

Nutrition of pigs, poultry and rabbits

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Nutrition of pigs

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Digestive anatomy and physiology of pigs

- The mouth of the pig
 - Long and varies with breed
 - Birth piglets have
 - Eight deciduous teeth
 - Four incisors teeth
 - Four canines teeth
 - Adult pigs have
 - 44 teeth
 - Complete by 18 months of age
 - Canines in boars continue to grow throughout life

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Digestive anatomy and physiology of pigs

- Gastrointestinal tract
 - Stomach
 - Simple, gastric stomach
 - Relatively larger than that of other mono-gastrics
 - Oesophagus enters the stomach at the cardia

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Digestive anatomy and physiology of pigs

- Gastrointestinal tract
 - The small and large intestines
 - Stomach empties into the duodenum through the pyloric sphincter
 - Small intestines comprise
 - Duodenum, jejunum and ileum
 - 16–21 m long in the adult pig
 - Large intestines comprise
 - Caecum and a colon

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Nutritional requirements of pigs

- General classes of nutrients
 - Water
 - Carbohydrates
 - Fats
 - Protein
 - Amino acids
 - Minerals
 - Vitamins
- Energy
 - Derived from oxidation of carbohydrates and fats
- Amino acids
 - From protein
 - Maintenance and tissue protein synthesis

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Nutritional requirements of pigs

- Other feed additives
 - Antibiotics
 - Chemotherapeutic agents
 - Microbial supplements
 - Prebiotics
 - Probiotics
 - Enzymes

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Nutritional requirements of pigs

- Energy
 - Energy requirements
 - Kilocalories (kcal) of
 - Digestible energy
 - Metabolizable energy
 - Net energy
 - Most commonly used
 - Digestible energy
 - Metabolizable energy
 - Trend in industry to formulate diets
 - Net energy

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Nutritional requirements of pigs

- Energy
 - Requirements are influenced
 - Weight
 - Genetic capacity for
 - Lean tissue growth
 - Milk production
 - Environmental temperature

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Nutritional requirements of pigs

- Protein and amino acids
 - Required for
 - Maintenance
 - Muscle growth
 - Development of fetuses
 - Supporting tissues in gestating sows
 - Milk production in lactating sows

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Nutritional requirements of pigs

- Amino acids
 - 12 amino acids are synthesized
 - 10 amino acids must be provided in diet for normal growth
 - Arginine
 - Histidine
 - Isoleucine
 - Leucine
 - Lysine
 - Methionine
 - Phenylalanine
 - Threonine
 - Tryptophan
 - Valine

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Nutritional requirements of pigs

- Protein
 - Milk protein
 - Well balanced in essential amino acids
 - Dried whey
 - Protein with an excellent profile of amino acids
 - Total protein content is low
 - Animal proteins
 - Good sources of
 - Minerals
 - B-complex vitamins

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Nutritional requirements of pigs

- Protein and amino acids
 - Diets for early weaned pigs
 - High levels of
 - Dried animal plasma
 - Dried blood cells
 - Deficient in methionine
 - High levels of methionine
 - Depress growth

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Nutritional diseases of pigs

- Diagnosis is difficult
- Clinical signs are result of
 - Mismanagement
 - Infectious diseases
 - Parasitism
 - Malnutrition
- Nutritional deficiencies
 - Poor appetite
 - Reduced growth
 - Unthriftiness
 - Difficult diagnosis

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Nutritional diseases of pigs

- Protein deficiency
 - Result from
 - Suboptimal feed intake or deficiency of
 - one or more essential amino acids
 - Causes
 - Reduced gains
 - Poor feed conversion
 - Fatter carcasses in
 - Growing pigs
 - Finishing pigs
 - Lactating sows
 - Milk production is reduced
 - Excess weight loss
 - Postweaning estrus
 - Delayed return to estrus

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Nutritional diseases of pigs

- Fat deficiency
 - Long-chain polyunsaturated fatty acids
 - Essential for swine
 - Linoleic acid
 - Essential
 - Used to produce longer-chain fatty acids
 - Deficiency
 - Hair loss
 - Scaly dermatitis
 - Skin necrosis on the neck and shoulders
 - Unthrifty appearance in growing pigs

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Nutritional diseases of pigs

- Mineral deficiency
 - Calcium or phosphorus
 - Rickets
 - Growing pigs
 - Osteomalacia
 - Mature pigs
 - Signs
 - Deformity and bending of long bones
 - Young pigs
 - » Lameness
 - Older pigs
 - » Fractures and posterior paralysis
 - Sows
 - » Posterior paralysis
 - End of lactation
 - After weaning

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Nutritional diseases of pigs

- Mineral deficiency
 - Selenium and vitamin E
 - Young pigs
 - Sudden death
 - More susceptible to iron toxicosis

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Nutritional diseases of pigs

- Vitamin deficiency
 - Vitamin D
 - Signs
 - Rickets
 - Stiffness
 - Weak and bent bones
 - Posterior paralysis

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Nutritional diseases of pigs

- Vitamin deficiency
 - Vitamin E
 - Poor reproduction
 - Impaired immune system

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Nutritional requirements of pigs

- Water
 - Free and convenient access to water
 - Amount required
 - Age
 - Type of feed
 - Environmental temperature
 - Status of lactation
 - Fever
 - High urinary output
 - Diarrhea
 - Normally
 - 2–3 kg of water for every kg of dry feed
 - Lactating sows
 - Consume more
 - High water content of milk

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Nutrition of poultry

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Digestive anatomy and physiology of chickens

- Mono-gastric animal
- Simple but efficient digestive system
- Intestinal digestion of high-quality feeds

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Digestive anatomy and physiology of chickens

- Digestive tract comprises
 - Oesophagus
 - Pre-crop
 - Post-crop
 - Crop
 - Proventriculus
 - Gizzard
 - Small intestine
 - Duodenum
 - Jejunum
 - Ileum
 - Large intestine
 - Caeca (paired)
 - Colon
 - Cloaca

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Digestive anatomy and physiology of chickens

- Mouth
 - Beak
 - Keratinised structure
 - Overlying the mandibles and incisive bones
 - There are no teeth

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Digestive anatomy and physiology of chickens

- Crop
 - Used in grain-eating birds
 - Store food
 - Storage function
 - Allows birds to eat 'meals'
 - continually digest food
 - Fermentation
 - Minor contributor to total energy production

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Digestive anatomy and physiology of chickens

- Proventriculus (glandular stomach)
 - Dilation of gut
 - Contains pepsin and hydrochloric acid
 - Beginning of protein digestion

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Digestive anatomy and physiology of chickens

- Gizzard (ventriculus)
 - Thick, muscular gizzard
 - Rounded organ
 - Covered on the serosal side by connective tissue
 - Circular and longitudinal muscles
 - » Thick
 - » Produce strong grinding motions
 - Grit
 - Acts as a grinding agent akin to teeth in mammals

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Digestive anatomy and physiology of chickens

- Small intestines
 - Digesta enters the duodenal loop
 - Centre of pancreas
 - Pancreatic secretions include
 - Proteases
 - Lipases
 - Polysaccharidases
 - Bicarbonate
 - » Neutralises pH of the chyme
 - Activity
 - Breaks down
 - Proteins and peptides into amino acids
 - Polysaccharides into simple sugars
 - Lipids into fatty acids
 - Absorbed
 - Minerals
 - Vitamins

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Digestive anatomy and physiology of chickens

- Large intestines
 - Two blind caeca
 - 16–18 cm in length
 - Fermentation

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Digestive anatomy and physiology of chickens

- Colon
 - Short
 - Ends at cloaca
- Urodeum
 - Area in the caudal large intestine
 - Contains distal openings of ureters from kidneys
 - Uric acid => Deposited with faeces

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Nutritional requirements of poultry

- Poultry convert feed
 - Quickly
 - Efficiently
 - Relatively low environmental impact
- High rate of productivity
 - High nutrient needs
- Criteria to determine the requirement include
 - Growth
 - Feed efficiency
 - Egg production

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Nutritional requirements of poultry

- Amino acids
 - Can synthesized but dietary source is required
 - Histidine
 - Glycine
 - Proline
 - Tyrosine and cysteine
 - Can be synthesized from
 - Phenylalanine
 - Methionine

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Nutritional requirements of poultry

- Vitamins
 - Vitamin A
 - Young chicks
 - Use less efficiently
 - Vitamin D
 - Cholecalciferol
 - Vitamin D₃
 - Ergocalciferol
 - Vitamin D₂
 - Used with an efficiency of vitamin D₃

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Nutritional requirements of poultry

- Minerals
 - Much of phosphorus
 - Is not absorbed efficiently
 - Calcium
 - Laying hens
 - Increases with rate of
 - Egg production
 - Age of hen
 - Ratio of
 - Calcium : Phosphorus
 - 2:1

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Nutritional deficiencies

- Difficult to diagnose
- Signs
 - Affected living birds
 - Necropsies
 - Tissue analyses
- Stress may interfere with
 - Absorption nutrient
 - Increase quantity
 - Stress
 - Infections
 - Bacterial
 - Parasitic
 - Viral
 - High or low temperatures

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Protein, amino acid, and energy deficiencies

- Protein, amino acid low
 - Slowly grow
- Deficiency of various amino acids
 - Signs
 - Peculiar
 - Loss of pigment
 - Retarded growth
 - Reduced egg size or egg production

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Protein, amino acid, and energy deficiencies

- Deficiency of energy
 - Bird will
 - Grow slowly
 - Stop ovulating
 - Ketosis

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Vitamin deficiencies

- Vitamin D₃
 - Required for absorption and metabolism of
 - Calcium
 - Phosphorus
 - Deficiency
 - Rickets
 - Osteoporosis
 - Poor eggshell quality

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Mineral deficiencies

- Calcium and phosphorus
 - Lack of normal skeletal calcification
 - Rickets
 - Reduced shell quality
 - Osteoporosis

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Nutritional requirements of poultry

- Water
 - Essential nutrient
 - Factors influence water intake
 - Environmental temperature
 - Relative humidity
 - Diet
 - Salt level
 - Protein level
 - Birds' productivity
 - Growth
 - Egg production

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Nutritional requirements of poultry

- Water
 - Requirements
 - Highly variable
 - Deprivation for
 - ≥12 hours
 - » Adverse on
 - Growth
 - Egg production
 - ≥36 hours
 - » Increase in mortality

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Nutrition of rabbits

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Anatomy and functions of the rabbit digestive tract

- Rabbits masticate their feed very thoroughly
 - As many as 120 jaw movements per minute
 - Ingested material is broken down to small particle sizes
- Stomach
 - Thin-walled
 - Pouchlike
 - pH in the adult
 - From 1 to 2
 - Kills bacteria and other microorganisms
 - » Stomach and small intestine are essentially sterile

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Anatomy and functions of the rabbit digestive tract

- Small intestine
 - Major site of
 - Digestion
 - Absorption
 - Divided into three functional areas
 - Duodenum
 - Jejunum
 - Ileum
 - Duodenum
 - Neutralization of the acid material coming from the stomach
 - Mixing by muscular churning action

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Anatomy and functions of the rabbit digestive tract

- The hindgut
 - Fermentation in the cecum
 - Selective excretion of fiber
 - Coprophagy
 - Reingestion of cecal contents

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Anatomy and functions of the rabbit digestive tract

- The hindgut
 - Appendix
 - Secretes an alkaline fluid
 - Buffer the volatile fatty acids produced during cecal fermentation
 - Lymphoid organ
 - Have an influence on microbial fermentation

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Anatomy and functions of the rabbit digestive tract

- The hindgut
 - Coprophagy or cecotrophy
 - Consumption of the cecal contents
 - Composition of soft feces, cecal contents, and hard feces suggests that the soft feces (cecotropes) are of cecal origin
 - Soft feces
 - Surrounded by a mucilaginous membrane
 - Cecotropes
 - » Are consumed as discrete clusters
 - » Continue to ferment in stomach

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Anatomy and functions of the rabbit digestive tract

- The hindgut
 - Excretion of
 - Hard feces
 - During first 4 hour after feeding
 - Soft feces
 - Rabbit licking anal area => Consuming the cecotropes

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Nutritional requirements of rabbits

- Rabbits
 - Small herbivores
 - Specialized
 - Feeding needs
 - Digestive systems
 - Selective eaters
 - Naturally pick and choose foods higher in energy density
 - Predisposes to obesity

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Nutritional requirements of rabbits

- Bacterial population in cecum
 - Gram-positive Bacteroides sp.
 - Very sensitive to oral antibiotics

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Nutritional requirements of rabbits

- Fiber
 - Digest fiber poorly
 - Selective separation and rapid excretion of large particles in the hindgut
 - High-fiber intake
 - Ad lib timothy hay
 - Absorb bacterial toxins
 - Eliminate them via hard feces
 - Diets low in fiber
 - Increased incidence of intestinal problems
 - Enterotoxemia

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Nutritional requirements of rabbits

- Fiber
 - Indigestible fiber
 - Important for stimulating gastrointestinal tract motility
 - Preventing behavioral problems
 - Fur chewing
 - Providing dental wearing
 - Stimulating
 - Appetite
 - Ingestion of cecotrophs

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Nutritional requirements of rabbits

- Carbohydrates
 - Inhibit motilin
 - Motilin
 - Polypeptide hormone
 - Secreted by cells of
 - » Duodenum
 - » Jejunum
 - Stimulates gastrointestinal tract smooth muscle
 - Starch
 - proliferation of pathogenic bacteria
 - Clostridium spiroforme
 - » Produce toxin

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Nutritional requirements of rabbits

- Volatile fatty acids
 - Cecum fermentation
 - Aid in control of pathogenic organisms
 - Maintain normal pH in cecum
 - pH 6 - 7

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Nutritional requirements of rabbits

- Vitamins
 - Necessary
 - Vitamins A, D, E
 - Vitamins B and K
 - Bacteria in gut synthesize
 - Dietary supplements are unnecessary
 - Increase daily requirements
 - Disease
 - Stress
 - Vitamins A and E
 - Feed preparation and storage destroys
 - Oxidation
 - Alfalfa meal
 - Sufficient vitamin A
 - Vitamin E deficiency
 - Infertility
 - Muscular dystrophy
 - Fetal death
 - Neonatal death

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Nutritional requirements of rabbits

- Water
 - Approximately 120 mL/kg/day
 - Dehydrated rabbits
 - 240 mL/kg/day
 - 10 mL/kg/hr
 - Anorexia
 - Most often also dehydrated
 - Drink more from open bowl than a sipper bottle

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Literature

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