, in ducks, 1239
- Dinoprost tromethamine, 462
- Diphenhydramine HCl, 462
- Diphtheroid lesions (wet pox), 873, 881,
 908
- Diplotrianena* sp., 1193
- Direct bilirubin (BIDI), 1244
- Disease management (see aviary)
- Dish-washing machine, 58, 135
- Disinfectant, 37, 59, 135, 138, 403, 594,
 809, 887, 1048, 1073, 1208
 for bacteria, 979t
 for *Chlamydia*, 987
 fumes and aspergillosis, 1001
 fumes and respiratory damage, 111f
 in ratites, 1318
 nursery and, 809
- Dispharynx*, 59, 496, 1023, 1195
- Diuretic therapy, 463, 537, 1076
- Diverticulum, in Galliformes, 1222
- DNA, cell production, 127
 fingerprinting, bird identification, 43, 44
- DNA probes, 122-124f
 false positive results, 124
 PBFD virus, positive, 123f
 polyomavirus negative response, 123f
 sensitivity, 122, 125
 specificity, 122, 124
 use in histology, 124
- Dog, as vector for disease, 960, 984
- Domestic pigeon (see pigeon)
- Domoic acid, 741
- Domoso (see dimethyl sulfoxide)
- Doppler flow probe, 1261
- Dopram, 462
- Dorisiella*, 1191
- Double buff, 1193
- Double clutching, 772
- Dove (see Columbiformes)
- Down, 616 (see feather down, powder
 down)
- Doxapram HCl, 462
- Doxepin HCl, 462
- Doxycycline, 437, 448, 460, 462, 784,
 827, 1063, 1193
 for *Chlamydia*, 994
 medicated food, 994-995t
 vomiting and, 1046
- Doyle technique, 1150f
- Dressing, hydroactive, 1097, 1099, 1133
- Droncit, 467
- Droppings (see excrement)
- Drought, effect on reproduction, 752
- Drowning, in Anseriforme chicks, 1254,
 1260
- Drug doses, conversions and formulas,
 469t
- Dry chemistry, 227
- DTPA, 1264
- Duck, 106, 282, 461, 485, 1265
 ataxia in, 1265
 bacteria in, 939, 955, 959, 964, 975
 beak and, 1249f
 breeding in, 1252
 cardiac rhythm in, 1262
Chlamydia in, 985, 987, 989, 995
 clinical pathology in, 1264, 1341t-1344t
 convulsions in, 1265
 dabbling vs diving, 1246
 diet, pellets vs mash, 1249
 dimorphic, exceptions, 1239
 duck hepatitis virus, 532, 537
 dyspnea in, 718f
 fungal disease in, 1006
 gender determination of, 1252
 heart and, 707
 lead in, 1036
 muscular dystrophy in, 1250
 mycoplasma in 1054, 1057
 mycotoxins in, 1043

- obesity in, 1248
ocular disease and, 685
parasites and, 1062, 1265
peritonitis in, 1131
syringeal bulla in, 1239
viral diseases in, 744, 884, 875, 882, 903-938, 1237
Duck plague, 372, 875, 877, 1237
Duck viral enteritis, vaccine, 744
Duck viral hepatitis, 532, 938, 1267
Duckling, 938, 1246, 1253
Duculidae, 1201
Ductus deferens, 334, 756
Duodenal feeding tube, 392, 403, 1124
Duodenum, 516 (see anatomy overlay)
Dura mater, 724
Dwarfism, 586
Dyschondroplasia, 848, 860
Dysphagia, 872, 887, 1255
Dyspnea, 408, 557, 704, 846, 1136, 492c
 aspergillosis and, 1001f
 cardiac effects, 713, 714, 718f
 causes of, 557, 566, 575
 Chlamydia and, 989
 egg binding and, 758
 emergency treatment for, 414
 in neonates, 821
 in Passeriformes, 1188, 1195, 1197
 liver disease and, 829
 pericardial effusion and, 708
 viral diseases and, 744, 872, 884, 887, 890, 911-930
Dystocia (see egg binding)
- D** *E. coli*, 466, 748
 cardiac effects of, 705t, 715, 718
 coronavirus and, 915
 in ratites 1292c, 1309, 1310c
 metritis and, 768
 orchitis and, 774
 peritonitis and, 772
 yolk sacculitis and, 1256
 vs paramyxovirus, 928
Ear, 344, 352, 838f
Earthworm, as disease vector, 1194
Eastern equine encephalomyelitis, 825, 915, 919, 1309
Eat, reluctance to (see dysphagia)
ECG (see electrocardiogram)
Echinophaga gallinacea, 624
Echinacea, 462
Echinura uncinata, 496
Echocardiography, 252, 697, 713
Eclectus Parrot, 74, 831, 890, 1330t
Eclipse plumage, 1239
Ectoparasite, in Columbiformes, 1209, 1215t
Edema, 302, 848, 855, 1233 (see effusion)
 of nictitating membrane, 884, 1266
EDTA, 461, 462
Edwardsiella, 951
EEG (see electroencephalogram)
Effusion, abdominal, 325
Egg
 abnormal, 773
 adherence to uterine tissue, 408
 anatomy of, 754f
 blood clots, meat spots, 773
 blood spot, 764c, 767c
 calcium deficient, 787
 candling, 791, 792f
 components, 754f
 dead-in-shell, 733, 801c
 decreased hatchability, 856
 double-yolked, 773
 ectopic, 771
 evaluation, 785, 792
 evaporative water loss, in ratites, 1319
 formation of, 749, 750f
 fungal infection, 801c
 handling of, 788c
 hatch, normal, 786c
 incubation, 767c, 792, 794, 1229
 malnutrition and, 859, 860
 manipulation, 792, 794, 1229
 marked for identification, 791
 microbiology of, 794
 morphology of, 755f
 Mycobacterium and, 972
 mycoplasma and, 1058
 necropsy of, 792
 parasites of, 769
 peritonitis (see egg-related peritonitis)
 physiology, in ratites, 1320
 recession of blood vessels, 795
 repairs, 794
 retention of, 751, 798c
 rough-shelled, uterine infections, 773
 shell, 755, 846, 854, 859, 1292c
 soft-shelled, 256, 752, 801c, 769, 773, 1050
 storage of, 788
 structure and physiology, 753
 therapeutics, 759, 794, 795
 tooth, 610, 808
 toxins and, 1051
 ultraviolet light exposure, 787
 viral diseases and, 914, 928, 937
 washing, in ratites, 1318
 weight formulas, 792t, 1319
 xeroradiograph of, 1319f
 yolk, 764c
Egg binding, 406, 407, 758, 759f, 760f, 761f, 768, 770, 771f, 772, 787, 801c
 and neuromuscular disease, 733, 736
 dystocia, 758
 in ostriches, 1301
 treatment of 407f, 414, 759, 760, 761f, 801c
Egg laying, 407f, 462, 772, 784, 1129
 chronic, 772
 frequency of, 807
 in Anseriformes, 1241, 1244t
 in Passeriformes, 1176t
 in Ramphastidae, 1279
Egg-related peritonitis, 147, 200, 235, 238, 315, 408, 465, 771, 914, 752, 758, 768, 771c, 798
 in Anseriformes, 1266
 in Passeriformes, 1188
 in ratites, 1304, 1322f
Eimeria, 1012f, 1015, 1191
Einthoven's triangle, ECG, 702f
Ejaculatory papillae, 756
Elavil, 458
Electrical fencing, predator control, 1245
Electrical current stimulation, 1142
Electrocardiogram (ECG), 553, 696 700, 702
 African Grey Parrot, normal, 703f
 anesthetic effects on, 699, 1078
 atherosclerosis and, 707f
 auricular T-wave, 700
 cardiomyopathy and, 717
 congestive heart failure, 706f, 715f
 halothane recovery and, 713f
 in Anseriformes, 1261
 interpretation of, 701
 lead II, normal, 700f
 measurements on lead II rhythm strip, 704
 P-wave, 700, 704
 pericardial effusion and, 708f, 718
 pigeon, 697, 700, 703f, 1204
 PR-segment, 700
 Q-wave, 700
 QRS-wave, 700
 R-wave, 700
 recording of ECG, 699
 reference values, 699t
 S-wave, 700
 ST-segment, 700
 T-wave, 700
Electrodiagnostics, neurology, 729
Electroencephalogram (EEG), 723, 731-738
Electrolytes, 239
Electromyogram (EMG), 720, 723, 730
Electron microscopy, 121, 864
Electrophoresis, 237, 864
Electrophysiology, 696
Electrosurgery (see radiosurgery)
Elementary bodies, 985
ELISA test, for *Chlamydia*, 991, 992
Embolicisms, yolk, 458
Embryo
 adhesions to CAM, 793
 assisting hatch, 797f
 development, 767c
 lethal rings, 787
 malposition, 791, 793t, 801c
 management, 1253
 monitoring, candling, 791
 viral diseases and, 926
Embryonal nephromas, 735
Embryonic death, 463, 768, 774, 787t, 789, 791t, 792, 855, 890
 hemorrhage, vitamin E and K, 787
 in Passeriformes, 1187
 in ratites, 1319
 structures and physiologic function, 755t
Emerald Toucanets, 1278
Emergency equipment, 415t
Emergency therapy, 392-416
Emetics, 503
EMG (see electromyogram)
Emollient cathartics, 1038
Emphysema, 341, 529, 1107, 1137
Emtryl, 461
Emu, 499, 506, 543, 916, 1288-1289, 1308-1320, 1345t
Enalapril, congestive heart failure, and 714
Encephalin, 584
Encephalitis, 372, 1054
Encephalocele, 746
Encephalomalacia, 731, 732, 937
Encephalomyelitis, 741, 744, 915, 916, 919, 1309
Enclosure (see housing)
Endocarditis, 518, 535, 714, 716f
 in ratites, 714
Endocrinology, 582-606

INDEX

- ACTH stimulation test, use of 598
 Addison's disease, 598
 adrenal gland, 597-598
 adrenocortical disorders, 598
 β - and γ -lipoprotein (β - and γ -LPH), 584
 β -endorphin, 584
 β -melanocyte stimulating hormone (α - and β -MSH), 584
 behavior and, 584
 calcitonin (CT), 587
 calcium metabolism, 587-589f
 carbohydrate, metabolism, 603t
 corticosterone, 597
 Cushing's syndrome, 598
 daylight and, 584
 dexamethasone, screening test, 598
 Fanconi's syndrome, 605
 feather formation, endocrine control, 601, 602
 feather picking, 596f
 goiter and, 593-594, 596
 Graves' disease, hyperthyroidism, man, 596
 Hashimoto's thyroiditis, 596
 hyperestrogenemia, 592f
 hyperostosis, 589f
 hyperparathyroidism, 582, 590, 591f
 hyperthyroidism, 593, 596
 hypoadrenocorticism, 598, 601
 hypothyroidism, 582, 593, 595
 immunity and, 599
 insulin, in birds vs mammals, 603
 Jod-Basedow phenomenon, 596
 lipoma, relation to thyroid, 595f
 luteinizing hormone (LH), 583
 mineralocorticoid activity, 600
 neurohypophyseal hormones, 583
 PU/PD, 587, 604, 605f
 parathyroid hormone (PTH), 587
 pituitary gland, 583, 586, 587
 plasma T_3 and T_4 , 595
 prolactin and proopiomelanocortin (POMC), 584
 pseudohyperparathyroidism, 590
 reproductive physiology, and 589
 stress and, 600f
 thyroid gland, 584, 593-596, 602
 thyroxine induced molt, sensitivity to, 597
 TSH stimulation test, 595
 water deprivation test, 586
 Endoscopy, 327-354, 1117, 1124, 1210, 1231, 1264
 anatomy, 328f, 330f, 333c
 approaches, 330f
 biopsy and, 346-354, 348t, 505
 choana, 344, 352c
 cloaca, 347
 collecting fluid, pericardial effusion, 718
 contraindications, 340, 341
 crop evaluation and, 352c, 1116
 ear canal, 344, 352c
 esophagus, 345, 352c
 equipment manufacturers, 349t, 354
 gonads, 334, 343, 349
 in Passeriformes, 1178
 landmarks, 331f, 333c
 liver biopsy, 352c
 Menghini or Jamshidi needle, 349
 oral cavity, 352c
 palate, 352c
 patient preparation, 339, 341
 proventriculus, 345, 352c
 renal disease and, 347
 respiratory tract and, 341, 342, 346, 348, 352c
 spleen and, 348
 sterilization of equipment, 338
 surgical sexing, 341
 ventral hepatic peritoneal cavities, 346, 351c
 Endotoxins (bacteria), 1033
 Energy requirements, 74, 1249
 Enilconazole, 454, 455, 462, 1004
 Enrofloxacin, 436, 443, 460, 462, 1060, 1187
 articular cartilage and, 821, 1046
 medicated food for *Chlamydia*, 995
 oral vs parenteral, 438
 plasma concentrations of, 435f
 Enteral nutrition, 390, 394, 395, 1086, 1125
 Enteritis, 174, 464, 466, 483, 492c, 507, 845, 906, 940f, 952, 982t
 in Galliformes, 1233
 necrotic vs ulcerative, 977
 viral, 912-915, 938
Enterobacter, 715, 951
 Enterobacteriaceae, 484, 950, 990, 1188
 abnormal hosts and, 951t
 lactobacilli, 111, 980
Enterococcus, 968-971, 1187
 Enterotomy, 1124
 Enterovirus, in cockatoos, 938
 Entropion, 679
 Enucleation, 689, 1103f
 Environmental responsibility, domestic raised birds, 142
 Enzyme inhibitors, 67
 Enzymes, damaged cell release, 226, 525
 digestive, 844, 845
 Enzymology, 226, 523-536
 Eosin-nigrosin stain, for semen evaluation, 757
 Eosinophilic inclusion bodies (Cowdry A type), 878
 Eosinophils, 112, 186, 190-194
 Epicardial diseases, 718
 Epididymis, 334, 756, 757
Chlamydia and, 990
 Epinephrine, 463
 Epiphora, 576, 684, 885, 905, 931, 1101
 Epiphysis, 1142
 Episiotomy, 760, 1129
 Epistaxis, 934, 1051
 Epithelial surfaces, nonspecific immunity, 110
 Epithelioid cells, with *Chlamydia*, 987
 Epitopes, 114
 Equatorial birds, photoperiod of, 752
 Ergocalciferol, 83
 Ergonovine maleate, 463
 Ergotism, 1265, 1282
Erysipelothrix, 535, 715, 975, 1183, 1232
 Erythremic myelosis, 669, 934
 Erythroblastosis, 933, 1197
 Erythrocytes, 183, 188
 iron in, 530
 life span of, 399
 protoporphyrin levels, free, 1037
 values, in vitamin C, 1251
 Erythroleukosis, 934
 Erythromycin, 438, 442, 449, 459, 463, 1060, 1189
 Erythropoiesis, 183, 196
Escherichia coli, 814, 951-953, 1188
 in Galliformes, 1232
 in Ramphastidae, 1281
 Esophageal
 air sac, in Galliformes, 1222
 stethoscope, 1078, 1261
 strictures, 497, 1113
 thermometer, 1261
 Esophagus, 352, 345, 489-492, 1265
 Estrogen, 753
 Ethambutol, 463
 Ethanol, 1044, 1198
 Ethoxyquin toxicity, 1045
 Ethylene glycol, 538, 1044
 Eucalyptus, 573
 Euthanasia, 61, 357, 822, 1138
 Euthyroid, 597
 Evoked potentials, 730
 Examination (see physical examination)
 hospitalized, daily assessment, 135
 initial, forms, 135
 post-purchase, 132
 resident bird, 61
 veterinary certificate of, 136
 Excrement, 149, 150, 169, 172c, 495, 769f, 819, 887, 943, 989, 1044, 1189
 blood in (see hematochezia)
 consistency, changes in, 743
 evaluation of, 60, 172c
 pericloacal accumulation, 168
 Excretory urogram, 307
 Exercise, 1178, 1207, 1221, 1324
 intolerance to, 1136
 Extrahepatic biliary cysts, 822
 Exertional rhabdomyolysis, 550, 855, 1263
 Exocrine pancreatic insufficiency, 507, 513
 Exophthalmos, 684, 736
 Expirations, respiratory, audible, 557
 Extensor carpi radialis, 1235 (see anatomy overlay)
 External coaptation, 1145
 External fixator, 1141
 Kirschner-Ehmer (KE), 1148
 Extraluminal masses, radiology, 255
 Exuberant granulation, in ratites, 1310c
 Exudative diathesis, 732, 859
 Eye
 anatomy of, 675f, 678f
 blink, 728, 732
 canthoplasty, 1100-1101f
 chronic lesions in, 1184
Mycoplasma and, 1056
 parasites in, 1195
 surgery of, 687
 Eyelid malformation, neonate, 838
 Eyelids, swollen, 885
 Facial nerve (CN VII), 726
 Falconiformes, 19, 508, 557, 773, 873, 875, 880, 882, 973, 933, 1001
 Falling from perch, and neuromuscular disease, 737
 Fasting periods, 852, 1077
 Fat
 dietary considerations of, 76, 81, 855, 1202, 1248

- disease of, 851, 856
 Fatty acids, malnutrition, 851
 Fatty liver degeneration, 311, 526, 533, 536, 828, 844, 851, 857, 1198, 1246, 1251
 Fatty liver hemorrhagic syndrome, 851
 Feather
 abnormalities, 144, 159, 463, 625, 824, 837, 846 (see feather picking, dermatology)
 anatomy, 614f, 615, 616t, 616-621
 barbules, 614, 615f, 621
 bristles, 616
 color, 74, 617t-618, 847f, 626
 cyst (*Hypopteronosis cystica*), 628c, 638, 673, 1098, 1099, 1183
 depigmentation, 74 (see depigmentation, feather)
 development, 619f
 down, 616
 dysplasia, 837, 846
 dystrophy, 463, 616, 625f, 628c, 638, 890, 926
 filoplumes, 616
 follicle, inactive, 637
 folliculitis, 625
 formation, endocrine control, 601
 growth, in neonates, 819f
 hemorrhage, with polyomavirus, 890
 hepatic dysfunction and, 632
 hydrophilic compounds and, 623
 hyperkeratosis and, 609, 618f, 632
 hypothyroidism, 637
 interlocking nature of, 628f
 loss of, 772, 1246, 1317
 malcolored, from hepatic dysfunction, 632
 malnutrition and, 628f, 846
 mites, in Passeriformes, 1196
 molt (see molt)
 pin, 143, 159, 618, 628c, 634
 removal, 1084f
 secondary, 615
 in ratites, 1295c
 sempiplumes, 616
 sheath, retention of, 159, 846
 types, 615, 616, 1139
 waterproof, 615
 curling of, in ratites, 1298
 Feather picking, 38, 107, 461, 462, 464, 466, 468, 523, 572, 631c, 634, 636, 637, 846, 1233
 tobacco smoke and, 1047
 cannibalism and, 916
 malnutrition and, 107, 596, 810, 847f, 857
 Feather duster, budgerigar, 873, 880
 Feces (see excrement)
 Fecal
 examination for parasites, 150, 379, 1009 (see parasites)
 sex steroid determination, 779
 Food and Drug Administration (FDA), extra-label drug use, 142
 Feed
 consumption, pigeons, 1206
 for Galliformes, 1233
 for aviary birds, 50
 for Passeriformes, 1178
 general recommendations, 50
 gram-negative pathogens in, 57, 149
 growth additives in, 1246
 storage of, 57f, 57, 1178, 1233
 passing undigested, 483, 855, 887, 940 (see passing whole seeds)
 mycotoxins in, 1043
 mites, 1206
 Feeding
 response, and neurologic disease, 728
 seasonal, 1178
 techniques, 37-38, 393, 1255
 tubes, 1086, 1111, 1124
 Femur (see anatomy overlay)
 in egg laying hens, 753
 surgical approach to, 1163f
 Fenbendazole, 463, 1314, 1194, 1195
 toxicity of, 1046
 Fence, for ratites, 1300, 1301
 Fennel leaf pond weed, 1247
 Ferric subsulfate, 399, 463
 Fertility, 732, 785, 1039, 1225
 Fertilizers, and Anseriformes, 1266
 Fiber, crude, in formulated diets, 76
 Fibrillation potentials, 730
 Fibrinous air sacculitis, 885
 Fibrosarcoma, 486
 Fibrosarcoma, REV, 643, 934
 Figure-of-eight bandage (see bandage)
 Filaridea, 371, 1024f, 1315
 Filoplumes, 616
 Finch, 97, 154c, 372, 450, 464, 465, 1173, 1186, 1188, 1190, 1193, 1336t
 amyloidosis in, 1198
 bacteria and, 956, 973, 1060
 characteristics of, 1174t
 Chlamydia in, 989
 megabacteria in, 982
 ocular disease and, 685
 parasites and, 467, 1192, 1194
 praziquantel toxicity in, 467
 reproduction and, 752, 756, 780, 1175
 straw feathers in, 1184
 toxicities in, 1050
 toxoplasmosis in, 742
 twirling syndrome in, 928, 939
 vasectomy of, 1178
 viral diseases and, 875, 884, 889, 891, 912, 916, 927, 955
 Fish and Wildlife Service, 143
 Fish
 feed for Anseriformes, 1246
 meal, ventricular ulceration and, 851
 toxicity, 464, 468
 -eating birds, *Erysipelothrix* in, 975
 Fistula, crop, 116, 826, 1113
 Fixation
 external 1141-1148f, 1141, 1147t,f
 intramedullary, 1148
 types of, 1138t
 Fixatives, 378t
 Flaccid paralysis, 978
 Flagellates, 1013
 Flagyl, 466
 Flamingos, 550, 1237
 Flatulence, 887
 Flavivirus, 915, 918-919
 Flea, 154, 624c, 1024
 collars, toxic, 1051
 Fledging
 of Anseriformes, 775, 1253
 of Columbiformes, 1210t
 of Passeriformes, 1176t
 Flies, as disease vector, 624, 739, 742, 977
 Flights, training, in Columbiformes, 1204
 Flock
 acclimation of, 50
 acquisition of, 47
 behavior, 806
 disease testing, subclinical, 46, 48
 health of, 45, 48
 identification of, 49
 preventive medicine, 46-59
 pre-sale testing, 47
 quarantine of, 48
 screening techniques, 48
 Flooring, padded, in Anseriformes, 1244
 FLSH (see fatty liver hemorrhagic syndrome)
 Fluconazole, 454, 455, 463, 999
 Flucytosine, 452, 459, 463, 999, 1004, 1005
 toxicity of, 1046
 Fluid, 821
 deficit, estimation of, 384
 dehydration, findings, 384t
 Fluid therapy, 384, 385f, 386f, 387, 611, 1026, 1074f
 requirements for, 383
 sodium retention, 712
 Flukes, 463, 769, 1021, 1215, 1282 (see trematodes)
 in ratites, 1316
 Flunixin meglumine, 413, 463, 836, 1095
 Fluorescein dye, for corneal ulcers, 674, 686
 Fluoroquinolones, 442-443
 Fluoroscopy, 260
 Flying, 729, 1178, 1207, 1221, 1239
 Foley catheter, 393
 Folic acid, 72, 87, 857, 1251
 feather picking and, 846
 malnutrition and, 87, 857, 858
 Follicle stimulating hormone (FSH), 583, 584, 751, 753, 757
 Follicular atresia, aflatoxicosis, 749
 Folliculitis, 625
 Food (see feed)
 Foot
 baths, 58
 cracking of, 632
 lesions, 625, 632, 743, 1265f
 pads, 608f
 Foreign body, 488f, 686, 503f
 in Galliformes, 1222f
 ingestion, in ratites, 1305
 ingestion, neonate, 828
 Formaldehyde, ingestion vs *Candida*, 999, 1048, 1061
 Formulary, 457-479
 Formulated diets, 38, 63, 65, 76, 132, 389, 469, 814, 845, 848, 849, 851, 854, 1030, 1046, 1133 (see diets)
 Formulator, 476-477
 Foster parents, 785, 788, 806
 Fovea, 677
 Fowl
 adenovirus (FAV) in, 903
 cholera, 961
 domestic, 757, 773
 favus, 1005
 plague, avian influenza A (AIV), 929, 930
 Fowlpox vaccine, in ostriches, 874

INDEX

- Fox, 1207
 Foxglove, 1041
 Fracture, 591, 1164 (see orthopedic surgical technique)
 electrical stimulation, 1142
 diagnosis of, 246, 250
 in Galliformes, 1233
 in ratites, 1306
 malunion of, 1142
 mandibular, 1164
 tarsometatarsal, 1160f
 types of, 1141
 Fracture stabilization, 428, 1138, 1146-1148
 principles of, 1138t
Francisella, 964, 1232
 Free flight, in aviaries, 1178
 Free radicals, 84
 Free-ranging birds
 captive birds vs dietary fat, 851
 disease in, 906, 929, 962
 Mycobacterium and, 972
 orthopedic surgery of, 1138
 poisoning of, 1051
 vs captive, 847
 waterfowl, loss of weight in, 1253
 French moult, causes of, 623, 869c, 890, 899
 Frostbite, 413, 414, 715, 775
 in Anseriformes, 1243
 in Galliformes, 1233
 Frounce, 491
 Fruits, in Galliformes, 1225
 FSH (see follicle stimulating hormone)
 Fumes, household, 576, 1049
 Functional ileus (see ileus)
 Fungal dermatitis, STA solution and, 468
 Fungal infections, treatment of (see mycoses)
 Fungizone, 459
 Funnel nets, 1260
 Furacin, 1187
 Furazolidone, 463, 518, 1307
 Furcula, wishbone, 1221
 Furosemide, 413, 458, 463, 518, 554
 brain swelling and, 411
 heart disease and, 706, 713
 side effects of, 714
 Fusariotoxicosis, 1265
Fusarium, 1043, 1044, 1265
- G** Gadwall, 1247
 Gagging, 1190
 Gall bladder, 506, 522, 1202, 1223, 1290
 Galliformes, 465, 1194, 1195, 1218-1236, 1248, 1338, 1339
 aspergillosis in, 1000
 bacterial diseases in, 959, 960, 964t, 973, 977
 Campylobacter in, 959
 cardiomyopathy and, 717
 clutch size, 1227
 coccidia and, 459, 461, 466
 diseases of, 1232
 Enterobacteriaceae in, 484
 families and subfamilies, 1220t
 hypovitaminosis A and, 487
 incubation times and, 1227
 levamisole toxicity and, 1045
 longevity and, 1223t
 megabacteria in, 982
 parasites and, 769, 1061, 1265
 physiology of, 1221
 streptomycin and, 468
 vent sexing and, 778
 viral diseases and, 744, 776, 872, 875, 884, 903, 907, 912, 914, 916, 919, 922, 923, 926, 929, 932, 934, 935, 937, 1054, 1056
 Gallus gallus, forma domestica, 1218
 Galvanized wire, 54
 Gamebirds, 1218
 Gander, castration of, 1274
 Gangrenous dermatitis, 967, 1187
 Ganglioneuritis, 501, 939 (see NGD)
 Gapeworm, 464, 574, 1195
 Gas chromatography, toxin detection, 1050
 Gas exchange, 569
 Gastric acid secretion, inhibitor of, 460
 Gastric
 impaction, 501, 503
 lavage, 828, 1038, 1264
 ulceration, 460, 504
 Gastroenterology, 482-521
 ascites, 516-517
 bacterial inhabitants of, 484
 beak and, 484, 485f
 ceca, 506
 choanal papillae, hypovitaminosis A and, 487
 cloaca, anatomy and physiology, 495c, 509f,t, 510c, 511
 cloacal bursa, bursa of Fabricius, 495, 509c
 coelomic cavities in birds, 514t
 colon strangulation, 495c
 crop, diseases of, 489, 489f, 490, 491, 495c, 496
 diagnostic tools, techniques for, 482
 differential diagnosis of, 483t
 dilatation of, 495c
 duodenum, 506
 esophageal disorders, 490, 492
 esophagus, anatomy and physiology, 489
 foreign bodies, 488, 503f
 gall bladder, 522
 gastrointestinal diseases, upper, 487t
 gastrointestinal neoplasias, 505t
 gastrointestinal perforation, 508
 ileus, 507
 ingluviolith, 495c, 497f
 intestinal obstruction, causes of 503, 508
 intestines, anatomy and physiology, 506
 maldigestion, 514
 motility, 465, 1203
 neoplasia of, 505
 neuropathic gastric dilatation, 500, 500t, 501, 502f
 oropharynx, anatomy and physiology, 485, 486f
 palatine beak necrosis, 488f
 pancreas, 512-513
 papilloma, 512f
 peritoneal cavities, 515
 proctodeum, 509
 proventriculus, 492, 492c, 498-499
 rectum, 506
 regurgitation and, 490f
 rhinotheca, 484
 Smadel's disease, 486
 stomatitis, 488
 tongue, 489
 traumatic gastritis, 503
 ultrasonography, ascites in, 517
 urodeum, 509
 ventriculus, 499, 503
 vitamins and, 504, 514
 volvulus, 508
 vomiting, 492c
 zinc toxicosis and, 1039
 Gastrointestinal tract
 displacement of, 258
 normal flora of, 484
 Gender determination, 148t, 154, 344, 499, 756, 757, 777-779, 1231, 1277
 in Anseriformes, 1239, 1252
 in Columbiformes, 1210
 in Galliformes, 1228
 in Passeriformes, 1178
 in Ramphastidae, 1277t
 in ratites, 1291
 sexual dimorphism and, 77, 779t
 Genetic
 and chick, 805
 disease, 720, 784, 1182, 1226
 selection, for heart disease, 713
 Genital tract, and mycoplasma, 1054
 Gentamicin, 239, 446, 463
 Gentian violet, 464
 Geothermal energy and incubation, 1229
 Geriatric birds, nutrition in, 72
 Germinal disc, description, 754
 GGT (see alanine aminotransferase)
 GI blockage, 887 (see gastrointestinal blockage, ileus)
 Giardia, 174c, 461, 464, 466, 495c, 631c, 1014, 1283
 cockatiel, paralysis and, 732, 845
 hypovitaminosis E and selenium, 852, 855
 in finches, 1190
 in Ramphastidae, 1282
 in ratites, 1314
 lid paralysis and, 680c, 686
 nestling mortality and, 807
 Giemsa stain, 987
Gigantobilharzia, 1194
 Gizzerosine, ventricular ulceration, 851
 Glands, 608, 675, 1129, 1221, 1245
 Glauber's salts (sodium sulfate), 1038
 Glaucoma, 687
 Glomerulomphistis, 352c
 Glossopharyngeal nerve (CN IX), 726
 Glucagon, birds vs mammals, 603
 Glucocorticoid, 600t
 Glucose (GLU), 234, 243, 1244
 effect of, 542
 kidney filtration of, 539
 relationship to hepatic dysfunction, 235
 Glucosuria, 243, 464, 539, 548, 636
 Glue traps, rodents, 413
 Glutamate dehydrogenase (GLDH), 230
 Glutathione peroxidase (GSHp), 84
 Glycerol, semen storage, 777
 Glycogen body, 726
 Glycopyrrolate, 1261
 Gnathotheca, 484
 Goblet cells, cytology of, 218c
 Going light syndrome, megabacteria, 982
 Goiter, 594-596, 461, 464-465, 495c, 594-596, 860
 Goldfinch, ivermectin in, 464

- Gonadotropin, suppression of, 584
 Gonads, 343, 1131
 functional relationship of, 758
 Gongylonema ingluvicola, 496
 Goose, 501, 875, 907-908, 910, 912, 934, 936, 1243
 aggressiveness in, 1243
 bacterial diseases of, 950, 956, 959, 975, 963, 973, 1054, 1057, 1060
 Candida in, 998
 Derzsy's disease, parvovirus in, 908
 diets of, 1249
 fatty liver in, 851
 fungal disease in, 1006
 mebendazole in, 465
 Neisseria, sexually transmitted, 774
 nutrition in, 1247
 pair bond in, 1252
 parasitic diseases of, 960, 1062, 1266
 respiratory rate of, 1243
 sexual maturity in, 1252
 viral diseases of, 875, 877, 907, 908, 910, 912, 920, 929, 931, 934, 936, 939
 Goose-stepping, pyridoxine and, 856
 Goslings, nephroenteritis, 943
Gossitis gelatinosa circumscripta, in Anseriformes, 489
 Gouridae, 1201
 Gout, 458, 461, 540, 547, 829, 849
 allopurinol and, 458
 articular, 850
 causes of, 850
 in ratites, 1295c
 visceral, 850
 Grackles, as disease vector, 1315
 Graft (see bone)
 Graft rejection, 120
 Grains, in Galliformes, 1225
 Gram scale, 136f
 Gram's stain, 1187
 antibiotics, and, 436f, 437, 442, 443, 807
 monitoring chicks and, 412, 824
 Candida and, 999
 yeast, and treatment, 436
 Gram-negative bacteria, 436f, 437, 443, 807
 Gram-positive bacteria, 437, 443
 Granulocytic leukemia, 186, 669
 Granuloma, 683c, 745, 952
 CNS signs and, 745
 Mycobacterium and, 973, 975
 Granulomatous
 dermatitis, 955, 962
 ingluvitis, 1188
 sinusitis, amphotericin B and, 459
 Granulosa cell tumor, 770
 Green foods, 1178
 Grey-cheeked Parakeet, 30, 656
 Grid keratotomy, 687
 Griseofulvin, 1190
 Grit, 38, 77, 496, 845, 846, 1038
 (see myoventricular dysgenesis)
 in Anseriformes, 1247f
 in Galliformes, 1225
 shell vs, 846
 Grooming, excessive, 1269
 Grouse, 960, 977, 1220, 1229
 Growth hormone (GH), 584
 Growth plate, 1142
 Growth rate, 815, 829, 1243
 leg deformities in ostriches, 1324
 Gruber-Widal method of antibody titration, 959
 Gruiformes (see cranes)
 Guinea pig, *Chlamydia* in, 984
 Guineafowl (see Galliformes)
Gymnodinium breve, 1266
- H** Habronema, 1011f
 Haecaputeus, 1019
Haemophilus, 221c, 961, 963, 1189
 clinical disease and, 964t
 differential diagnosis of, 982t
 in Galliformes, 1232
Haemoproteus, 190, 194c, 468, 1176, 1192
 Hafnia, pathogenicity of, 951
 Halodol (see haloperidol)
 Halofuginone, 1225
 Haloperidol, 464, 637
 Halothane, 569, 1068, 1261
 cardiac effects of, 705t, 709, 711, 713f
 Haloxon, 464
 Hand-feeding, 468, 806f, 808, 812, 813
 diet, 395, 812, 813t, 814f, 846
 feeding amounts and frequency, 813
 in Columbiformes, 1210
 methods of, 812
 percent solids, cooking effects, 812
 species differences, 822
 tubes, 813
 Haptens, 114
 Harderian gland, 116, 675
 Hardware disease in ratites, 1313c
 Harvesting free-ranging birds, 21-22
 Hatchability, 72, 856, 890, 1253
 decreased, from malnutrition, 849, 855
 in ratites, 1318
 pesticides and, 1051
 mycoplasma and, 1054
 Hatching, 786f, 793
 in Anseriformes, 1253
 in ratites, 1320
 muscle, 793
 records, 793
 Hawk-headed Parrot, 30, 886, 911
 Hay, aflatoxin in, 69
 Head
 and neck extension, schistosomiasis, 742
 trauma, 410, 414, 465
 tremor, 689, 743, 744, 1035, 1264
 Head tilt, 742, 745, 1035
 CN VIII defect, 728
 heavy metal toxicosis, 739, 1035
 twirling syndrome, in finches, 928
 Healing process, of bone, 1140
 Health
 certificate, 31, 133, 136
 exam, new bird, 31
 factors in, 65f
 guides for choosing a new bird, 31
 Heart, 695 (see cardiology, cardiac)
 anesthetic effects on, 1077
 arrhythmias, 705
 auscultation of, 1078
 AV blocks, 709, 710
 disease, clinical signs of, 371, 696
 electrically vertical, 702, 704f
 electrophysiology, 696
 failure, right-sided, 713
 imaging, 697, 698f
 lesions, common causes of, 717t
 surgery of, 718
 ventricular septal defect, neonate, 816f
 Heart rate
 determination of, 148t, 701
 ECG (see electrocardiogram)
 in Anseriformes, 1243
 in Columbiformes, 1204
 in Galliformes, 1221t
 Heat loss, in Anseriformes, 1243
 Heaters, fumes, toxicity, 1049
 Heavy metal toxicity, 173c, 248, 349, 468, 739, 937, 1038t (see lead, zinc, toxin)
 CNS signs and, 739
 myocardial lesions and, 717
 renal damage and, 553
 shell and, 846
 Helmeted Curassow, trachea, 560 (see Galliformes)
 Helmeted Guineafowl, 1218
 Helminths, 532, 1021, 1208
 Helper cells, 118
 Hemacolor, stain, *Campylobacter* and, 484
 Hematochezia, 149, 164c, 172c, 404, 483t, 887, 982
 Hematology, 176-198, 1330t-1345t
 anemia, causes of, 188t
 basophil development, 190, 193c
 blood cells, characteristics of, 186t
 blood film, 178
 blood parasites, identification of, 190
 bone marrow, collection of, 191
 cells, identification of, 181, 186
 corpuscular hemoglobin concentration, mean (MCHC), 180
 corpuscular volume, mean (MCV), 180
 EDTA, 177, 178
 eosinophil, 189, 190, 193c, 194
 erythrocyte, 183c, 188, 196
 erythropoiesis, 183c, 196
 granulopoiesis, 196
 hematologic stains, 179
 hemogram, 188, 194c
 heparin, 177
 heterophil, 189, 193c
 leukocyte, 180
 leukocytosis, 188, 189, 194c
 leukogram, interpretation of normals, 188
 leukopenia, causes of, 189
 lymphocytes, reactive, 194c
 lymphocytosis, causes of, 189
 manual cell counter, use of, 179
 methylene blue stain, 180
 monocyte development, 184c
 monocytosis, causes of, 189
 myeloblast, 193c
 Natt and Herrick's method, 180
 packed cell volume (PCV), 179
 polycythemia, causes of, 188
 prolymphocyte, differentiation of, 197
 prorubricyte, basophilic erythroblast, 196
 red blood cell count (RBC), 179
 reticulocyte count, 180
 rubricyte, hemogram, 194c
 thrombocyte, interpretation of, 190
 thrombocytopoiesis, 183c, 196
 toxic heterophils, 194c
 Unopette system, cell counting technique, 179

INDEX

- white blood cell counts (WBC), 181t
Wright's stain, standard, 179
- Hematuria, 150, 890, 1040
- Hemicellulose, 458, 464, 536, 844, 1038
(see psyllium)
- Hemochromatosis, 209, 409, 464, 517,
526c, 534, 713, 849, 1198, 1281f
in Passeriformes, 1197
in Ramphastidae, 1281
renal, 547c
treatment of, 530, 536
- Hemoglobin values, vitamin C and, 179,
1251
- Hemoglobinuria, 1035
- Hemogram, 176, 1330t-1345t
normal cockatoo hen and, 753t
- Hemolysis, glucose, effect on, 234
- Hemoparasites, 1019
- Hemopericardium, 718
- Hemoperitoneum, 218c
- Hemorrhage, 398, 399, 464, 526, 890,
916, 927, 934, 1051, 1087-1089,
1233, 1265
control, 39, 399, 463, 1113, 1269
- Hemorrhagic
conure syndrome, 934
enteritis, EEE, emu, 916
nasal discharge, PMV-3, 927
syndrome, with sulfa antibiotics, 1045
- Hemosiderosis, 366
- Hemostatic clip, 1034f, 1086, 1103,
1129, 1131, 1135
- Hen, reproductive
anatomy, 749 (see anatomy overlay,
endoscopy)
disorders, 758
hormones, 751
- Henle, loops of, 539
- Hepadnavirus, orthohepadnavirus,
909-910
- Heparin, 1135
- Heparinized flushes, 387
- Hepatic
anesthesia and, 1068
damage, 73, 632 (see hepatitis, liver)
dysfunction, relationship to glucose
level, 235
encephalopathy, 525, 736
fibrosis, 461, 530, 537
lipidosis, 88, 215, 221c, 828, 829f, 1198
stenosis, 533
- Hepatitis, 148, 154, 221c, 405, 462,
526c, 529, 714, 798c, 982t, 312,
1054, 1062c
black, *Plasmodium*, 529c
granulomatous, mycobacteriosis, 529c
relationship to glucose level, 235
viral, 904, 906, 909, 916
- Hepatocellular carcinoma, 1197
- Hepatocellular necrosis, 889, 529c
- Hepatology, 522-537 (see liver)
ammonia tolerance test, 530
ascites and, 523, 530, 537
aspergillosis and, 535f, 526c
beak, overgrowth and, 523
bile acids, 525, 530
bile salts in skin, pruritus, 523
biliverdin reductase, 523
biliverdinuria, 523, 526c
chlamydiosis and, 537
colchicine and, 537
corticosteroid and, 537
enzymology, 523-530
enzyme activities, 463, 523-530
enzyme activities, liver vs muscle
disease, 525t
fatty liver, 526c, 529c, 533, 534
hepatic encephalopathy, 525
hepatic fibrosis, 531f, 537
hepatomegaly, 523, 533f, 529c
icterus and, 523
jaundice and, 523
malnutrition and, 526, 533, 536
neoplasia and, 536
parasitic disease and, 529-533, 529c,
536, 537
portal hypertension, 536
radiology, 530
serum iron concentration, 530
toxins and, 529, 530, 535-537
traumatic rupture, 536
ultrasonography, 536
viral diseases and, 527, 532, 537
- Hepatomas, 829
- Hepatomegaly, 523, 529, 533f, 719, 823,
1121, 1197
differential diagnosis of, 254t
cardiac disease and, 697
- Hepatopancreatitis, with coronavirus,
914
- Hepatopathies, 485f, 858, 1075
- Hepatosplenomegaly, 532
- Hepatotoxins, 335-337, 529, 1043
- Herbst's corpuscles, 609, 1249
- Hernias, abdominal, 1132
- Herniorrhaphy, 1132
- Hérons, 910, 1238
- Herpesvirus, 874-885
Chlamydia vs, 990
CNS signs and, 687
cross-reactions, 876t
differential diagnosis of, 871t
in Galliformes, 1232
in Passeriformes, 1186
in Ramphastidae, 1282
inclusion bodies and, 874
ocular disease and, 687
PMV-1 pigeon vs, 926
survey of hosts, 875t
treatment of, 878, 879
- Hetastarch, 384
- Heterakis*, 361, 367, 644, 1023
in Galliformes, 1235f
- Heterogametic gender, 779
- Heterophil, 111, 112, 186, 189, 194,
1206 (see hematology)
left shift, 111
- Heterophilia, 915, 934, 1003, 1063 (see
hematology)
- Hexamita*, 459, 462, 466, 732, 1015
- Hind limb paresis, progressive, 736
- Hippoboscids flies (*Ornithomyia
avicularia*), 190, 1010f, 1197
- Histology, relation to biochemical
changes, 226
- Histomonas*, 366, 459, 461, 464, 1015
in ratites, 1314
- Histopathology, problems of, 121
- Histoplasma, 454, 1005
- Hjarre's disease, coligranulomatosis, 951
- Hock, enlarged, zinc deficiency, 848, 859
enlarged, vitamin E, 855
- Holocrine secretion, in Columbiformes,
1210
- Homogametic gender, 779
- Hooding, 1233
- Hopping, and neurologic disease, 728
- Hormonal cycle, diminishing exposure to
light, 772
- Hormone (see endocrinology)
measurement, 584
parathyroid (PTH), 587
follicular, 1211
- Hornbills, 499, 1282
- Horner's syndrome, 689, 728
- Horse, as disease vector, 929, 984
- Hospital management, 133, 135-137,
138, 248
- Hospitalization, 398, 1244
- House Sparrow, as disease vector, 916,
919, 926, 929, 955, 1054, 1195
- Housing, 34f, 35, 54f, 146, 1176, 1207,
1223, 1233, 1244 (see aviary)
crowded, 1179
galvanized wire toxicity and, 54
hygiene, 37
in Anseriformes, 1244, 1269
in Columbiformes, 1207
in Galliformes, 1223, 1228, 1233
in ratites, 1300, 1301
indoor environment, 146
nest box size, 54t
suspended flights, 53
- Humerus (see anatomy overlay)
in egg laying, 753
surgical repair of, 1156f
- Humidity, 792, 1097
- Hunting, falconry, 19
- Husbandry, 50, 61
in Galliformes, 1223
in Passeriformes, 1175
- Hyclate, 462
- Hydrated collagen, 687
- Hydroactive (HAD) dressing, use of, 412,
420, 1099
- Hydrocephalus, 746, 822
- Hydrochloric acid, 464
- Hydrocolloid dressing, 420
- Hydrogen peroxide, use in bleeding, 399,
987
- Hydropericardium, causes of, 371, 717t,
904, 1198
- Hydroxyzine hydrochloride, 636
- Hyperactivity, 732, 1044
- Hypercalcemia, 407, 589, 769
- Hypercholesterolemia, 464
- Hyperestrogenism, 256, 314, 518, 592,
637
- Hyperexcitability, 743
- Hyperglobulinemia, with reovirus, 897,
911
- Hyperglycemia, 234, 605, 915, 1039
- Hyperkalemia, 542, 705t, 706, 915
- Hyperkeratosis, 164c, 558, 609, 618,
632, 859, 1001, 1196
in ratites, 1298, 1310c
malnutrition and, 852, 859, 1173, 1196
- Hypernatremia, in waterfowl, 1245
- Hyperostosis, 406, 407f, 769
- Hyperparathyroidism, 371, 373, 582,
590, 591
secondary nutritional, 590, 857-858, 1258
- Hypersensitivity responses, 114, 119, 120

- Hyperthermia, 463, 1203
 clinical signs of, 413, 829
 emergency treatment of, 414
- Hyperthyroidism, 593, 596
- Hyperuricemia, 554
- Hypervitaminosis A, 852, 1046
- Hypervitaminosis D, 74, 551f, 592, 845, 855, 1046
 high-protein diets and, 850
 renal damage and, 239
- Hypoadrenocorticism, 598-601
- Hypoalbuminemia, 911, 915
- Hypocalcemia, 411, 464, 592
 cardiac effects of, 705t
 dietary management of, 858
 hemorrhagic conure syndrome with, 934
 in African Grey Parrots, 411
 neuromuscular disease and, 737
 seizures and, 857-858
- Hypochromasia, 188
- Hypoglossal nerve (CN XII), 726
- Hypoglycemia, 234, 389, 738, 821, 852, 934
- Hypokalemia, cardiac effects of, 705t, 709, 710, 714
- Hyponatremia, 554
- Hypopennae, 1220
- Hypophosphotemia, 590
- Hypoproteinemia, 1310c
- Hypopteronosis cystica* (see feather cyst)
- Hypopyon, 911
- Hypothalamus, 583
- Hypothyroidism, 465, 595, 637, 844
 iodine and, 860
- Hypovitaminosis A, 166, 487, 552, 558, 845, 853, 1250, 1298
 aspergillosis and, 1001
Candida vs, 999
 embryo death and, 787
 ocular disease and, 679, 680c
 syringeal granuloma, 853f
- Hypovitaminosis B₁ (thiamine), 733
- Hypovitaminosis B₂ (riboflavin), 733
- Hypovitaminosis B₆ (pyridoxine), 733
- Hypovitaminosis D, skeletal disorders, 250, 845, 848, 853, 1257
- Hypovitaminosis E, 731, 854, 1298
- Hypoxia, cardiac effects, 709
- Hysterectomy, 407, 408, 760, 770-772, 1129 (see salpingohysterectomy)
- I** Iatrogenic intoxications, 1045
- Ibuprofen, 1113
- Icterus, 523, 1062
- IDEA test, for *Chlamydia*, 992
- Identification systems, 40, 49, 611, 810
- Idiopathic epilepsy, 410, 738
- Ileus, 255, 826, 1035, 1039
 radiology of, 255, 258
- Iliotibialis, 1213
- Illness, increased metabolic rate, 73
- Imaging, 246-346 (see radiography)
 air sacculitis, 317f
 air sacculography, 294f
 alternative, 260
 Amazon, 262f, 264f, 265f, 267f, 268f, 269f
 Amazon, head, 266f
 Amazon, pelvic limb, 720f, 721f
 Amazon wing, 269f
 bone lesions and, 324f
 cardiomegaly, 313f
 cloacal distention, 317f
 cockatiel, 272f, 273f, 274f
 contrast studies and, 318f, 319f, 321f, 322f, 330f
 duck, 275f, 276f, 277f
 duck, head, 279f, 280f, 281f
 duck, pelvic limb, 282f
 duck, wing, 283f
 egg-binding, 315f
 egg-related peritonitis, 315f
 femoral head necrosis, 324f
 fibrosing cellulitis, 292f
 goose, head, 279f
 hepatitis, 312f
 Hyacinth Macaw, 291f
 hyperestrogenism, 314f
 lipidosis, 311f
 liver herniation, 316f
 mass and, 298f, 302f
 microhepatia, 310f
 nephromegaly, 308f, 309f
 ovary, 314f
 peafowl, 290f
 pigeon, neonate, 323f
 pneumonia, 301f, 303f
 quail, 284f, 286f
 quail, head, 287f, 288f
 quail, wing, 289f
 quail, pelvic limb, 290f
 renal calcification, urogram, 307f
 respiratory tract and, 298f, 304f, 305f, 306f
 restraint and positioning, 248
 rhinogram, 294f
 round cell tumor, 302f
 sinography, 295f, 296f, 297f
 splenomegaly, nephromegaly, 313f
 tracheal mass, 299f, 300f
 Trumpeter Swan, 278f
- Imaging technique, 246 (see radiographic technique)
- Imidazole antifungals, 459
- Immune complex reactions, 120
- Immune response, 114, 119, 754, 849
 cell-mediated, 118
- Immune stimulant, 389, 462, 465
- Immune system, 110-119
 disturbance of, 119
 humeral system, 115
 immunoglobulins, IgM, IgG, IgA, 115
 in Anseriformes, 1244
 lymphocyte activity, 116
 macrophage, 112t
 mechanisms of the avian host, 109
 myeloid system, 111
 pH, low intestinal environment, 111
 weakened from inbreeding, 110f
- Immunodiffusion assays, problems of, 121
- Immunogenic glomerulonephritis, 120
- Immunoglobulins, 115, 754
- Immunoregulin, 464
- Imunosuppression, 119, 461, 468, 772, 870, 897, 910, 914, 931, 1001, 1017, 1256
 in Columbiformes, 1208
 in Passeriformes, 1189
 in waterfowl, 1265
- Impaction
 in Columbiformes, 361, 828, 1205f
 in ratites, 1313c
 in neonates, 828f
 in Anseriformes, 1254
- Impregnated pellets, CTC, 460
- Imprinting, 97, 772, 775, 783, 1180, 1243, 1301
- Inbreeding, 713, 784, 792
- Inclusion bodies, 125, 878, 882, 889, 906, 1016
 differentiation of, 890
 hepatitis, 878, 882
- Incoordination, 462
 viral disease and, 774, 881, 911, 937
 vitamin E and, 855
 NGD with, 942
- Incubation, 757, 788, 796, 1227, 1229
 artificial, 788, 1227t
 chicks and, 62, 790, 791t, 805
 common problems with, 790-795
 embryonic death and, 790, 792
 in Anseriformes, 1241t, 1253
 in Columbiformes, 1210t
 in Galliformes, 1227t
 in Passeriformes, 1176t
 in Psittaciformes, 789t
 in Ramphastidae, 1279
 in ratites, 1303, 1318, 1320, 1324
 natural, 785
 parameters for, 792-794
 periods of, for common species, 789t
 requirements of, 788, 789
- Incubator management, 790, 791
- Indeterminate layers, 752, 783
- Indian Hill Mynah, 858, 872, 929, 1197
- Indocyanine green, 242
- Indolent corneal ulcers, 1100
- Infectious
 disease outbreak, 60, 807
 esophagitis, 880
 laryngotracheitis virus, 579, 875
 neuropathies, 741
 salpingitis, adenovirus, 903
 stunting syndrome (ISS), 507, 513
- Infertility, 460, 784, 786t, 792
 malnutrition and, 849, 855
- Influenza A virus (see avian influenza)
- Influenza C, 929
- Influenza virus, 704, 705t, 707, 709, 924, 1057
 in ratites, 1309
 in Anseriformes, 1237
- Infra-acoustic waves, 1204
- Infraorbital
 air sac, inflation, 1105 (see anatomy overlay)
 diverticulum, flushing of, 203f
 sinus, 160, 558, 905, 1106f (see anatomy overlay)
- Infrared heat lamp, 1254
- Infundibular cleft, 353c, 485
- Infundibulum, 561, 749
- Ingluvies (see crop)
- Ingluviolith, 495c, 497f
- Ingluviotomy, 414, 828, 1115, 1117f
- Injacom, 469
- Injectable anesthetics, in Anseriformes, 1262
- Injections, 1203, 1212, 1213, 1221
- Insecticide (see pesticide)
- Insectivore, low-protein diet for, 851
- Insectivorous Passeriformes, 558, 1173

INDEX

- Insects, as viral vectors, 912, 916, 1215
 Insemination, artificial (see artificial insemination)
 Inspiration, fresh air, 569
 Inspiratory strider, 711f
 Instincts, avian behavior and, 724
 Insulin, 603
 Insurance, ratites and, 1309
 Integument (see dermatology)
 anatomy of, 608-611f, 615f
 diseases of, 621t, 622t
 in Columbiformes, 1202
 in Galliformes, 1219, 1233
 lesions, general therapy for, 622
 physiology of, 608
 Interdigitating bandage (see bandage)
 Interferon, antiviral, 862
 Interleukin 1, 112
 Interleukin 2, antiviral, 932
 International Chick Units (ICU), 83
 International Racing Pigeon Association, 1201
 International System of Units, 226, 1328t
 Interosseus metacarpal artery, 1269
 Interstitial cell tumors, 774
 Intervertebral discs, 734
 Intestinal
 disease, 904, 942, (see gastroenterology)
 microflora, in Galliformes, 1225
 peritoneal cavity (IPC), 346
 surgery, 1124
 Intestinal tract
 gas in, 255
 length of, in Columbiformes, 1203
 in ratites, 1313c
 Intracranial pressure, 465
 Intramedullary PMM, 1149
 Intramuscular injection, 388, 440, 1181
 Intranuclear inclusion bodies, 125, 881, 906
 Intraocular
 pressure, 465
 tumors, 689
 Intraosseous cannula, 386-387, 1133f, 1134, 1181
 Intraventricular conduction
 disturbances, 710
 Intubation, 1068f
 Intussusception, 507, 828
 Iodide, 93
 Iodine, 461, 464, 860, 1190
 Ionophore coccidiostat, 1307
 Iothalamate sodium, radiography, 259
 Iprnidazole (Ipropran), 464
 Iris, 676, 728
 Iron, 72, 92, 235, 462, 858
 deficiency of, 188
 dextran, 464
 diet low in, 713
 diet high in, 1197
 oxide, in Columbiformes, 1204
 Iron storage disease (see hemochromatosis)
 Iron storage protein ferritin, 530
 Ischemic infarction, 736
 Ischiatic plexuses, 727
 Isoelectrical lead, 701f
 Isoflurane, 135, 705, 1066, 1213 (see anesthesia)
 in Anseriformes, 1270
 in Ramphastidae, 1280
 recovery from overdose, 711
 Isolation areas, for new or sick birds, 60
 Isoniazid, 464, 468
Isospora, 1015, 1191t, 1012f
 Israel turkey meningoencephalitis (ITM), 918, 919
 ISS (see infectious stunting syndrome)
 Isthmus, 498f, 749, 1121, 1123
 Itraconazole, 451, 453-455, 464, 999, 1004
 Ivermectin, 464, 499, 1196, 1314, 1316
 environmental toxicity of, 464, 1045
- J** Japanese B-encephalitis, (JBE), 919
 Jaundice, 523, 1193
 Jaw tone, reduced, 686, 732
 Joint abnormalities, 463, 982, 1054, 1146
 in Anseriformes, 1269
 Junctional tachycardia, differentiation, 707
 Junglefowl, 1231
- K** Kanteling, in ostriches, 1302
 Kaolin, activated charcoal, 458
 Kaprycidin A, 459
 KE apparatus (see external fixator)
 Keel, abscesses of, 1258
 Keel-billed Toucan, 1276, 1282
 Kelp, 87
 Keratin, in Columbiformes, 1202
 Keratinocytes, 611
 Keratitis, 679, 686, 687, 1101
 in ratites, 1295c
 Keratoconjunctivitis, with *Chlamydia*, 989
 Keratogenic cysts, 487
 Keratomas, 632
 Kerosene fumes, toxic, 1049
 Ketamine hydrochloride, 462, 711, 1213, 1214
 Ketoconazole, 455, 459, 464, 1005, 1189, 1190
 Ketones, presence of, 150
 Ketonuria, 549, 843
 Ketosis, 843
 Kidney, 74, 539, 851 (see nephrology)
 anatomy, physiology, 539 (see anatomy overlay)
 calcification of, 74
 Kinky back, with *Staphylococcus*, 967
 Kirschner wires, 1146
 Kirschner-Ehmer (KE) device (see external fixator)
 Kiwi, 1284, 1285
Klebsiella, 956, 1189
 in Galliformes, 1232
 in Ramphastidae, 1281
 in ratites, 1309
 Knee web, 611, 1118
Knemidokoptes, 40, 464, 631c, 1026
 ocular disease and, 680c, 684
 in Passeriformes, 1196
 Knob, 607
 Knuckling over, 728
 Koilin membrane, 1289 (see ventriculus)
- L** L-form bacteria, 459, 955, 967, 969
 Laboratories
 fax, security of, 141
 samples, submission of, 138, 140-142
 Laboratory tests, not diagnostic alone, 226
 Lacrimal gland, 675
 Lacrimal sac abscesses, 684
 Lacrimation, 905, 931
 LaCrosse fever virus, 919
 Lactate dehydrogenase (LDH), 231, 890, 911, 916, 989, 1243
 Lactated Ringer's solution (LRS), 384, 464
 Lactobacillus, 111, 465, 575, 978, 980, 955
 Lactophenol cotton blue, fungal and, 999, 1003
 Lactose, 78
 Lactulose, 439, 464, 465, 467, 536, 953
 Lady Amherst's Pheasant, 1231
 Lafora body neuropathy, 738
 Lake Victoria Cormorant herpesvirus, 875, 883
 Lamellae, 1238, 1249
 Lameness, 935, 942, 999, 1001
 Laparoscopy, in Passeriformes, 1178
 (see endoscopy)
 Laparotomy, 770, 771 (see celiotomy)
 Larynx, 560
 Lasalocid, 1307
 Laser surgery, 1113
 Lasix, 463
 Latex agglutination, aspergillosis and, 1003
 Latitude, effects on, Anseriformes, 1243
 Laxative, mineral oil, 466
 Laying ducks, nutrient requirements for, 1250
 Laying process, calcium levels, 753
 Lead
 ALAD levels and, 1037
 analysis for, 1036
 blood levels and, 1036t
 cardiac effects of, 709
 CNS signs, 739, 1038
 ECG and, 701
 in Anseriformes, 1263
 intoxications vs picornavirus, 937
 muscle tissue and, 1034
 sources of, 1034t
 testing kit, 1035
 toxicosis, 258, 459, 550, 1033, 1034, 1035, 1198
 treatment for, 458, 1038
 Left lateral, celiotomy, 1120
 Left-to-right (LeRtL) view, radiograph and, 248
 Leg
 band, injury, 42f (see band, leg)
 chains, warning against use, 36f
 deformities, 823, 830, 850, 858, 1161, 1165f, 1298, 1310c, 1324
 paresis, 724, 743, 1035, 1264
 surgical approach to, 1159f
 weakness, with NGD, 942
 Leiomyomas, 770
 Leiomyosarcomas, 770
 Lember pattern, 1124
 Lens luxation, cataract and, 687
 Lens removal, 1100
 LeRtL, left-to right lateral view, radiograph and, 248
Leucocytozoon, 190, 194c, 533, 1020

- in Passeriformes, 1193
 - in ratites, 1314
 - Leucopenia, 189, 882, 911
 - Leukemia virus (SLV), 931
 - Leukemic blood panel, and neoplasia, 668
 - Leukocyte morphology, 111, 186t
 - Leukocytosis, 189, 194, 942, 1188
 - Leukosis, 553, 587, 774, 933
 - in Passeriformes, 1187
 - Leuprolide, 465
 - Levamisole, 465, 499, 1004, 1193-1195
 - toxicity of, 1045
 - Levinthal-Cole-Lillie (LCL) bodies, 985
 - Levothyroxine sodium, 465
 - LH (see luteinizing hormone)
 - Libyostrongylus*, in ratites, 1314
 - Lice, 464, 1197
 - Lid paresis, 686
 - Lidocaine, 1133, 1214
 - Ligament, dorsal of uterus, 749
 - Light
 - for Arctic circle waterfowl, 1257
 - relationship to breeding, 51, 584, 853, 1175, 1233
 - Limberneck (see *C. botulinum*)
 - Lincomycin, 450, 465, 686
 - Lincosamides, pharmacology, 449
 - Lipase, 236
 - Lipemia, 234, 465, 844
 - Lipid production by keratinocytes, 611
 - Lipid solution, 393
 - Lipogenesis, 851
 - Lipoma, 213, 221c, 595f, 640, 642, 662
 - breeding and, 784
 - treatment of, 1133
 - Liposomes, 127
 - Liquid diets, 1125
 - Lissencephalic, 724
 - Listeria*, 718, 744, 976, 1188
 - CNS signs and, 744
 - in Galliformes, 1232
 - Live yeast cell derivatives, 419
 - Liver, 522, 536 (see hepatology)
 - biopsy of, 530, 532
 - cirrhosis of, 530, 1265
 - damage, 362, 524, 526, 772
 - disease of, 405, 414, 465, 530, 532-536, 853, 1280
 - enlargement, hemorrhages, 878
 - enzymes and, 524
 - fatty infiltration of, 828, 849, 851, 856
 - flukes, 460
 - function, 524
 - hemorrhagic syndrome and, 851, 1186
 - herpesvirus lesions, 882
 - in oil-contaminated birds, 1263
 - in ratites, 1308
 - Mycobacterium* and, 973
 - mycotoxins and, 1043
 - neonates and, 506, 828, 832c
 - normal, 526c
 - posthepatic septum, 515
 - rupture, 526c
 - specific enzyme for, 524
 - tumors, classification, 536
 - Local inflammation, 120
 - Loft, pigeons and, 1206t, 1207
 - Longevity
 - in Anseriformes, 1244t
 - in companion birds, 30t
 - in Galliformes, 1223t
 - Lorelco, 465
 - Lory, 463, 878, 977
 - Louping Ill virus, 919
 - Lovebird, eye disease of, 679
 - LRS (see lactated Ringer's solution)
 - Lugol's solution, 464
 - Lumbar plexuses, 727
 - Lumbosacral spinal cord lesion, 729
 - Lung
 - cancer, risk of, human, 37
 - movement of, 167
 - normal, 362
 - parenchyma, radiograph, 252
 - pigeon breeder's, 1202
 - resistance to disease, 112
 - Lupine, 1041
 - Lutalyse, 462
 - Luteinizing hormone (LH), 583, 751, 753
 - Luxations, repair of, 1161
 - Lymph follicles, 116
 - Lymphatic erection, 756
 - Lymphocytes, in Anseriformes, 1244
 - (see hematology)
 - Lymphocytic blood differential, in
 - Columbiformes, 1204
 - Lymphocytosis, 189
 - Lymphoid leukosis, 587, 774, 933
 - Lymphoid neoplasia, 116, 221c
 - Lymphokines, 118
 - Lymphomatosis, 770
 - Lymphopenia, 599
 - Lymphorensis, 184c, 197
 - Lymphoproliferative disease (LPD), in
 - turkeys, 931, 932
 - Lymphosarcoma, 352, 529, 1197
 - Lysine, 72-74
 - in Anseriformes, 1250
 - Lysozyme activity, 1251
- M** M response, 730
- M. avium*, (see *Mycobacterium*)
 - M. flexor cruris medialis*, 342
 - MAC, 1068
 - Macaw, 29, 75, 97, 462, 523, 886-888, 927
 - beak deformities, 836
 - biochemistry values in, 1329t, 1334t, 1336t
 - constricted toes, 831
 - doxycycline dose, 448
 - drug susceptibility, 449, 1046
 - effects of aging, 149t
 - hematology values, 1333t
 - hepatic lipidosis, 829
 - regurgitation and, 827
 - vitamin D toxicity in, 51, 74, 469, 829
 - wasting disease (see neuropathic gastric dilatation)
 - Macchiavello's stain, 532, 987
 - Macrolide, 449
 - Macrophages, complement factors, 112t, 113
 - Maggots, 739, 1263
 - Magnesium, 91, 858, 1244
 - feather quality and, 846, 848
 - Magnetic field, flight orientation, 1204
 - Magnetic resonance imaging (MRI), 723, 734, 736
 - Magnum, 749
 - Malabsorption, 149, 173c, 845, 969
 - Malaria, 460, 467, 936, 1192
 - Malathion, 1316
 - Male
 - behavioral abnormalities, 775
 - courtship, in Passeriformes, 1178
 - imprinted on humans, 775
 - reproductive disorders, 774, 777
 - Mallard Duck, 927, 1039, 1243, 1247, 1255, 1257
 - Malnutrition, 842-861, 1030, 1224
 - biotin, 857
 - calcium to phosphorus ratio, 858
 - carbohydrate, 851
 - cardiac effects, 713
 - choline, 857
 - clinical conditions associated with, 843-849
 - copper, 859
 - fatty liver, 844
 - feather changes, 846f
 - folic acid, 857
 - formulated diet and, 849f
 - in Anseriformes, 1257
 - in Passeriformes, 1189, 1196
 - infectious disease and, 1001
 - insectivore, low-protein diet, 851
 - iodine, 859-860
 - iron, anemia, 858
 - magnesium, 858
 - manganese, 859
 - minerals, 857-860
 - neurologic signs and, 848
 - niacin, 856
 - nutrient deficiencies, 849
 - obesity and, 843, 844f
 - ocular lesions and, 679
 - pantothenic acid and, 856
 - potassium, 860
 - protein and, 850
 - pyridoxine, perosis, 856
 - reproduction and, 762, 772, 774, 792, 849
 - riboflavin, 856
 - selenium, 859
 - skeletal disorders and, 848
 - skin changes and, 848
 - sodium and chloride, 860
 - symptoms of, 146f
 - thiamine, seizures, 856
 - vitamins, 852-857
 - water, 860
 - zinc, 859
 - Malunion, types, 1142t
 - Mammography, 247
 - Managing disease outbreaks,
 - histopathology, 60
 - Mandible, 558, 609, 728, 837, 891
 - Manganese, 72, 93, 859
 - feather quality and, 846
 - in ratites, 1298
 - in Anseriformes, 1258
 - Mannitol, 411, 413, 465
 - Marble spleen disease, 903, 907
 - Marek's disease virus, 645, 653, 744, 874, 884
 - Marijuana, 1047
 - Marine diatoms, 741
 - Mast cell tumor, 645
 - Mastadenovirus, 903
 - Masturbatory behavior, 772, 775
 - Maternal immunity, 754
 - Maxitrol, 688
 - Maxilla, 609

INDEX

- Mealworms, 1225
 Mean corpuscular hemoglobin concentration, (MCHC), 180
 Mean corpuscular volume (MCV), 180
 Mean electrical axis, 696-702f
 Measurement, units of Systeme International d'Unites (SI), 226, 1328t
 Mebendazole, 465
 Mechanical ileus, radiography, 258
 Meckel's diverticulum, 116
 Medroxyprogesterone acetate, 465, 621, 636
 egg binding and, 761
 peritonitis and, 771
 Medullary calcification, 251, 753 (see hyperostosis)
 Megabacterium, 174, 372, 464, 499, 978, 980f, 982c, 1188
 Megapodes, 611, 1219, 1225, 1228
 Meglumine diatrizoate, radiography, 259
 Meibomian glands, 675
 Melanin, and feather quality, 847
Meleagris gallopavo, *forma domestica* (see Galliformes, turkey)
 Melena, 149, 404, 656, 908 (see hematochezia)
 Menace reflex, 728
 Meningeal cryptococcosis, 453
 Meninges, 724
 Meningocele, 746
 Meningoencephalitis, 741, 881
 Mental status, and neurologic disease, 728
 Mercury, toxicity of, 774, 1040
 Merganser, 363c, 1246
 Mesotocin, 583
 Metabolic
 acidosis, 389
 disease, 813f, 1076
 rate (BMR), in Passeriformes, 1173
 scaling, 1349
 tests, causes of increases in, 231
 Metabolizable energy (ME), 74, 78
 Metal toxicities, chelating agents for, 1038t
 picornavirus vs, 937
 Metamucil, 464
 Metapatagium, 611
 Metaphysis, 1142
 Metazoal parasites, 1232
 Methionine, 72, 846, 1250
 Methomidate, 1213
 Methomyl, toxin, 1050
 Methoxyflurane, 711, 1068, 1261
 Methoxymol, use in ducks, 1260
 Methridine, *Capillaria* in raptors, 465
 Methylcellulose, 464
 Methylene blue, diagnosis of
 aspergillosis, 999, 1003
 Methylprednisolone acetate, 465
 Metoclopramide HCl, 403, 465
 Metomidate, 1260
 Metritis, 462, 760, 768
 in ratites, 1318
 Metronidazole, 406, 466, 686, 741, 1209, 1282
 toxicity in finches, 466
 Mibolerone, 466
 Miconazole, 452, 466, 999, 1004
 Microbiology, courier service for, 377
 Microcardia, causes of, radiograph, 697f
 Microchips, 42-43, 49, 810, 1300f
 Microfilaria, 463, 576, 1193
 Microhepatia, 153c, 254, 310, 531, 739f
 Microphthalmia, 684, 746
Microsporium, 625, 1189
 Microwave oven, 401, 1114
 Mid-tibiotarsus, cast repair, 431f
 Midbrain, 724
 Migration, fat reserves, 1248
 Migratory Bird Treaty Act, 1237
 Mikado Pheasant, 1228
 Milk, crop, 1210 (see crop milk)
 Mimicking, talking ability, 27t, 1174
 Mine wastes, in waterfowl, 1264
 Mineral, 89
 antagonists, 68
 mixture for pigeons, 1206
 oil, 466
 requirements, 1252t
 Mineralization, soft tissue, 84 (see gout, hypervitaminosis D₃)
 Mineralized eggs, radiography, 256
 Mineralocorticoid, 600
 Minimal inhibitory concentration (MIC), 435
 Mink, influenza virus in, 929
 Minocycline, 448
 Mirrors, 36
 Mist nets, 1260
 Misting, 1178
 Mite, 59, 459, 464, 916, 1026f, 1176
 egg of, 1012f
 protectors, 38, 1027, 1051
 in Passeriformes, 1196
 in ratites, 1317
 tracheal vs *Streptococcus*, 970
 Moist dermatitis, 464
 Mollicutes, 1215
 Molt, 618
 cycle, 159, 547, 618-620, 926, 1220
 in raptors, aminoloid, 458
 in Anseriformes, 1239, 1244
 Monensin, 459, 461, 466, 1307
 Monistat, 466
 Monk Parakeet, 28, 30, 714
 Monoclonal antibodies, 127, 864
 Monocular vision, 724
 Monocytosis, 189, 976, 1188 (see hematology)
 Monogamy, 781, 1209
 Monsel's solution, 39, 463, 1269 (see hemorrhage)
Moraxella, 964
 Morbillivirus, 920
 Morphine, 466
 Mosquito, as disease vector, 624, 924, 934, 960, 1192, 1193
 Motion sickness, 107
 Mourning Dove (see Columbiformes)
 MRI (see magnetic resonance imaging)
 Mucoid tracheitis, with PMV-3, 927
 Mucolytic agents, 390, 458
Mucor, 625, 1003, 1005
 Mucormycosis, 456, 575, 1005
 Multifocal ventricular rhythms, in Anseriformes, 1262
 Murexide test, 542
 Murray Valley Encephalitis virus (MVE), 919
 Muscle
 cell necrosis, 229
 pectoralis, 1213
 Muscular dystrophy, 732, 1250
 Muscularis complexus, hatching muscle, 793
 Musculoskeletal disorders, 829
 Muskgrass, 1247
 Mute Swans, 1257
Mycobacterium, 352, 363c, 437, 463, 486, 518, 971-975
 aspergillosis vs, 1003
 cytology and, 221c
 in Columbiformes, 1211
 in Galliformes, 1236
 in Passeriformes, 1188
 in Ramphastidae, 1282
 ocular disease and, 684c
 paratuberculous form, 973
 viral diseases and, 883
 Mycoplasma, 437, 443, 450, 469, 574, 718, 795, 1053
 avian hosts, clinical signs, 1053t, 1060
 Chlamydia vs, 990
 diagnosis of, 1060
 egg transmission and, 1058
 in Anseriformes, 1057
 in Columbiformes, 1058
 in Galliformes, 1056, 1057f, 1232
 in Passeriformes, 1059, 1187
 in ratites, 1303t, 1314
 influenza vs, 931
 metritis and, 768
 ocular disease and, 685
 parvovirus vs, 909
 treatment, 1060
 Mycoses, 997-1006
 antifungal agents, 999t, 1003-1004
 in Columbiformes, 1215t
 in Galliformes, 1232t
 in Ramphastidae, 1282
 in ratites, 1303t
 neuropathies with, 741
 treatment of, 437, 466, 741
 Mycotoxins, 69t, 68, 553, 857, 1004, 1033, 1043, 1206 (see aflatoxin)
 breeding and, 784
 CNS signs and, 741
 formulated diets certified free of, 1043
 in Anseriformes, 1265, 1267t
 in Galliformes, 1232
 in Ramphastidae, 1282
 sources and pathology, 69t
 treatment of, 1043
 Mydriasis, 674, 1101, 1266
 Myeloblastosis, 933
 Myelography, 260, 734
 Myenteric plexus, 942
 Myeloblast, 193
Myrialgae, pruritus and, 1028
 Mynah bird, 366, 459, 464, 713, 738, 1172, 1189, 1195
 blood parasites in, 1192
 hemochromatosis in, 1197
 keratitis and, 687
 ocular disease and, 679
 parasites in, 1196
 reproductive characteristics of, 1176t
 Myocardial degeneration, Psittaciforme, 717
 hypoxia, 705, 711f

- infarction, heavy metal poisoning, 717
 Myocarditis, 518
 causes of, 717t, 912f
 Myoglobinuria, 550
 Myopathy
 degenerative in ratites, 1307
 primary, 730
 Myoventricular dysgenesis, 504
 Myxedema, 595
 Myxomatous, glandular tissue
 proliferation, 575
 Myxosarcoma, REV, 934
- N** Nail
 bleeding, treatment for, 39
 clipping, 38f
 overgrowth and liver disease, 523f
 Naloxone, 466, 734
 Naphthalene, toxicity, 1051
 Naprosyn, 1113
 Nasal
 aspergillosis, 1002f
 discharge, 160, 877, 912, 1190, 1266
 salt gland, 240, 860, 1245
 septum, 559
 sinuses, in Passeriformes, 1173
 Nasolacrimal ducts, 675, 680c, 684, 685f
 National Animal Poison Control Center, 1033
 Nebulization, 390, 441, 573, 574
 Neck braces, 1094, 1125
 Neck stretching, in Passeriformes, 1190
 Necropsy, 355-379
 air sacs, 361c, 365
 antibody, fluorescent, 377
 bone, 375
 brachial plexus, 374
 brain, 369, 372c
 communication with pathologist, 357
 brain, encephalitis, Amazon, 372c
 cloacal bursa, 368
 crop, 372c
 fecal material, fixative solutions for, 379t
 fixatives for tissue, 378t
 form, 356f, 357
 heart, 371c
 histopathology, tissues routinely
 collected, 376t
 instruments, disinfected, 357
 ischiatric nerve, 374
 kidney, 362c, 368
 lung, 362c, 368
 normal organs, 371c
 oviduct, 368
 pancreas, duodenum, relation to, 360c
 parasite, 377, 379t
 pericarditis, 371c
 procedure, 359-363f
 proventriculitis, Anseriformes, 372c
 sacral plexus, 374
 spleen, 367
 staining, 377
 thymus, 372c
 thyroid gland, 370c, 370c
 tissue for histopathology and electron
 microscopy, 357
 toxicology, samples for, 377
 urate crystals, 375
 vaccine reaction, 372c
 ventriculus, 368
 vertebral column, 362c, 369
 viral isolation, tissue to collect, 377
 zoonotic precautions, 357
 Necrotic enteritis, *Clostridium* and, 977
 Necrotic tracheitis, 1234f
Neisseria, 774
 Nematodes, 464, 465, 486, 507, 1194
 in Galliformes, 1232, 1236
 in Passeriformes, 1194
 in ratites, 1314t
 Neomycin, 466, 1103
 Neonate, 805-839
 abandoned, 807
 abdominal distention, 821
 abnormal urine, 829
 anorexia, 821
 beak problems, 836, 837
 body weight charts, 818t, 829
 bone deformities, 823
 clinical signs of illness, 822t
 congenital abnormalities, 822
 critical care of, 821
 crop and, 809, 819, 825, 826, 828, 835c
 developmental characteristics of, 816
 diagnostic procedures, 819-820
 diets, hand-feeding, 808, 811t, 850
 disease outbreak, handling procedures,
 822t
 droppings, 819
 ear, membrane of, 838f
 edema, in ratites, 1324
 egg tooth, 808f
 endoscopy of, 820
 eyes, 817, 838
 feather plucked, 807
 feeding, 808, 811-814, 812f, 835c
 fetal monster, 832c
 foreign body ingestion or impaction, 828
 fostering, 806
 gout, vitamin D₃, toxicosis, 829
 hand-raising, 806, 808-820
 hepatic lipidosis, 828
 hepatomas, 829
 ileus, 826
 infectious diseases, 807, 814, 823-825
 integument, 819, 837
 leg deformities, 807, 816f, 830f, 831f,
 832c
 liver, 832
 management, in Anseriformes, 1253,
 1255, 1256
 management, in Galliformes, 1226
 management, in ratites, 1320, 1324
 manufacturers of diets, 811t
 microbial flora, 808, 820, 823
 musculoskeletal disorders, 829
 nestling posture, 817
 nursery management, 809, 810t, f, 1135
 omphalitis, 835
 parasitic infections, 807, 808, 825
 parent-raising, problems with, 807t-808t
 pharyngeal trauma, 825
 pipping muscle, 820f
 pneumonia, aspiration, 828
 problems of, 807, 820-838
 radiographic characteristics, 249, 820,
 832
 regurgitation, case report, 827, 835c
 stunting, 821, 822f
 surgery in, 1135
 ventricular septal defect, 816f
 weaning, 813
- Neoplasia, 505, 640 (see oncology)
 in Passeriformes, 1198
 in ratites, 1308
 reproductive tract and, 650, 770, 774
 Neoplasms
 circulatory system and, 646
 differentiation of, 670t
 feminization or masculinization, 651
 nervous system and, 736
 NGD vs, 942
 of muscles, 647
 of urogenital system, 650-654
 specific treatment for, 670t
 Neoplasmic, 1174
 Nephritis, 541f, 547, 551, 914
 Nephroblastoma, 553
 Nephrons, 539
 Nephrocalcinosis, 84, 551f, 855
 Nephroenteritis, 909, 943
 Nephrology, 538-558
 amyloidosis, 552
 anatomy, physiology of kidney, 539
 cellular cast, 549
 chemical test and strips, 549
 electrolyte changes and, 542, 554
 endoscopy of, 550
 Fanconi's syndrome, 549
 flow-osmol factor, definition of, 548
 glucose, urine and, 548, 549
 gout, 539, 540f, 544c, 547c
 granular cast, 549
 infectious diseases, 550
 ketonuria, 549
 kidneys, normal, 544c
 malnutrition and, 551
 metabolic disorders, 551
 neoplasia and, 544c, 547c
 nephritis, 547c, 551
 nephrons, 539
 nephropathy, 554
 non-nephrotoxic antibodies, 554
 pathophysiology, 539
 Ponceau S method, 548
 porphyrin, urine test for, 550
 postrenal renal failure, 541, 553
 prerenal renal failure, 541, 553
 prerenal azotemia, definition of, 541-542
 radiography, 550
 renal hemorrhage, 547c, 553
 renal dysfunction, clinicopathologic
 diagnosis, 541-543
 renal, agenesis, 552f
 renal output, 539
 renal failure, 541, 553, 554
 therapeutic considerations, 553-555
 toxic, nephropathies, 553
 ureteral obstruction, 553
 uric acid, 540, 542
 urinalysis, 543t, 547c-549
 urinary enzymes, 549
 urine concentration ability, 543
 urine water, reabsorbed from colon, 539
 urography, 551
 water deprivation, 548
 Nephromegaly, 74, 245t, 256, 308, 309,
 313, 362
 Nephropathies, 904, 906
 Nephrotoxicity, 444, 458, 463, 538, 1046
 Nerve conduction velocities, (NCV), 730
 Nerve injury, 734

INDEX

- Nervous system, disease of, 723, 877, 904f, 922, 999, 1044, 1264
- Nest
behavior in, 1129
box, 54t-56, 58, 783, 788, 806, 807
building, 757, 1178
material, problems, 56, 807
- Neurapraxia, 734
- Neurocalcinosis, 1251
- Neurologic examination, 727
- Neurology, 723-748
diagnostic technique, data base, 729
- Neuromuscular disease, vitamin E, selenium, 469, 728, 737
- Neuropathic gastric dilatation (NGD), 155, 348, 500f,t, 501, 502f, 704f, 743, 825, 924, 1123, 1269
case report, 869c
diagnosis of, 258, 501, 942f, 981f
leukocytosis with, 942
viral serositis vs, 917
- Neuropathies, 727, 731
bacterial, 744
infectious, 741
metabolic, 736
toxic, 739
traumatic, 733
viral, 743
- Neurohypophyseal hormone, 583
- New bird kit, contents of, 134
- New duck disease, duck septicemia, 964
- New wire disease, 1198 (see galvanized wire)
- New World Psittacines, 886, 895, 911
- Newcastle disease, 143, 562c, 709, 768, 920-925
cardiac effects of, 705t
host susceptibility, 922t
in Anseriformes, 1237, 1267t
in Ramphastidae, 1282
in ratites, 1309
pathology, 924t-925t
Chlamydia vs, 990
- NGD (see neuropathic gastric dilatation)
- Niacin, 86, 856, 858, 1251
- Niclosamide, 466
- Nicotine toxicity, 966f, 1033, 1047
- Nidifugous young, 1228, 1253
- Nitrates, toxicosis, 1041
- Nitric acid, 542
- Nitrofurazone, 438, 466
- Nitromidazole, 496
- Nitrothiazole, toxicity in finches, 466
- Nizoral, 464
- Nocardia, 575, 978, 1005
- Nodules, miliary, with *Mycobacterium*, 973
- Nolvasan, 460
- Non-breeding season, 1209
- Non-determinant layers, 1228
- Non-selective angiography, 260
- Non-steroidal anti-inflammatory medications, 1113
- Non-stick cookware, toxicity, 1047
- Northern fowl mites, 808, 1209, 1215t
- Nortriptyline HCl, 466
- Nosocomial infection, 412
- Nuclear scintigraphy, 325
- Nucleic acid, 125
- Numida meleagris, forma domestica*, 1218
- Nuptial, 1239
- Nursery management, 808, 809t, 814f, 815, 823t (see neonate)
- Nuttallia* spp., in Passeriformes, 1192
- Nutrient
allowances, recommended, 71t
antagonists, 67
density, effect on energy level, 66t
debilitation needs, 73t
essential, biological functions, 78
interrelationships, 66
potential toxic effects, 75t
requirements, 69-72, 74, 394, 842, 1206
toxic potential, 75t
- Nutrition, 63-95 845, 850, 1177
bird health and, 64
chicks and, 805
energy, 78
energy nutrient density, 66t
essential nutrient and functions, 78-94
fatty acids, 81
fertility and, 786, 787
food sources, nutrient content, 79t, 80t
formulated diets, 76, 77
free-ranging birds and, 63
in Anseriformes, 1246, 1257
in Columbiformes, 1205
in Galliformes, 1224
labeling, commercial products, 76, 77
minerals, 75, 89-94
mycotoxins, 68, 69t
neuromuscular disease and, 731
oxidation, control of, 77t
plumage abnormalities and, 846
protein, 73, 74, 81, 82
research potential, 64
respiratory disorders and, 846
vitamins, 74, 82-89
water, 65
- Nutritional
deficiencies vs paramyxovirus, 928
deficiency, neonates, 811
support, sick birds, 390-396
hyperparathyroidism (see hyperparathyroidism)
- Nystagmus, 728
- Nystatin, 451, 454, 455, 466, 824, 999, 1189
- O** Oak toxicosis, 1042
- Obesity, 75, 164, 173c, 582, 596, 637, 844, 1121, 1133, 1248
anesthesia and, 1076
dyspnea and, 557
egg binding and, 758
hypothyroidism and, 582
in Galliformes, 1225
in ratites, 1301, 1313c
reproductive failure and, 775
species predisposition, 844
- Obstruction, tracheal/syringeal, 1107
- Obstruction, GI, 361
- Ocluded ear openings, 838
- Ochratoxin, 533, 1044
- Ocular lubricants, 679
- Ocular prosthesis, 1103
- Oculomotor nerve (CN III), 725
- Oculonasal discharge, chicks, 823
- Oil-contamination, 413, 598, 623, 628c, 1263
- Old World Psittacines, 742, 878, 895, 911
- Oleander toxicity, 1041, 1266
- Olfactory center, 724
- Olfactory navigation, in Columbiformes, 1204
- Olfactory nerve (CN I), 725
- Oliguria, 541 (see nephrology, renal failure)
- Omphalitis, 821, 835c, 1187, 1256
in ratites, 1309
- Onciola canis*, 496
- Onciola pomatostomi*, 1193
- Oncology, 640-672
adenocarcinoma, 605c, 644, 646
adrenal gland, 661
astrocytoma, 661
basal cell tumors, 644
bile duct hyperplasia, 658
biliary cyst, 658
bone cyst, 649f
bone neoplasia, 251, 649, 650f, 665c
carcinoma, 644, 662c
cartilage and bone, neoplasms of, 649
cholangiocarcinoma, bile duct carcinoma, 658
chondroma, 649
choroid plexus papilloma, 666
circulatory system, neoplasms of, 646
cloacal neoplasia, 657
cyst, ultimobranchial, 644, 646
digestive system, neoplasms of, 655
ectopic pulmonary ossification, 645
embryonal nephroma, 651
feather folliculoma, 644
fibroplasia, reactive, 644
fibrosarcoma, 643f, 645, 655c 662c, ganglioneuroma, 666
glioblastoma, 666
granulosa cell tumors, 653
hemangioma, 645, 647, 648f
hepatocellular neoplasia, 658
hibernoma, 642
integumentary system, neoplasms of, 641, 644, 655, 662c
interstitial cell tumor, 653
intestinal carcinoma, 657
islet cell carcinoma, 661
leiomyoma, 647, 657
lymphoid neoplasms, 645, 647, 662c, 667, 668, 653
malignant medulloepithelioma, 667
malignant melanoma, 667
malignant schwannoma, 667
mast cell tumor, 645
meningioma, 665c, 666
myeloblastosis, retrovirus and, 669
myelocytomas, 669
myxoma, 643
neoplasia, definition of, 640
neoplasms and feminization or masculinization, 651
neoplasms, differentiation of, 670t
neoplasms of muscles, 647
neoplasms of urogenital system, 650-654
neoplasms, specific treatment, 670t
nodular hyperplasia, hepatic, 658
oligodendroglioma, 666
pancreatic neoplasia, 659f
papilloma, 640, 644, 655c, 662
pheochromocytoma, 661
pinealoma, 660
pituitary neoplasia, 659, 660

- proventricular neoplasia, 656
 pseudoneoplasia, 641f
 renal neoplasia, 652f, 662c
 respiratory system, neoplasms of, 645
 rhabdomyomas, 648, 667
 sarcinomatosis, 654
 schwannoma, 666
 thymoma, 669
 thyroid neoplasia, 660
 uropygial neoplasia, 644, 645f, 665c
 ventricular neoplasia, 656
 xanthoma, 642, 665c
- Oophoritis, 769
 Open bands, 49
 Open vs closed reduction, advantages, 1139 (see orthopedic surgical techniques)
 Operculum, 160, 1105
 Ophthalmoscope, 673
 Opisthotonus, 1045, 1265
 chlamydia and, 745, 989
 CNS toxins and, 740, 741
 bacteria and, 744
 viral diseases and, 743, 873, 906, 922
 Oponin, 112
 Ophthalmology, 673-694
 blindness, 689
 congenital disorders, 684
 conjunctiva, 685
 eye anatomy, 675
 in ratites, 1316
 keratitis, 687
 lids and periorbita, 677
 lovebird eye disease, 679
 malnutrition, 679
 mycoplasma, 1054
 ocular examination, 674
 periorbita, 676
 periorbital abscesses, 684
 retinal disease, 688
 tumors, 689
 uvea, 687
 viral diseases, 678, 872, 911, 937
 Optic nerve (CN II), 725
 Optic nerve glioma, 684
 Oral cavity, 352, 462
 in Anseriformes, 1266
 malnutrition and, 845
 poxvirus and, 872
 white plagues and *Candida*, 998
 Oral ulcers, trichothecene, 1044
 Orbital abscesses, 684
 Orbital round cell sarcoma, 684
 Orbivirus, 912
 Orchiectomy, 1131
 Orchipedium, 1011f
 Orchitis, 774, 990
 Orchratoxin, 1044
 Organ function, measure of, 226 (see biochemistry)
 Organic iodine, 464
 Organochlorine, toxicity, 773, 1050
 Organophosphate, toxicity, 459, 706, 737, 1050
 Ornithosis (see *Chlamydia psittaci*)
Ornitysluss sylviarum, 808
 Oropharyngeal papillomas, 1113
 Orthohepadnavirus (see hepadnavirus)
 Orthomyxoviridae, 929-931
 in Galliformes, 1232
 Oropharynx, 486
 Orthomyxovirus, 929
 Orthopedic surgical techniques, 1137-1169
 Orthoreovirus, 910, 911
 Osmoregulation, in oil-contaminated Anseriformes, 1263
 Osmotic diuretic, 465
 Ossification, 1142, 1144f (see biochemistry)
 Osteoblast vs osteoclast, 197
 Osteoconduction, 1114
 Osteodystrophy, 591, 1046
 Osteogenesis, 1144
 Osteoinduction, 1144
 Osteomalacia, 591
 Osteomyelitis, 650, 745, 967f, 1139, 1141
 Osteomyelosclerosis, 406
 Osteopetrosis, 649, 933
 Osteoporosis, 591
 Osteotomy, dome, 1161
 Ostium, smooth muscles, 566
 Ostrich, 565c, 821, 1283, 1284, 1302f, 1309, 1314, 1316, 1320 (see ratite)
 anesthesia in, 1070
 aspergillosis in, 1001
 bacteria and, 956, 978, 982
 characteristics of, 1285
 Chlamydia in, 989
 cloaca of, 1290f
 Clostridium in, 977
 digestive system of, 499, 501, 845, 1288f
 egg binding and, 1301
 eggs of, 1319f
 hematology, 1345t
 male anatomy, 775, 1291, 1296
 management, 1300, 1301
 maturity in, 1301
 mycotoxins in, 1043
 ocular disease and, 683c, 686
 parasites and, 1062, 1314, 1316f
 reproductive system, 798, 1131, 1296f, 1302t, 1304
 thoracoabdominal anatomy of, 1289f
 viral disease and, 874, 915
 Otidiphabidae, 1201
 Otitis, 154, 372, 745
 Ototoxicity, 463
 Ovarian growth, enhanced, 784
 Ovarian neoplasm, 173c, 770, 798c (see oncology)
 Ovary
 cystic, 173c, 770
 melanistic, 749, 798c
 persistence of, 773
 Overcrowding
 aspergillosis and, 1001
 in Galliformes, 1233
 Oviduct, 334, 368f, 749, 768, 770, 1129, 1210
 anatomic abnormalities and, 773
 cystic hyperplasia of, 770
 flushing of, 768
 growth and secretory activity of, 752
 impaction of, 768
 in ratites, 1304
 masses, radiography, 256
 ovulation, preventing, 465
 prolapse of, 759, 762
 ruptured, 771
 stretch stimulus of, 752
 surgery of, 769
 Oviposition, 752 (see egg laying)
 Ovocentesis, 407f, 760, 801c
 Ovotomy, 796
 Ovulation, inhibition of, 465
 Owl, 145, 463, 773, 875, 882, 884, 914, 960
 ear, 353c
 esophagus, 353c
 mast cell tumor in, 645
 ocular characteristics and, 353c, 676f
 Oxfenbendazole, 466, 1194
 Oximeter, 1079
 Oxygen, 395, 396
 flow rate with anesthesia, 1069
 saturation, 1074, 1079
 toxicity, 396, 1047
 Oxypurinol, 554
Oxyspirura, 464, 686, 1023, 1195
 Oxytetracycline, 448, 466, 994, 1046
 Oxytocin, 406, 467, 752, 759
 complications of, 760
 Ozone, toxicity, 1048
- P** P mitrale, 704
 P on T phenomenon, 707
 P-wave, 700, 704
 PA, 1264
 Pacemaker, wandering, 706
 Pacheco's disease virus, 173c, 875, 878, 879f
 treatment of, 458
 vaccine, 879f, 880
 Packed cell volume, 179 (see hematology, CBC)
 Pain
 control, 1094, 1095
 perception and neurologic disease, 729
 Pair bond, in Anseriformes, 1252
 Palate, 352, 488
 Paleopulmonic parabronchi, 1174
 Palpation, of abdomen, 770
 Panacur, 463
 Pancreas, 255, 512, 603, 859, 1043, 1263
 adenovirus and, 904, 906
 Chlamydia and, 990
 enzymes and, 467
 tumors and, 363, 514
 zinc toxicosis and, 859, 1039, 1264
 Pancreatic exocrine insufficiency, 173c, 513
 Pancreatitis, 405, 513, 771
 Pancuronium bromide, 467
 Pantothenic acid, 72, 846, 849, 856
 Papillae, 756, 1210
 Papilloma, 512f, 640, 644, 655, 656, 798, 886, 887, 1113
 affect on urine pH, 243
 autogenous vaccines for, 887
 bile duct carcinomas and, 657, 887
 clinical changes of, 887t
 diagnosis of, 169, 511, 887
 feet and, 885f
 herpesvirus and, 875, 885
 in ratites, 1300
 malnutrition and, 887
 oral, 1113
 species predilection, 886
 Papillomavirus
 in African Grey Parrot, 886
 in finches, 886, 1186
 internal, clinical signs, 887t
 Papovavirus, 885-894

INDEX

- Para-chlormetazymol, mite protector, toxicity, 1051
- Para-dichlorobenzene, toxicity, 1051
- Parabronchi, 561
- Paracentesis, 770
- Parainfluenza-2-virus, in humans, 928
- Paralysis, 411, 467, 733
 - bacteria and, 976, 978
 - Chlamydia* and, 989
 - CNS toxins and, 739, 1035
 - cryptococcosis and, 1004
 - flaccid, with *Corynebacterium*, 978
 - in Passeriformes, 1188
 - malnutrition and, 469, 845, 848
 - viral diseases and, 744, 873, 881, 922, 926, 927
- Paramunity inducers, 114, 862
- Paramyxovirus (PMV), 501, 514, 743, 920-928, 1232
 - Chlamydia* vs, 990
 - control of, 940t
 - hosts, 921t
 - in Columbiformes, 1208, 1216f
 - in Passeriformes, 1186
 - in ratites, 1304
- Paranasal lymphatic tissue, 116
- Paranasal sinus, 558
- Parasites
 - blood, 1010, 1016, 1018t
 - Capillaria*, 1023
 - coccidia, 1015
 - companion birds and, 1008t
 - Cryptosporidium*, 1016t
 - diagnosis of, 377t, 379, 1009t, 1011f, 1012f
 - diagnostic stages, 1012f
 - external, in ratites, 1314t
 - fecal examination, 1009t
 - Giardia*, 1014f
 - helminths, 1021
 - hemoparasites, 1019
 - Hippoboscidae, 1010f
 - in Anseriformes, 1253, 1267t
 - in Columbiformes, 1208, 1215t
 - in Galliformes, 1232t
 - in Ramphastidae, 1282
 - in ratites, 1303t, 1314t
 - leg swelling, 1025f
 - mites, 1026f
 - neonates and, 825
 - neuropathies and, 741
 - ocular, 684
 - preserving, 1012
 - protozoa, 1008, 1009, 1013-1015, 1017
 - reproductive disease and, 769, 1007-1029
 - Sarcocystis*, in psittacines, 1017t
 - Syngamus*, 1024f
 - tapeworms, 1013f
 - treatment of, 1008t
 - Trypanosoma*, 1021
- Parathion, toxicity, 1050
- Parathyroid glands, 366, 737
- Parathyroid hormone, 587, 857
- Parconazole, 467, 1004
- Parent-raised, 806, 807
- Parenteral alimentation, sites for, 391, 393, 827
- Paresis, 732, 735
 - bacteria and, 976
 - Chlamydia* and, 989
 - CNS toxins and, 739, 740, 1035
 - egg binding and, 758
 - in Passeriformes, 1188
 - in Ramphastidae, 1278f
 - neoplasia and, 774
 - viral diseases and, 744, 873, 916, 920
- Paroxysmal, supraventricular tachycardia, 707
- Parsley toxicity, in ratites, 1043, 1317
- Parvoviral hepatitis, 943
- Parvovirus, 904, 908-909, 1232
- Passeriformes, 1172-1199
 - air sacs in, 1174
 - anemia in, 1193, 1996
 - breeding characteristics of, 1176t
 - characteristics in, 1174t
 - Cryptosporidiosis* in, 1998
 - diseases of, 1183t
 - dyspnea in, 1195
 - gender determination and, 778, 1178
 - hydropericardium in, 1198
 - intramuscular injections, 1181
 - jaundice in, 1193
 - liver disease and, 1197, 1198
 - malnutrition in, 1196
 - Mycobacterium* and, 972
 - neoplastic diseases in, 1198
 - nutrition in, 1177
 - ocular disease and, 689
 - parasites and, 1192-1195
 - pneumonia in, 1186
 - pruritus in, 1197
 - reproduction in, 756
 - respiratory distress in, 1193, 1195
 - sexing of, 1178
 - toxicosis in, 776, 1198
 - viral diseases and, 870, 872, 884, 914, 921, 927, 933, 1185, 1198
- Passing whole seeds, 483t, 1190 (see pancreatitis, enteritis, neuropathic gastric dilatation)
- Pasteurella*, 232, 361, 412, 459, 961, 982, 1189
 - heart disease and, 715
 - metritis and, 768
 - ocular disease and, 684
 - orchitis and, 774
- Patagiotomy, in geese, 1269
- Patagium, 611, 626
- PBFD (see psittacine beak and feather disease)
- PCR amplification of nucleic acid, 125f
- PCV, 753, 934 (see hematology)
- PD (see polydipsia)
- Peafowl, 366, 875, 1057, 1220, 1230
- Peanuts, aflatoxin, 50, 69, 1043, 1265
- Pecten, 677
- Pectoral crest, 1270
- Pectoral muscle atrophy, and NGD, 743
- Pendulous crop (see crop, pendulous)
- Penetran, 458
- Penicillin, 412, 444, 445
 - toxicity, of, 1046
- Penicillium fungi, 625, 1044
 - aspergillosis vs, 1003
 - in Ramphastidae, 1282
- Penny ingestion, in Anseriformes, 1264
- Penrose drains, 1086, 1131
- Pentobarbital sodium, 1260
- Pepper tree, 1041
- Pepto-Bismol, 459
- Perches, 35, 39, 55, 1094, 1223
- Perching ability, and neurologic disease, 728
- Perforation, esophageal, 1113
- Pericardial effusion, 697, 704, 706f, 709f, 718, 719f
- Pericardial sac, 695
- Pericarditis, 371, 518, 547, 709, 711, 718, 999
 - causes of, 717t
 - Pericardium, surgery of, 718
- Periodic acid-Schiff stain, 1005
- Periorbital, 558, 673
 - masses, 558, 684, 1106
 - disease, 677
- Periosteum, 1139
- Peripheral nervous system, trauma, 734
- Peristaltic waves, 490, 940
- Peritoneal hernia, in ratites, 1304
- Peritoneum, yolk, effect on, 771
- Peritonitis, 218c, 515, 518, 769, 771, 798c, 1131 (see egg-related peritonitis)
 - clinical signs of, 771
 - in ratites, 1313c
 - yolk-related, 1129
- Perosis, 848, 856, 857, 859, in Anseriformes, 1251, 1258
 - species predisposition, 848
 - surgical repair of, 1259f
- Peroxidation, 84
- Peroxide levels, rancid fat, 851
- Peru's Manu Biosphere Reserve, 96
- Pessulus, 1107
- Pest control, 59
- Pesticide, 740, 1033, 1049
 - Anseriformes and, 1266
 - CNS signs and, 740
 - egg production, hatchability and, 1051
 - food contamination and, 773
 - poisoning, 1049-1057
 - prophylactic use of, 808
 - treatment for toxicity, 458, 741
- Petechiation
 - rodenticide and, 1051
- Petrochemicals, and migratory bird populations, 1050
- Petroleum distillates, as CNS toxins, 746
- Peyer's patches, 116
- pH
 - of crop, 150, 827
 - with megabacteria, 499, 980
 - with papilloma, 887
- Phacoemulsification, 688, 1101
- Phagocytosis, 112
- Phallus, 756
 - in Anseriformes, 1253f
 - with mycoplasma, 1057
 - prolapse of, 511, 774
 - ratites, 1290f, 1291, 1304
 - types of, 509
- Pharmaceutical use in birds, 142, (see formula)
- Pharmacokinetics, 437
- Pharyngostomy tube, 392, 1112f
- Phasianiformes (see Galliformes)
- Pheasant, 1229, 1230 (see Galliformes)
 - ocular disease in, 686, 689
 - Borrelia* in, 960
- Phenobarbital, 411, 467, 736, 738, 741
- Phenol, as disinfectant, 1061
- Phenylbutazone, 467

- Phenylephrine, 689
 Phenylmercuric acetate, 746
 Pheochromocytoma, chromaffinoma, 601
 Philodendron, 1041
 Philophthalmus, 686
 Phosphorus, 90, 235, 590, 811, 857
 deficiencies and skeletal disorders, 848
 protein in diet, 850
 vitamin D₃ and, 854
 Photoperiod, in equatorial birds, 752
 Photophobia, 877
 Photorefractoriness, 752
 Photosensitization, 485, 1317
 Physical examination, 144-175
 abdomen palpation, 168
 abdominal muscles, in Passeriformes, 168
 aging, effects of, in macaws, 149t
 Amazon, anorectic excrement, 173c
 anamnesis, 145t
 auscultation, 167f
 beak, normal appearance of, 161
 behavior, 147, 148
 Blue and Gold Macaw, normal, 153c
 cere, color of, 160, 161
 choana, 163
 cloaca, 150, 151f, 168, 170
 cockatiel, 154c
 crop, 167
 dermis, 157
 diet, effect on skin and feathers, 158
 ear, 154c, 160
 environment, evaluation of, 147
 feathers, 157-159, 170
 feet, abnormalities, in 154c, 170, 171f
 frequency of, 147
 glottis, 163c
 Gram's stain, 151t, 174
 head, 160, 166f
 heart rate, 148t
 house-training, 150
 hydration evaluation, 170
 minimum database, 171
 molting, seasonal, 159
 nail length, 171
 nares, 160
 odors, 151
 oral cavity, 161, 166
 palpation, 167
 prepatagium, tattoo ink, 164c
 regurgitation in, 151
 respiratory tract, 147-148t, 166
 restraint, 156f, 158f
 speculum, oral, 167f
 sternal muscle mass, 168f
 sternal necrosis, 164c
 thermometer, tympanic, 169
 toxins, 146
 translucent skin, 159f
 urates, normal, 149, 174c
 urophygial gland, 169
 vomiting, 150, 151
 weak grip, cause of, 171
 weight in comparison with condition, 168f
 Physical therapy, postsurgical, 1140
 Physiology
 of Anseriformes, 1244t
 of Columbiformes, 1203
 of Galliformes, 1219
 of Passeriformes, 1173
 of ratites, 1286
 Physis, 1142
 Pia mater, 724
 Piciformes (see Ramphastidae)
 Picornavirus, 744, 913, 937-938
 Pigeon, 459, 461-465, 742, 1204, 1218
 (see Columbiformes)
 bacterial diseases in, 910, 913, 920, 923, 956, 959, 960, 961, 962, 964, 969, 970, 977, 1054, 1060, 1062, 1212
 breeding season in, 1208
 Chlamydia in, 985, 989, 995
 Cryptococcus in, 1004
 diseases, 1215t
 drug susceptibility to, 1046
 ECG, 697, 714f
 fledgling age of, 1210
 grit and, 77
 health certificate for, 1208
 heart, 710, 711f, 717
 housing requirements, 1207
 incubation period, 1210
 ketoconazole in, 453
 lead in, 1035, 1037
 parasites in, 466, 715, 962, 1005, 1061, 1209, 1215
 racing season, 1208
 stones, 1206t
 susceptibility, disease, 1208
 special management, 1208
 urine, reference values, 543t
 varieties, 1200
 viral diseases in, 743, 875, 881, 895, 911, 921
 Pigment changes, in feathers, 523, 617
 Pigs, influenza virus in, 929
 Pin feathers, 38, 159, 618
 Pinioning, 1235, 1245, 1269f
 Pinning, for fracture repair, 1149 (see orthopedic surgical techniques)
 Pins, positive-profile threaded, 1146
 Piperacillin, 445, 467, 554
 Piperazine, 467, 1194
 Pipping, 795, 1253
 Pipping muscle, 820, 1292c
 Piroplasmosis, in Passeriformes, 1193
 Pituitary
 adenoma syndrome, 736
 chromophobe syndrome, 736
 chromophobe tumors, 684
 gland, 583, 660
 Plants, toxic, 536, 741, 1041t, 1042t, 1224, 1266
 Plasma ammonia, 231
 Plasma bile acid (PBAC), 525
 Plasma cells, differentiation of, 197
 Plasmodium, 194c, 460, 467, 529, 936, 1020, 1176, 1192, 1282
 characteristics of disease, 190, 191
 Plates, bone, 1150
 Pleuro-peritoneum, 514
 Pleuromutilin, 1060
 Plexus subcutaneous collaris, 926, 1203f
 Plexuses, lumbar, ischiatic, pudendal, 727
 Ploceidae, 912
 Plumage (see feather)
 male vs. female, 602
 PMSG (gonadotrophin serum), 776
 PMV-1 pigeon, 921, 926
 PMV-3 to PMV-9, 927-928
 Pneumatic, bones, 1138
 Pneumonectomy, 1111
 Pneumonia, 301, 303, 872, 927, 1054, 1186, 1189
 aspiration, 562, 828
 Pneumonology, 556-581
 air capillaries, 566
 air sac, 565f, 567, 568f, 572, 579
 air sacculitis, 576, 579
 aspergillosis, 565c
 aspiration, with hand-feeding, 562c
 auscultation, 571
 bacteria in, 575
 bronchi, 561, 567f
 caudal air sacculitis, 568
 cervical air sac inflation, 580f
 cervicocephalic air sacs, 566
 choana, 575, 576
 conjunctivitis and, 576
 coughing, 557
 dermatitis, 576
 dyspnea, 557, 566f, 575
 endoscopy, 571, 572
 epithelium, trachea, type of, 561
 facial swelling, 562c
 feather picking, air sac problems and, 572
 feathers over nares, stained or matted, 557
 foreign body inhalation, 579
 gas exchange, efficiency of, 569
 infraorbital air sacs on expiration, insufflation of, 577
 infraorbital sinus, 558
 infraorbital sinusitis, 574
 inhalation, toxicosis, 576, 1048
 lung biopsy, 573
 lung, changes in the size or position of, 561
 malnutrition and, 557, 574, 576
 muscles, expiratory, 568
 muscles, inspiratory, 567
 nares, 557
 nasal concha, 557, 558
 nasolacrimal ducts, lack of, 557f
 nebulization therapy, 574t
 neoplumonic parabronchi, 566, 569
 operculum, 557, 577
 palatine salivary glands, 574
 paleopulmonic parabronchi, 566, 569
 parabronchi, surfactant, 566
 parasites, 557, 562c, 575, 576
 periorbital depression (sunken sinus syndrome), 577
 pharyngitis, 565c
 pneumonia, 565c
 pneumonitis, severe allergic, 576
 respiratory cycles, two, 569
 respiratory disease, 559t, 560t, 578t
 respiratory imaging, 571
 respiratory problems, database for, 572
 respiratory rate, influences on, 569t
 respiratory recovery time, 571
 respiratory system, avian vs mammal, 561t
 respiratory tract, 557-567
 rhinogram, 576
 rhinorrhea, 574
 septum, oblique, 567
 sinus aspirate, 572
 sinusitis, 562c

INDEX

- sunken sinus syndrome, 562c
 syrinx, classification of, 560, 561
 tail-bob, 557, 568
 trachea, 560, 567
 tracheal lavage, 572
 tracheitis, 562c, 565c
 tracheitis, proliferative, 579
 transtracheal injection, 574
 zinc toxicosis, acute, 557
 Pneumoviruses, 929
 Pododermatitis
 in Anseriformes, 1262
 in Passeriformes, 1187
 malnutrition and, 632, 848 (see
 bumblefoot)
 nicotine toxicity and, 1047
 Polarized light, toxic fumes, 1049, 1204
 Polychlorinated biphenyl, cardiac, 706
 Polychromasia, 194c, 196
 hemorrhagic conure syndrome with, 934
 Polyclonal antibodies, virus
 identification, 864
 Polycythemia, 188, 590, 713
 Polydipsia (PD), 586, 604, 845, 860
 malnutrition and, 845
 plant toxicity and, 1042
 salt toxicity and, 1044
 viral diseases and, 877, 905, 908, 916,
 926, 942
 Polyfolliculitis, 638
 Polyglactin, 910, 1092, 1093
 Polymerase chain reaction (PCR), 125
 Polymethylmethacrylate, in orthopedic
 repair, 1148
 Polymorphonuclear granulocytes, 111
 Polymyxin B, 467
 Polyomavirus, 46, 47, 361, 526, 718, 790,
 808, 826, 869c, 885-894, 1186
 CNS signs and, 744
 anemia, 399
 antemortem vs postmortem diagnosis,
 869c, 893
 gross lesions, 892t
 histologic lesions, 892t
 in Passeriformes, 1198
 vaccine and, 891f, 894
 viral-specific antibodies, 866c
 Mycoplasma vs, 1058
 Polyostotic hyperostosis, 251, 256, 753
 Polyphagia, 844, 845
 Polymer rods, orthopedics, 1149
 Polypropylene welding rods, orthopedics,
 1149
 Polyserositis, 930, 952, 964
 Polytetrafluoroethylene (PTFE) gas,
 1047, 1198
 Polyunsaturated fatty acids, 851
 Polyurates, with *Chlamydia*, 989
 Polyuria (PU), 463, 541, 543, 586, 604,
 605
 causes of, 149, 150, 173c, 547c, 890, 905,
 926, 942, 1035
 egg laying and, 772
 in Passeriformes, 1188
 intermittent, 934
 malnutrition and, 845, 850
 neonates, 819
 physiologic, 539
 salt toxicity, 1044
 zinc toxicosis, 1039
 Pons, 724
 Pool, transmission of disease in
 Anseriformes, 1246f
 Popcorn stool, 1189
 Porcine circovirus, (PCV), 895
Porrocaecum, 1011f, 1194
 Portal hypertension, 536
 Portomicrons, birds vs mammals, 516
 Positive pressure ventilation, 1068,
 1261, 1288
 Positive sharp waves, 730
 Post-capture gastrolavage, in
 Anseriformes, 1260
 Posterior chamber, of eye, 676f
 Posterior umbilicus, 614
 Postoperative care, 1139
 Postorbital, 558
 Post-patagium, 611
 Postventer, 627
 Potassium, 91, 240, 407, 706, 840
 Powder down, 608, 616, 1202
 Pox ulcerations, 166
 Poxvirus, 114, 344, 462, 865t-874f, 866c,
 967, 999, 1216t, 1232c
 acyclovir and, 458
 cross-reactions, 871t
 cytology of, 221f
 diagnostic techniques, 865t
 differential diagnosis, 873t
 free-ranging birds and, 872f
 host spectrum, 871t
 in Columbiformes, 1208
 in Galliformes, 1234f
 in Passeriformes, 1176, 1185
 in ratites, 1309
 infectivity, 870f
 ocular lesions, 678, 679, 680c
 species susceptibility, 871t
 stage of infectivity, 870f
 survey of hosts, 871t
 vaccine reactions and immunity of flock,
 874f
 PR interval, normal findings, 704
 Practice dynamics, 131-143
 Practice management, 130
 Pralidoxime hydrochloride, toxin
 antidote, 741, 1051
 Praziquantel, 467, 1194, 1283
 toxicity of, 1046
 Precocial birds, 802, 805, 1324
 Predators, of Anseriformes, 1245
 Prednisolone, 389, 461, 467, 600, 632
 feet sores and, 632
 Prednisone, 600
 Preening, 92, 159, 781, 782
 Preservatives, wood, 1033
 Preventive medicine, future of, 121
 Primaquine phosphate, 467
 Primary feathers, 615
 Probes, contamination, problems of, 126
 Probiocin, 465
 Probuco, 1099
 Procaine penicillin, 467, 1046, 1214
 Proctodeal glands, 756
 Proctodeum, 509, 757
 Profuse hemorrhagic diarrhea, 744
 Progesterone, 752
 Prognathism, mandible, 1165
 Prognosis, postsurgical, 1139
 Progressive paresis, in geese, 1266
 Prolactin, 84, 584, 751, 753, 783, 1210
 Prolapse of the nictitans, 740
 Pronate, 1139
 Propatagium, 165, 611, 1153, 1213
 Propranolol, 467
 PU/PD (see polyuria, polydipsia)
 Propylene glycol, 464, 1045
 toxicity of, 1190
 Prostaglandin, 406, 462, 597, 752
 egg binding and, 759
 Prosthetic beaks, 1272 (see acrylic, beak)
Prosthogonimus, 769, 1194
 Protamine zinc insulin, 1283 (see
 insulin)
 Protein
 amino acids and, 81-82
 breeding and, 72
 calcium and, relationship between, 589
 chicks, 811
 crude, in Galliformes, 1225
 determination, 548
 energy and, 66t
 in Anseriformes, 1247, 1257
 in Columbiformes, 1206
 in ratites, 1297, 1298
 labeling and, 76
 leg deformities and, 1324
 levels, 71t, 73, 530, 850
 quality of, 76, 82
 slow growth rate species, 1257
 total, in egg development, 753
 urinalysis and, 543
 Proteinuria, 548
Proteus, 951, 1309
 Prothrombin time, in Columbiformes,
 1204
 Protoporphyrin, for diagnosis of lead,
 1037
 Protozoa, 1013, 1215
 in Galliformes, 1232
 in ratites, 1314t, 1315
 Proventricular dilatation, geese, 1269
 (see neuropathic gastric dilatation)
 Proventriculotomy, 828, 1038, 1121
 Proventriculus, 74, 345, 352, 372, 492,
 498, 499, 656, 887, 1023, 1195, 1265
 flushing, cautions of, 345
 impaction of, 940, 1037, 1195
 in ratites, 499, 1288, 1310c, 1313c
 Pseudochylous, cause of, 516
Pseudomonas, 460, 462, 463, 468, 565,
 958, 1189
 heart disease and, 715
 in Galliformes, 1232
 in ratites, 1295c, 1309
 Pseudohyperparathyroidism, 590
 Psittacine beak and feather disease
 (PBFD), 30, 46, 47, 790, 808, 822,
 824f, 837, 894-903
 diagnosis of, 866c, 885f, 897, 902
 HI titer data, 898t
 incubation, 897f
 stability, 902
 susceptibility, 895t, 897
 transmission, 895f
 vaccination, 866c, 902, 903t
 Psittacosis, ornithosis, 984 (see
 Chlamydia)
 Psyllium, 81, 384, 415, 464, 1038 (see
 hemicellulose)
 Ptarmigan, 1220, 1229
 Pterygiae, 614
 PTH, parathyroid hormone, 587

- Ptyalism, and CNS toxins, 740
 PU (see polyuria)
 Pudendal plexuses, 727
 Puerto Rican Amazon Parrot, 96
 Pullorum disease, 769 (see pneumonology, salmonella)
 Pulmonary silicosis, 1049
 Pulviplumes, in Columbiformes, 1202
 Pupil, 676, 728
 dilation of, 467
 Pupillary light reflexes, 676, 728
 Pruritus, 160, 523, 1026, 1197 (see dermatology)
 Purkinje fibers, conduction of, 696
 Pygmy Goose, 1239
 Pyrantel pamoate, 467
 Pyrethrin, toxicity, 467, 808, 1050f, 1195-1197
 Pyridoxine, 72, 86, 856, 858
 Pyridoxine anemia, 858
 Pyrimethamine, 467, 1192
- Q** Quill mite, 1215
 Q-fever, 1061-1062
 Q-wave, 700
 QRS complex, 700, 704
 QT interval, 705
 Quail, 1219, 1225, 1229 (see Galliformes)
 bacterial disease in, 970, 977
 mycoplasma in, 1054, 1056
 parasites in, 466, 1062
 viral diseases in, 872, 875, 905, 910, 915, 930, 932, 935, 937
 Quaker Parakeet, 461, 464, 886 (see Monk Parakeet)
 digoxin dosage in, 714
 Quarantine, 33, 48, 60, 143
 bands, USDA, 143
 Quaternary ammonium, for *Chlamydia*, 987 (see disinfectant)
 Quetzal, iron storage disease in, 534
 Quill mites, 1196, 1316
- R** R-waves, 700
 Rabies virus, 920
 Raccoon ascarid, (see *Baylisascaris*)
 Rachis, 158, 614f, 619, 1245
 Racing pigeon (see Columbiformes)
 EEG lead II, 700f
 impaired cardiac function, 697
 race basket, 1207
 Radiation safety, hospital personnel, 248
 Radiation therapy, 736
 Radiocautery (see radiosurgery)
 Radiography, (see imaging techniques)
 anatomy, 249-251, 697, 698f, 720
 anatomy, cardiovascular, 252
 anatomy, coelomic cavity, 253-255
 anatomy, gastrointestinal system, 253-255
 anatomy, respiratory system, 252
 arthritis, acute septic, 251
 barium sulfate transit times, 256-258, 257t
 bone, marbled appearance, 251
 CNS disease and, 733
 contrast procedures, dehydration and, 698f
 contrast procedures, indications for, 256
 dilated proventriculus, 942, 982
 egg binding and, 761
 gastrointestinal motility and, 248
 heavy metal and, 248, 1035
 hepatomegaly, 254, 255
 hyperestrogen syndrome, 256
 hypovitaminosis D₃ imbalances, 250
 in Passeriformes, 247
 interpretation, 249-256
 intravenous excretory urography, 257, 259
 left-to-right (LeRtL) position, 248
 lung architecture, inspiration, 253
 metritis and, 768
 Mycobacterium, diagnosis of, 974
 neonatal, 249
 nephromegaly, causes of, 256
 pancreas, 255
 pericardial effusion, 718
 presurgical, 1139
 reproductive tract, 769, 1128
 respiratory disorders and, 253
 rhinosinography, 259
 risk and benefit, 246
 screen, film, 247
 skeletal disorders and, 250-251
 splenomegaly, 254
 sternal/rib distance, (SR), 254
 Radioimmunoassay (RIA), hormone measurement, 584
 Radiosurgery, 39, 1103, 1113
 bipolar, 399, 1106, 1138
 Radius, 1139
 surgical repair of, 1155
 Rafoxanide, 468
Raillietina, 1011f
 Rales, 922, 989 (see auscultation)
 Ramphastidae, 534, 777, 1276-1283
 anesthesia in, 1280f
 atherosclerosis in, 720
 bacterial infections in, 1281-1282
 biochemistry values in, 1335t
 diabetes mellitus and, 1282-1283
 gender dimorphism, 1277t
 GI, neoplasia of, 505t
 hemochromatosis, 526, 530, 534, 1281f
 liver disease in, 1280-1281
 radiographs, 1278f
 reproduction in, 756, 1279
 Ranching, free-ranging birds, 21
 Rancid fat, 851, 855
 Rape seed, and canaries, 536, 1043
 Raptor, 687, 710, 749, 870, 910, 923, 1207
 free-ranging vs captive, 987
 gender determination in, 778
 ocular characteristics in, 677
 protein electrophoresis, 1335t
 rabies in, 920
 Ratite, 1174, 1284-1326, 1345t (see ostrich, emu, cassowary, rhea)
 anatomy and physiology, 1286f, 1287f, 1288f, 1290f, 1291f
 aorta, ruptured, 1307
 blood collection in, 1297f
 characteristics of, 1285
 chick management, 1318, 1322
 Clostridium perfringens in, 363c
 congenital disorders of, 1322-1324
 dermatology of, 1317
 egg production in, 755, 768
 fracture repair, 1150, 1161-1162, 1306-1307
 gender determination in, 778
 gout in, 547c
 incubation, 1319-1320
 infectious disease, 989, 992, 998, 1303t, 1314, 1308
 liver, ruptured in, 363c
 medical disorders, 716f, 720, 848, 1303-1304
 microchip, 1300f
 musculoskeletal disorders, 717, 850, 858, 1298, 1324
 neoplasms in, 1308
 neural diseases in, 1317
 ocular problems in, 1316
 parasites in, 1314t
 peritonitis, 1313c
 reproduction in, 509, 757, 768, 1303-1305
 respiratory problems in, 1316
 sinusitis in, 678f
 transportation, 1300
 yolk-related problems in, 1135, 1321, 1322f, 1323f
 Rats, vectors of disease, 938, 961, 1207
 Raw fish, *Erysipelothrix* in, 975
 Records, medical, 135
 Rectal thermometer, 1261
 Rectrice, 615, 1220
 Red blood cell count, 179 (see hematology, CBC)
 Red factor, in canaries, 1177
 Red mites, *Ornithonyssus*, 1196, 1209
 Red tide, 978, 1266
 Reference intervals, 225
 Reference values, 225, 1329t-1345t
 Reglan, 465
 Regurgitation, 150, 414, 490, 497, 743, 775 (see vomiting)
 crop pH and, 150, 827
 egg laying and, 772
 in adults, differential, 483t
 in chicks, 824
 in Passeriformes, 1190
 malnutrition and, 849
 sexual, 36
 undigested seeds in feces and, 500
 Rehabilitation, wildlife, native birds, 19
 Reintroduction to wild, 806, 1229
 Remige, 615
 Renal, 538-581 (see kidney, nephrology, urine)
 adenocarcinomas, and neuromuscular disease, 735
 calcification in, 1046 (see hypervitaminosis D₃)
 damage, in oil-contaminated Anseriformes, 1263
 disease, diets for, 850
 dysfunction, 446, 758
 excretion of calcium, increased, 737
 failure, causes of, 408, 890, 1247
 glucosuria, 605
 neoplasia, 553
 portal system, 539
 toxicity, 444
 Renografin, 464
 Reovirus, 718, 744, 904, 910-913, 943, 1232
 Reproduction (see theriogenology)
 cessation of, 771
 daylight length and intervals in, 1174
 disorders, evaluation of, 748, 758, 774, 787

INDEX

- E. coli* in, 951
 failures, evaluation of, 61t
 genetic abnormalities, 1226
 in Anseriformes, 1243, 1252
 in Columbiformes, 1209
 in Galliformes, 1226
 in Passeriformes, 1174
 in Ramphastidae, 1279
 in ratites, 1290, 1302t, 1304
 neoplasia and, 770
 salt and, 860
 stimulation in Psittaciformes, 782
 surgery and, 1128
 Respiratory (see pneumonology)
 arrest, 711, 1080
 cycles, two, 569
 disease, 144, 558, 559t, 560t, 578t, 677t, 770, 828, 904, 908, 915, 927, 982, 1190
 imaging, 571
 E. coli and, 951
 in Passeriformes, 1187, 1193, 1195
 in ratites, 1316
 malnutritional disorders and, 846, 860
 mycoplasma and, 1054
 problems, database for, 572
 radiographic lesions and, 252t
 recovery time, 571
 system, avian vs mammal, 561t
 tract, 557-567
 toxic fumes and, 1049
 viral disease and, 905, 922, 928
 Respiratory rate
 in Anseriformes, 1243
 in birds, formula, 148t, 166
 in Columbiformes, 1204
 in Galliformes, 1221t
 influences on, 569t
 Respiratory stimulant, 462
 Restraint, 156, 157f (see physical exam)
 in Anseriformes, 1258, 1260f
 in Columbiformes, 1211f, 1211t
 in Galliformes, 1233
 in Passeriformes, 1181
 Restraint board, plexiglass, 248
 Retarded growth (see stunting)
 Rete testis, 756
 Reticulate body, 985
 Reticulocyte, 934
 Reticuloendotheliosis virus, 934-935
 Retinal disease, 688
 Retrovirus, 931-936, 1185, 1232
 Rhabdomyolysis, exertional, vitamin E, 855
 Rhabdovirus, 920, 1232
 Rhamphotheca, 484, 609, 618, 1220
 Rhea, 685, 973, 1049, 1284-1286, 1288, 1290, 1298, 1308, 1320 (see ratite)
 digestive anatomy in, 1288
 reproduction in, 1303
 testicle in, 1290f
 Rhinitis, 160, 562c, 576, 680c, 881, 930, 963, 1106
 mycoplasma and, 1054
 Rhinogram, 294-297, 576, 577f
 Rhinolith, 577, 683c, 1105f
 Rhinorrhea, 560t, 574, 912, 1106
 Rhinosinography, 259
 Rhinosporidiosis, 575, 1005
 Rhinotheca, deformed, 485f, 562c
Rhizopus, from sprouted seed, 1005
 Rhododendron, 1041
 Riboflavin, 72, 85, 849, 856, 1251
 deficiencies in, 848, 1298
 Rickets, 590, 854f, 858
 in Anseriformes, 590, 1252, 1258
 rubber beak, 484, 590
Rickettsia, 1053, 1061, 1215, 1232
 Rifamate, 464
 Rifampin, 452, 464, 468, 1005
 Right jugular vein, catheter, 385f
 Right ovary, persistent, 773
 Rima infundibuli, 486
 Roaches, pest control, 59
 Robert Jones bandage, 430f (see bandage)
 Rocket nets, 1260
 Rocky Mountain Spotted Fever (RMSF), 1061
 Rodenticide, toxin, 1051
 Rodent, as disease vector, 59, 917, 961-964, 1061, 1188, 1281
 Rolled toes, in ratites, 1324f
 Roller Canary, 1174
 Ronidazole, 1190, 1209
 Rose-breasted Cockatoo (see cockatoo)
 Rostral, 558
 Rotating skin flap, 1115
 Rotational deformity, in ratites, 1310c
 Rotavirus, 913
 Round heart disease, 717
 Roundworms, 1021f, 1194, 1215
 Rubber band, tourniquet, 1007
 Rubber bill, 484 (see rickets)
 Rubivirus, German measles, 918
 Rubriblast, proerythroblast, characteristics of, 196
 Rubricyte, 188, 196
 Ruddy Shelduck, 1239
 Ruffed Grouse, 1229
 Runners, budgerigars, 623
 polyomavirus in, 890
 Ruptured aorta, 1307
 Russian spring-summer encephalitis virus, 919
- S** *Struthio*
 S. camelus australis, 1285
 S. massaicus, characteristics of, 1285
 S. molybdophanes, 1285
 S-wave, 700
 Sabouraud
 dextrose agar, 1003, 1005
 cornmeal agar, 999
 Saccopleural membrane, 514
 Safflower seeds, dietary fat, 851
 Sagittal saw, 1133
 Salinomycin, 1307
 Salivary ducts, swelling, 845
 Salivary glands, 485
 Salivation, in Anseriformes, 1266
Salmonella, 59, 466, 718, 953-955, 982, 1208
 Chlamydia vs, 990
 control of, 955
 in Anseriformes, 1237, 1257
 in Columbiformes, 1212
 in Galliformes, 1232
 in ratites, 1309
 metritis and, 768
 mycoplasma and, 1058
 paramyxovirus vs, 928
 reproduction and, 768, 774, 1256
 S. typhimurium var *copenhagen*, 1188
 Salpingeal orifice, 1211
 Salpingitis, 462, 768-769, 798c
 heart disease and, 714
 Salpingohysterectomy, 772, 1129
 Salt (NaCl), 553
 feather quality and, 846
 in Galliformes, 1221
 polydipsia and, 845
 toxicosis, 38, 553
 Salt gland (see nasal salt gland)
 Sandpaper perches, warning, 39
Sarcocystis, 59, 362, 742, 808, 826, 1017
 in Passeriformes, 1190
 susceptible species, 1017t
 treatment for, 467
 Sarcoma/leukosis virus (SLV), 931-934
 Scaly mites (see *Knemidokoptes*)
 Schirmer tear test, results in, 674
 Schistosomiasis, 742, 1266
 Schroeder-Thomas splint, indications, 430f
 Scintigraphy, 734
 Scissors beak, 789, 1165f
 Screamers (Anhimidae), 1238
 Sea ducks, 1246
 Sebaceous secretions, irradiation, 83
 Secondary feathers (see feathers)
 Seed, 842, 951 (see feed)
 amino acids in, 851
 calcium deficiency of, 858
 undigested in droppings, 855, 887
 Segmental reflex, 729
 Seizure, 410, 461-462, 739 (see convulsion, tremor, epilepsy)
 causes of, 738t
 Chlamydia and, 745
 CNS toxins and, 740, 1038-1039, 1044, 1047
 emergency treatment for, 411, 414
 idiopathic epilepsy and, 738
 recording of, 738
 viral diseases and, 744
 Selective breeding, Columbiformes, 1204
Selenidera spp., 1277
 Selenium, 71t, 84, 94, 469, 848, 859 (see vitamin E)
 deficiency of, 504, 848, 937, 1298
 degenerative myopathy in ostriches, 1307, 1308
 egg binding and, 759
 feather quality and, 846
 food sources of, 80t
 immune response and, 849
 malabsorption and, 845
 requirement in ducklings, 1251
 toxicosis, 75t, 1041
 Self-adherent bandages, 422
 Self-mutilation, 424f, 461, 464, 846
 Semen, 757, 780, 1211 (see artificial insemination)
 extender, 757, 1231
 in ratites, 1305
 preservation of, 777, 1253
 volume and concentration, 757t
 Seminal glomus, 756, 857, 1178f
 Seminal papilla, 757
 Seminoma, 774
 Semiplume, 615, 1202
 Sentinel birds, for viral monitoring, 916

- Septicemia, 362c, 459, 826, 982t, 1187
Septum, horizontal, 514, 515
Serofibrinous pericarditis, 709f
Serratia, 951
Serratospiculum amaculata, 1193
Sertoli cells, 756
tumors in, 251, 774
Sexing (see gender determination)
Sexual characteristics, 770, 778, 1175
Sexual maturity, age of, 779, 1210, 1229, 1252, 1301
Sexual orientation, 1180
Sheep, *Chlamydia* in, 984
Sheldgoose, 1239, 1252
Shelduck, 1239
Shell gland, 1129
Shell vs grit, 846
Shigella, 951
Shock, 389, 414
Shock molt, 1233
Shoe splint, 431
Shuttle pins, 1149
SI Unit System, 226, 1328
Sialolith, in Columbiformes, 487, 881
Siberian tick encephalitis virus, 919
Silicosis, silicone/sulfur ratio, 1049
Silkie chickens, as foster brooders, 788
Silver nitrate, 39, 113, 1269
Silver sulfadiazine, for burns, 412, 424
Singing
in Passeriformes, 1178
testosterone-induced, 1175
Sinoatrial block, 706
Sinuses, heart
arrest, 705
arrhythmias, 705
bradycardia, 706-707
tachycardia, differentiation, 708
Sinuses, respiratory, 558, 160, 905, 1106
(see anatomy overlay)
aspiration of, 202, 345, 1038
inflation, 680c
infraorbital, 558, 931
Sinusitis, 558, 562, 572, 678f, 680c, 683c
Chlamydia and, 989
cytology of, 202f, 218c
from airborne toxins, 1048
mycoplasma and, 1054, 1058
radiograph, 251
rhinorrhea, 459, 1106
Skeletal deformities, 848, 918f, 1324
Skeleton, ostrich, 1287f
Skin, 1097, 1197
discoloration, with *Clostridium*, 977
leg scales, in Passeriformes, 1097, 1197
Skull, radiography, 249 (see imaging)
Slide agglutination test, for
Mycobacterium, 974
Slipped tendon, 1258, 1324
Slit lamp, 674f
Smuggled birds, 47
Snail, aquatic, 769, 1194
Snake, pest control, 59
Sneezing, 905, 1048, 1058, 1106
Snood, 1219
Snowshoe splint, 432f
Sodium, 91, 240, 712, 850, 1252
toxicity of, 714, 1044
Sodium diatrizoate, radiography, 259
Sodium fluoride, 234
Sodium hypochlorite, toxicity, 1048
Sodium polyanetholsulfate, 950
Sodium sulfate (Glauber's salt), 415, 458, 468, 1038
Soft tissue mineralization, 84 (see renal calcification)
Soft tissue surgery, 1096-1136, (see surgery)
Soft-shelled eggs, 256, 752, 1336 (see egg, soft-shelled)
Solar heat, 1229
Somatotropin, 584
Sour crop, 825, 1216 (see ingluvies)
Sparrow, 20, 461
as disease vector, 1191-1194
Sparatrix, 459
Specific gravity, urine, 242, 548
Spectinomycin, 438, 468, 686, 1060
Speculum, canine vaginal, 1108
Speleognathus, 1195
Sperm, 174c, 756 (see semen)
in Anseriformes, production, 1265
Spermatocrit, 757
Spermatogenesis, 458, 757, 784
Spermatozoa, blood clotting agents, 757
Sphenisciformes (penguins), 933
Spherophorus, 953
Spica splint, 431, 1161
Spinal
abnormalities, 734
accessory nerve (CN XI), 726
autonomic nervous system, 727f (see anatomy overlay)
surgery, 734
Spiramycin, toxicity, 1060
Spirillum pulli, 489
Spirochaetaceae, 960
Spirulina, 87, 1177
Spiruroid, 486, 1011f, 1023, 1195
Splay leg (see spraddle leg)
Spleen, 116, 882, 907, 973, 1043, 1173
Spleen necrosis virus, 934
Splendidofilaria, 1193
Splenomegaly, 117f, 254, 907-909, 930, 1054
Chlamydia and, 990
differential diagnosis, 254t, 313
Splints, 431, 1182
spica-type, 1161
Spondylolisthesis, 734
Spontaneous cardiomyopathy, in broilers, 713
Spraddle leg, 732, 830f, 855, 1324
Spring-loaded nets, 1260
Sprouts, source of pathogens, 57
Sputum solvents, for *Mycobacterium*, 974
Squab, 821, 880, 1046
Squamous metaplasia, 344, 558, 850, 852, 1108, 1113
Squamous plaque, 655
St. Louis encephalitis virus (SLE), 919
ST-segment, 700, 704
STA solution, 468
Stains (see hematology, cytology)
Stamp stain, 532, 987
Stanzolol, 468
Staphylococcus, 535, 965-967, 1187, 1232, 1281, 1309
Amazon foot necrosis and, 966f
Chlamydia and, 991
dermatitis and, 460
heart disease and, 715
ocular disease and, 685
peritonitis and, 772
spinal deformities and, 968f
Star gazing, 1251
Starling, as disease vector, 28, 872, 960, 1054, 1195
Starvation, effects on glucose, 234
Starveout, in Anseriformes, 1255
Steatitis, vitamin E, 855
Steatorrhea, 514, 846
Steinmann pins, 1146
Sternostoma tracheacolum, in Passeriformes, 464, 575, 1026, 1195
Sticky chick, in ratites, 1321
Stifle subluxation, neonate, 831, 836f
Stool (see excrement)
Stomatis, 488
Strabismus, 684, 728
Straw feathers, 1184
Streptococcus, 535, 820, 968-971
cardiac effects and, 715, 718
in Galliformes, 1232
in Ramphastidae, 1281
infection from children, 970
metritis and, 768
Streptomyces, 978
Streptomycin sulfate, 468
Stress, 72, 394t, 850, 1257, 1323
Stress marks, feather, 601, 628, 633-634, 837, 846
Strictures, esophageal, 1113
Strigeid, 1011f
Struthio camelus, characteristics of, 1285
Struthioniformes (see ostrich, ratites)
Stunting, neonates, 822f, 1233
Stupor, 976, 1188
Sturnidae, 534
Subcutaneous edema, 1198
Subcutaneous fluids, 384
Subcutaneous injections, 388, 611
Suborbital diverticulum, 204f
Substrates, *Aspergillus* in, 1001
Sucralfate, 468, 857
Sulfa drug, 442, 1046
Sulfachlorpyridazine, 438, 468
Sulfadiazine, 468
Sulfamethoxale, 1187
Sulfur amino acids, 72
Sunburn, 50
Sunflower seeds, dietary fat, 851
Sunken sinus syndrome, 562c, 577, 1316
Superficial pectoralis muscle, 127
Superoxide dismutase, 112
Supinate, 1139
Supportive care, 382-416
air sac rupture, 409
air sac tube, 396, 397f
anemia, 398-399
animal bites, 412
blood volume, 400
burns, 412
caloric requirements, 394
cardiovascular system, 398, 401
cloacal prolapse, 404
coma, 411
conure bleeding syndrome, 404
corticosteroid, 389-390
crop flushing, 403
dehydration, 384t
diarrhea, database, 404
duodenal feeding tube, 403

INDEX

- dyspnea, 408
egg binding, 406, 407f
egg-related peritonitis, 408
emergency problems, 383, 398-416
emergency quick referencing, 414t
enteral nutrition, 345t, 394, 395t
equipment, 415t
fluid requirements, 383-388
frostbite, 413
gastrointestinal stasis, 402
head trauma, database, 410
heat, 398
heavy metal, GI stasis, 403
hemorrhage, treatment of, 399
hepatitis, database, 405
housing, 398
hyperthermia, 413
hypoglycemia, common in, 389, 410
hysterectomy, 407, 408
liver disease, treatment for, 405
maintenance energy requirement (MER), 394
metabolic scaling, example, 394t
neurologic system, 410
nutritional support, 390, 396, 1082
oil, 413
oxygen, 395t
pancreatitis, 405
paralysis of acute onset, 411-412
renal failure, 408
respiratory system, 408-410
seizures, 410
shock, 401
stress maintenance, 394t
toxins, 415
tube feeding, 392t
urogenital system, 406
uterine prolapse, 407
vascular perfusion, 401
vomiting, 403, 404
- Supracoracoideus muscle, 1271
Supraventricular tachycardia, 708
SureCell, for *Chlamydia*, 992
- Surgery
antibiotics and, 1084
basal metabolic rate and, 1082
bipolar forceps, 1088f, 1103
celiotomy, 1118, 1119f
cloacopexy, 1126f, 1127f
considerations, 1081
constricted digits, 1098f
controlling hemorrhage, 1087
crop burns, 1116f
drapes, 1084
egg-related peritonitis, 1131
eye, 1100-1105
feather cyst, 1098
feather removal, 1083
gastrointestinal, 1111
ingluviotomy, 1117f
instruments, 1085
integument, 1097
microsurgery, 1086, 1090, 1091f, 1097
orchidectomy, 1131
oviduct, 769
patient preparation, 1082, 1094
postoperative management, in ratites, 1094-1111
proventriculotomy, 1121, 1122f, 1123f
radiosurgery, 1087f, 1090, 1097
reproductive, 1128-1131
respiratory, 1105f
salpingohysterectomy, 1130f
scalpel blades, 1097
skin incisions, 1088f, 1090, 1097
soft tissue, 1096
suture, 1092, 1093, 1097, 1123, 1125
thoracic, 1107
tissue adhesives, 1093, 1099
toe amputation, 1134f
trachea, 1109f, 1110f
urophygeal gland, 1099
vasospasm, 1089
wing, 1099, 1133, 1136, 1154f
wound healing, 1084f, 1085
- Surgical sexing (see gender determination)
Suspended flights, 53
Swallowing, and neurologic disease, 728
Swallow, as disease vector, 1193
Swans, 452, 742, 908, 1049, 1039, 1238, 1252, 1257
herpesvirus in, 875, 877, 884
lead in, 1035, 1038
trachea in, 1107
Swollen head syndrome, influenza virus and, 929
Synchronization of hatch, in Galliformes, 1228
Syncope, 706f, 712, 849, 1197
Syngamus, 468, 576, 1011f, 1024t,f, 1024f, 1198, 1295c
Synovitis, 982t, 1058
Syringeal bulla, ducks, 1239 (see imaging)
Syringeal foreign body, removal of, 1108
Syrinx, 561, 1108
- T-cell, 117
T-lymphocytes, 113, 118f
T-wave, 700, 705
T₂ intoxication, 1265
T₃, fat metabolism and, 595, 851
T₄, reproduction and molt, 851
Tachycardia, 702, 1266
propranolol and, 467
with P-wave, 704
Tachypnea, 590, 715, 1266
Tagamet, 460
Tags, bird identification, 51
Tahyna virus, 919
Tannin, 1042
Tapeworms, 460, 466, 1021, 1194, 1215f, 1011f, 1013f, 1314t (see cestodes)
Tarsometatarsus, 1121, 1157
Tarsorrhaphy, 686
Tasselfoot, in canaries, 1026, 1196
Tattoos, bird identification, 42, 611
Taxonomy, pigeons, 1201
Technician, duties of, 131
Teflon stent, 1107
Teflon toxicity, 1047
Tellurium, toxicity, CNS signs and, 746
Telmintic, 465
Temperate species, 1174, 1257
Temperature in birds, 169, 792, 1203, 1220, 1221t
Tendonectomy, in Anseriformes, 1269
Tenesmus, 461, 483t
Tensor proptagialis, 1271
Territorial defense, 782, 1129
Testicle
atrophy of, 776
color and variables, 332c, 343, 348t, 349, 755, 756, 774f, 756
degeneration of, 774, 855
in Galliformes, 1223
masses of, 256
mature, 335c
melanistic, 332c
neoplasia of, 774
Testosterone, 465, 468, 637, 757, 770, 775, 776, 1175, 1211
peritonitis and, 771
Tetanus, 978
Tetracycline, 447, 459, 824, 1187, 1189
for *Chlamydia*, 993
in toucans, 462
in water, 439, 442
toxicity of, 1046
Thelazia and ocular disease, 686c, 683, 1023
Theophylline, and chocolate toxicity, 1044
Therapeutic agents of choice, 462, 1181
Theriogenology, 748-804
artificial incubation, 788-804
artificial insemination, 776-777
calcium metabolism, 753
egg formation, structure, 750f, 753-754f
female hormonal factors, 751-752
female reproductive anatomy, 749 (see anatomy overlay)
female reproductive disorders, 774-777
male hormone factors, 757-758
male reproductive anatomy, 755-756f
male reproductive disorders, 774-777
non-disease factors affecting reproduction, 777-778
semen, 757
Thermogradient, in brooder, 1254f
Thermometer, 1261
Thiabendazole, 468
Thiaminase, fish diet, 468
Thiamine, 73, 468, 856, 1251
deficiency, 1292c, 705t, 706, 709
Thiopental sodium, 1260
Third degree AV block, 710
Thoracic air sacs, 342 (see anatomy overlay)
Thoracic surgery, 1107, 1198
Thoracoabdominal cavity, fluid in, 366
Thoracolumbar spinal cord lesion, 729
Thrombocytes, 112, 183, 187, 196 (see hematology)
Thymus, 118f, 372
Thyroglobulin, 593
Thyroid, gland, 370, 594, 1210
stimulation testing, TSH, 468, 584
tumors, 594, 860
Thyroiditis, 119, 593
Thyrototoxicosis, 596
Thyrotropin releasing hormone, for spinal trauma, 734
Thyroxine, 637
Tibia, in egg laying, 753
Tibiotarsus, 1142, 1161
surgical approach to, 1160, 1162f
Ticarcillin, 445, 468
Tick (as disease vector), 916, 960, 1061-1063, 1192-1193
Tinamous, 1285
Tissue adhesives, 1093, 1099

- Tobacco products, toxicity, 1047
 Tobramycin, dose, 447, 468
 Toe
 amputation, 1134f
 constriction, malposition, neonate, 830-831
 neonate, 831
 necrosis, 1097
 picking in Galliformes, 1233
 Togavirus, 915, 917
 CNS signs and, 744
 in chicks, 825
 in Galliformes, 1232
 picornavirus vs, 937
 Tomia, 484
 Tongue, 728, 732, 743, 1173
 Tonometry, 675
 Tophi, 540
 Torticollis
 bacterial, 953f, 976
 Chlamydia and, 745
 correction of, 816f
 in Passeriformes, 928, 1188
 in pigeons, 881, 1216f
 parasites and, 742
 viral disease and, 743, 744, 881, 906, 916, 922, 930
 vitamin E and, 855
 Total iron binding capacity (TIBC), 236, 530
 Total parental nutrition (TPN), 393
 Total protein, 236
 Toucan, 334, 459, 464, 1279, 1280-1282
 (see *Ramphastidae*)
 coccidia in, 468
 liver disease in, 858
 tetracycline in, 468
 Yersinia in, 957
 Tourniquet, 1097
 Toxiban, 458
 Toxicologic analysis, 1033, 1051
 Toxin, 1030-1052
 antifungal, 999
 antimicrobial therapy, 442
 automobile lubricant, 1035
 birds vs mammals, 1033
 brodifacoum, 1051
 carbamate, 1051
 carbaryl, 1050, 1051
 carbon monoxide (CO), 1049
 chelating agents, 1038t
 CNS diseases and, 723
 commonly encountered, 1032t
 copper, 1039
 crown vetch, 1042t
 DDE, DDT, 1050
 diazinon, 1050
 dichlorvos, 1050
 emergency treatment of, 414
 environmental, 460
 ethylene glycol, 1044
 exposure, 414
 fertility and, 786
 flea collars, 1051
 formaldehyde fumes, 1048
 fungus, 1043
 gases, in Galliformes, 1233
 harmful foods, 1044
 household compounds, toxic potential, 1031t, 1032t
 iatrogenic, 1045-1047
 in Anseriformes, 1266
 insecticides, 1049
 lead, blood levels, normal, 1036t
 lead, sources of, 1034t
 lily of the valley, 1041
 malnourished birds and, 1033
 mercury, 1040
 methomyl, 1050
 mite protector, 1051
 mycotoxin, 1041
 naphthalene, 1051
 natural gas, 1049
 natural plant, 68
 nitrate, 1041
 normal household compounds, 1031t, 1032
 nutrients, effects of, 75t
 oil, 1040
 organochlorine, 1050
 organophosphate, 1050
 oxygen, prolonged exposure, 1047
 para-dichlorobenzene, 1051
 parathion, 1050
 permethrin, 1050
 pesticide vapors, 1049, 1051
 petro-chemicals, migratory bird, 1050
 plants, 741, 1041t
 polytetrafluoroethylene (PTFE) gas, 1047
 reproductive disorders and, 774
 rodenticide, 1051
 selenium, 1041
 tobacco products, smoke, 1047
 vitamin K, antidote, 1051
 warfarin 1051
 zinc, 1038-1039
Toxoplasma, 467, 1017, 1190, 1191, 1314
 clinical signs of, 741, 742
 Toys, safe, unsafe, 36f
 TPN solution, 383
 Trachea, 567, 1107, 1221, 1238, 1295
 bullae, 1238f
 coiled, 1107
 diameter, 1108
 diverticulum, in emus, 1288, 1292c
 in ratites, 1295c
 mites, 970
 obstruction, 704
 surgery of, 1107, 1108
 wash, 211, 221, 572
 worms, in ratites, 1314
 Tracheitis
 adenovirus and, 579, 906, 1234
 in Passeriformes, 1187
 in ratites, hemorrhagic, 1314
 influenza virus and, 930
 mycoplasma and, 1054
 Tracheobronchial syring, in Galliformes, 1221
 Tracheotomy, 1109f
 Tragopans, 1219
 Training, behavior, 101-107, 1204
 in Columbiformes, 1204
 Tramisol, 465
 Transfusions, neonates, 829
 Transportation, 31, 33, 133, 136, 1208
 Transtracheal illumination, 576
 Trauma,
 band injuries, 422-424
 feather, toenail, beak injuries, 423
 fractures, immobilization, 428
 frostbite, 424
 hydrocolloid dressing splints, 421f
 injuries, management of, 422-433
 lacerations, 422
 medicine, 417-433, 419f
 neuropathies, 733
 self-mutilation, 423
 Trematodes, 468, 576, 1194, 1232 (see flukes)
 Tremor, 689, 740, 743, 744, 745, 906, 976, 989, 1045, 1188
 Trephination, 1106, 1107
Treponema, 961, 1232
 Triamcinolone, 1100
 Tribromoethanol, 1260
Trichobilharzia, in geese, 1266
Trichomonas, 113c, 166, 210, 344, 459, 461, 464, 486, 489, 491t, 575, 882, 915, 973, 825, 1013, 1209
 Candida vs, 999
 cytology of, 218c
 in Columbiformes, 715, 881, 1207
 in Passeriformes, 1190
 in ratites, 1314
 resistant strains of, 496
Trichophyton, 625, 1005
 in Galliformes, 1232
 in Passeriformes, 1189
 zoonosis, 1005
 Trichosporonosis, 575, 1005
 Trichostrongylus, 1011f
 Trichothecenes (T₂), 485, 489, 1044, 1265
 Tricyclic antidepressant, 461, 462, 636
 Trigeminal nerve (CN V), 724
 Trigeminy, 708
 Triglycerides, 238
 Trimethoprim, 468, 824, 1187, 1322
 TRIS lysozyme solution, 462
 Trochlear nerve (CN IV), 725
 True geese, 1239
Trypanosoma, 1021, 1193
 TSH, 468
 stimulation test, 595, 729
 Tube feeding, 391, 1115
 Tubercle bacilli, 464, 468
 Tuberculin test, false-negative results, 974
 Tuberculosis (see *Mycobacterium*)
 cytology of liver, 215
 decreased A/G ratio in, 238
 in ratites, 1309
 Tularemia, 964
 Tumescence, 509
 Tumors, 251, 689, 774 (see oncology)
 abdominal, 1133
 granulosa cell, 770
 in waterfowl, 1266
 poxvirus with, 872
 viral-induced, 936
 Turacos, 957, 1282
 Turkey (see Galliformes)
 aortic rupture, 720
 hemorrhagic enteritis, antibody, 903
 herpesvirus, 875
 meningoencephalitis virus in, 918
 Twiehaus-type strains, 935
 Twirling syndrome, in finches, 939
 Tylosin, 449, 686, 1060
 eggs and, 795
 in canaries, 1187
 Type C retrovirus, leukosis-related viruses, 931-932

INDEX

- Type C toxin, 1263
Tyrosine, and feather quality, 847
- Ulcer, sucralfate, 468, 851
Ulceration, corneal, 1100
- U** Ulcerative dermatitis, 461, 462
Ulna, 1139 (see anatomy overlay)
surgical repair of, 1155
Ultrasonography, 260, 325
anechoic and, 325
hyperechoic and, 325
pericardial effusion and, 718
Ultrasound, 260, 325, 697, 706f
abdominal, 256
for reproductive evaluation, 768
guided biopsy, 325
in ostriches, 1301, 1304
soft-shelled eggs vs egg-related
peritonitis, 325
Ultraviolet light, 1204
Ultraviolet Wood's lamp, 686
Underbite, mandibular prognathism, 837
Urates, 150, 1132
Urea, 238, 239, 539, 542
Ureaplasma, 1053, 1232
Ureter, relation to ductus deferens, 756
Uric acid (UA), 239, 539, 850, 916, 1223, 1335t
postprandial effects of, 542
Uricotelic, 539, 850
Urinalysis, 150, 242, 543t, 547, 548
bacteria and, 244
casts and, 244
color of, 523, 829, 845
in Anseriformes, 242
in ratites, 242
osmolality of, 586
white and red blood cells in, 244
Urine water, 539
Urination, in ratites, 1290
Urodeum, 509
Urogenital system, anatomy and
physiology, 255-256
Urography, 256
Urolithiasis, 553, 914
Uropygial gland, 169, 613-614, 784
impaction, 644, 665, 1099, 1219
in Columbiformes, 1202
Uropygial teat, 1219
Uterus, 749, 1129 (see anatomy overlay)
contractions of, 463
emergency treatment of prolapse, 414, 762
flushing of, 760, 762
increased tone of, 462
infections, rough-shelled eggs, 773
prolapse of, 407, 801c
rupture, 768
stasis and, oxytocin, 467
Uukuniemi virus, 919
Uveitis, 194, 673, 687, 1100
viral diseases and, 744, 911
- Vaccination, 372, 1004, 1208
aspergillosis and, 1004
V for *Chlamydia*, 995
for PMV-1 pigeon, 926
in Columbiformes, 1208
in Ramphastidae, 1281
in ratites, 1309
Pacheco's virus disease, 50
Pasteurella, 963
Salmonella, 50
subunit, 126
viral, 126, 939t
Vagina, 749
examination of, 760f
prolapse of, 801c
relaxation of, 462
Vagus nerve (CN X), 706, 726
Valgus deformity, 250, 830, 831f, 832c, 1161, 1165f
in ratites, 1307f, 1325f
Valvular endocarditis, 717f
Vapor permeable (MVP) dressings, 420
Varieties, pigeons, 1212
Vas deferens, in Columbiformes, 1210
Vasa Parrot, cloacal swelling, 509
Vascular access device, 388, 1133
Vascular clips, 1111
Vasectomy, 777, 1178
Vasotocin, 583, 760
Vector leads, augmented, 701
Vecuronium bromide, 674
Vegetable oils, essential fatty acids, 81
Vegetative endocarditis, 414, 716f
Venereal disease, and mycoplasma, 1054
in ganders, 511
Venezuela equine encephalomyelitis,
(VEE), 917
Venous sinus, 724
Vent
gleet, 510
opening, narrowing, 1125
picking, in Galliformes, 1233
response, and neurologic disease, 729
sexing, 778
Ventilation, poor, 1001
Ventral hepatic peritoneal cavity, 346, 351
Ventral ligament, of oviduct, 1129
Ventricular
arrhythmias, 708
bigeminy, 122
fibrillation, 1262
hypertrophy, 710f
premature contractions, 708, 709
septal defect, 816
tachycardia/atrioventricular
dissociation, 707
digitalis, 714
Ventriculotomy, 1121
Ventriculus, 345, 499, 503, 851, 1121, 1203, 1288
aflatoxin in, 1265
atonic, 845
atrophy of, 940
biopsies, 942, 1123
erosions in, 851
in Galliformes, 1222f
in Passeriformes, 1173
in ratites, 1288, 1289
treatment of, 499, 1121
Veratrum californium, 746
Vertebrae, varying number, 726
Vertebral fracture, radiograph, 251
Vesicular dermatitis, with
Staphylococcus, 967
Vestibulocochlear nerve (CN VIII), 726
Vetisulid, toxicity, 1045
VHPC, 346 (see endoscopy, ventral
hepatic peritoneal cavity)
- Vibramycin, 463
Vibravenös, 462
Vibrio, 960
Vinyl turf-type mat, for Anseriformes,
1254
Viral serositis, (AVS), 371, 501, 507f, 917
ascites and, 869c
ileus and, 918f
pathologic changes and, 917t
Virginia creeper, 1041
Virus, 862-948
Agar-gel diffusion test, 864f
common, reference data, 939t
complement-fixation test, 863
control, 939-940t
cultures, 863-865
diagnosis of, 863, 865t
egg-transmitted, 119
ELISA test, 863
HA titer, hemagglutination inhibition
(HI), 864f
identification, 863f, 864, 865
in Anseriformes, 1267t
in Columbiformes, 1212, 1215t
in Galliformes, 1232t
in Ramphastidae, 1282
in ratites, 1303t, 1308
interferon, for treatment, 862
neuropathies, 743
neutralization test, 863
ocular, 678
radioimmunoassay test, 863
specific treatment for, 943t
supportive care for, 862
transmission, 862
tumors, 872
Viscera, posthepatic septum, 515
Visceral gout, cardiac effects, 718, 914
Visceral lymphomatosis, with REV, 934
Visual deficits, 736, 937
Vitamin A, 72, 82, 83, 574, 738, 852, 1250
egg laying and, 773
feather quality and, 846
dyspnea and, 846
gout and, 850
immune response and, 849
parental administration of, 1113
supplements of, 1262
toxicity of, 1046, 1047
vitamin D₃ and toxicosis, 855f
Vitamin antagonists, 68
Vitamin B complex, 73, 469
Vitamin B₁₂, 72, 85, 87, 88, 461, 846
Vitamin B₆, 1298
Vitamin C, 73, 88, 459, 857
debilitated birds and, 852
for viral infections, 862
hemoglobin values and, 1251
immune response and, 849
in Galliformes, 1233
required nutrient in some birds, 88
Vitamin D, 82, 83, 588, 853
egg binding, and, 759, 773
toxicity of, 51
Vitamin D₃, 72, 73, 75, 587-589, 852, 1252
egg laying and, 753
embryo death and, 787
dyspnea and, 846
relation to phosphorous and calcium, 67
sunlight, 83

- toxicity of, 829, 1046
toxicity, in macaws, 51, 74, 592
Vitamin E, 72, 469, 504, 855
angel wing and, 1257
egg binding and, 759, 849
embryo death, 787
malabsorption and, 845
ocular disease and, 686
deficiencies and, 705t, 706, 709, 784, 1298
deficiency vs picornavirus, 937
neurologic signs with, 848
immune response and, 849
Vitamin H, 82
Vitamin K, 73, 856
embryo death and, 787
hemorrhage control and, 802
antidote for, 1051
viral therapy and, 916
malnutrition and, 856
Vitamin K₁, 349, 389, 469
Vitamin M, 82
Vitamin precursors, 83
Vitamin requirements
in Anseriformes, 1251t
fat-soluble, 82, 86
in Galliformes, 1223
in Columbiformes, 1206
water-soluble, 856
Vitelline diverticulum, Merkel's
diverticulum, 506
Vitrogenin, 237
Vocalization
changes in, 576, 732, 1001
emus and, 1288
neurologic disease and, 728
Volvulus
in ratites, 1292c
mesenterialis, 508
nodosus, 508
Vomer bone, 559
Vomiting, 403, 492, 905, 926, 940, 1004, 1044 (see regurgitation)
adults and, 483
Candida and, 998
doxycycline and, 1046
in Passeriformes, 1189
myocardial degeneration and, 504f
papillomas and, 887
VPC's, 708
Warfarin, 1051
Warts (see papilloma)
W Wasting disease, with *Mycobacterium*, 973 (see neuropathic gastric dilatation)
in Passeriformes, 1188
with enterovirus, 938
Water
contamination of, 65, 860
deprivation test, 586
for Arctic circle waterfowl, 1257
in Anseriformes, 1247, 1265
in Columbiformes, 1204, 1206
intake, variance of, 383t
malnutrition, 860
quality, and *C. botulinum*, 1263
vitamins in, 57, 65
Water bottle, 55f
Waterfowl, 805, 850, 856, 1237, 1266 (see Anseriformes)
Actinobacillus in, 962
airplane wing in, 848
botulism and, 739, 978
aspergillosis in, 1000, 1001
Candida in, 999
Cryptococcus in, 1004
free-ranging, as disease vector, 921, 958
bacterial disease and, 959, 960, 961, 975
viral disease and, 872, 929, 934, 937
gender determination in, 778
immunosuppression in, 1265
lead in, 1035, 1037
migration and elevations of, 1239
neonatal management in, 1253
oil-contaminated, 599
pinioning in, 1269
restraint of, 1258, 1260f
surgical techniques in, 1269
tumors in, 1266
zinc toxicosis in, 1039
Watering techniques, 37-38
WBC, white blood cell, count, 180, 916, 1181 (see hematology)
formula for determining, 181t
Weakness, 720, 732, 739, 1039, 1251, 1266
Weaning, 101, 812, 827
natural eating habits, 997
regurgitation, in neonate, 827
WEE virus, 919
Weight, hand-weaned and adult, 818
Weight loss
in chicks, 824
in free-ranging waterfowl, 1253
zinc toxicosis and, 1039
Wenckebach phenomenon, 710
Wenyonella, in Passeriformes, 1190
West-Nil virus, 919
Western duck sickness, 1263
Wet chemistry, 227
Wheat, aflatoxin, 69
Wheezing, 887, 1001, 1197
White lethal factor, in canary, 1184
White muscle disease, 859
Wild bird
Conservation Act, 23
harvesting, 22
ranching, 21
reintroduction, 22
Wing
balance, use of, 728
body wrap, 429
clipping, 38, 40f, 1224, 1225
droop, 728, 743, 1035, 1264
feather, 616f
flaccid paralysis, 1044
flapping and CNS signs, 736, 741
slipped, 1257
surgical approach to, 1153
withdrawal, and neurologic disease, 728
Winter plumage, 1239
Wires, interfragmentary, cerclage, 1149
Wolf-Parkinson-White syndrome, 710
Wood chips, and fungus, 741
Wood's lamp, ultraviolet, 696
Wound healing, 418f, 419, 637, 1084
sutures and, 1092
Wright's stain, 179 (see hematology)
Wry neck, 789
Xanthoma, 207, 642, 665, 1099
X cytology of, 213, 221c
Xanthophyll, and feather pigmentation, 846, 1177
Xenografts, 1145
Xylazine, 462, 709, 711, 1213
Xylocaine gel, 510
Yeast, 152, 436, 820, 823
cell derivatives, 469
in chicks, 152, 814, 823, 826
Yersinia, 575, 771, 957-958, 1188
in Galliformes, 1232
in Ramphastidae, 1281
Yew, 1041
Yolk (see egg)
Yolk sac, 506, 821
in Anseriformes, 1256
infection of, 820
percent body weight, 802
removal, 1135, 1256, 1323
retained, in ratites, 1292c, 1321
retraction, 795
Yolk sacculitis, bacterial, 969f, 1256
in ratites, 1320
Zearalenone (F2), 1265
Z Zinc, 72, 73, 93, 459, 513, 557, 848, 859, 1039
feather quality and, 846
immune response and, 849
liver levels in Anseriformes, 1264
new wire disease, 1038-1039
monocytosis and, 189
protoporphyrin levels, 1037
serum levels in Anseriformes, 1264
toxicosis and, 739, 1039, 1198, 1264
vitamin A and, 853
Zoonoses (DOT) toxicosis, 504
Zoonoses, 357, 921, 929, 955, 1061
bacterial diseases, 964, 971, 972t
Chlamydia and, 995
fungal diseases, 1005
viral diseases, 930
Zovirax, 458
Zygapophyseal joint, 734
Zygodactyl, 1277
Zygomycosis, 1189
Zyloprim, 458
Zythromax, 459
2-PAM, 467
5-fluorocytosine, 463