- **B3 (Niacin):**
  - Essential for DNA repair and energy metabolism. Deficiency can cause pellagra, characterized by dermatitis, diarrhea, and dementia.

- **B5 (Pantothenic Acid):**
  - Crucial for fatty acid synthesis and energy production. Deficiency is rare but can lead to fatigue and neurological symptoms.

- **B6 (Pyridoxine):**
  - Involved in amino acid metabolism and neurotransmitter synthesis. Deficiency can result in anemia and impaired immune function.

- **B7 (Biotin):**
  - Important for fatty acid synthesis and energy metabolism. Deficiency can lead to skin problems and hair loss.

- **B9 (Folate):**
  - Essential for DNA synthesis and cell division. Deficiency can cause megaloblastic anemia.

- **B12 (Cobalamin)**:
  - Vital for red blood cell formation and neurological function. Deficiency can lead to anemia and neurological issues.

Metabolism and Absorption

Vitamins are absorbed in the gastrointestinal tract, with fat-soluble vitamins requiring dietary fats for absorption. Water-soluble vitamins are generally absorbed directly into the bloodstream. The metabolism of vitamins involves various biochemical pathways, with some vitamins being converted into active forms that participate in enzymatic reactions.

Importance in Veterinary Medicine

Understanding vitamin metabolism in veterinary species is crucial for diagnosing and treating nutritional deficiencies. Recent advances in analytical techniques, such as liquid chromatography-tandem mass spectrometry (LC-MS/MS), are enhancing the ability to profile vitamin metabolites, particularly vitamin D.

- **Vitamin D Analysis:**
  - There is increasing demand for vitamin D metabolite assessment in veterinary species due to its roles beyond bone health. The circulating 25-hydroxyvitamin D (25(OH)D) metabolite is commonly used to assess vitamin D status, but profiling other metabolites is becoming essential for a comprehensive understanding of vitamin D metabolism.

- **Challenges**:
  - The veterinary field is behind in vitamin D metabolite assessment, with few studies utilizing LC-MS/MS for measurement. Establishing reference ranges and understanding species differences in vitamin D metabolism are critical for improving veterinary care.

Conclusion

Vitamins are vital for animal health and productivity. Adequate dietary intake and understanding of their biochemical roles are essential for preventing deficiencies and promoting overall well-being in veterinary practice. Ongoing research into vitamin metabolism and its implications for animal health will enhance our ability to manage nutritional needs effectively.