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Popular Article

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## Clinical and Nutritional Importance of retinol (Vitamin A) in the domestic and companion Animals

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Vitamins play a key role in maintaining the health and productivity of animals, and deficiencies can lead to significant health problems, especially in livestock, affecting growth, reproduction, and general well-being. Among vitamins, Vitamin A (retinol) is crucial for vision, immune function, reproduction, and maintaining epithelial tissues. In this article, we will explore the importance of Vitamin A, its role in livestock and companion animals, deficiency symptoms, and preventive measures.

### Functions of Vitamin A

- Vision:** Vitamin A is essential for normal vision, particularly for the synthesis of rhodopsin, a pigment in the retina. Deficiency can cause night blindness and, in severe cases, complete blindness due to retinal damage.
- Immune Function:** It strengthens the immune system by supporting the integrity of epithelial tissues and mucous membranes, which act as barriers against infections. A deficiency can increase susceptibility to infections.
- Reproduction:** Vitamin A is vital for proper reproductive function. Deficiency can cause infertility, abnormal fetal development, and reproductive tract disorders in both male and female animals.
- Skin and Epithelial Health:** It maintains and repairs epithelial tissues, including the skin, respiratory, and gastrointestinal tracts. A deficiency can result in hyperkeratosis (thickened skin) and an increased risk of infections due to compromised barrier functions.
- Bone Growth and Development:** Vitamin A influences bone metabolism and growth, particularly in young animals. Deficiency can lead to impaired skeletal development and deformities.
- Antioxidant Function:** In some species, Vitamin A and its precursors (such as carotenoids) have antioxidant properties, protecting cells from oxidative damage.

3737

## Importance of Vitamin A in Livestock and Companion Animals

**Livestock (Cattle and Sheep):** Adequate Vitamin A levels are essential for resistance to respiratory and gastrointestinal infections. Supplementation can improve immune function, especially during stressful periods like transport or weaning.

- **Dairy Cows:** Vitamin A supplementation improves milk's nutrient profile and yield, especially during early lactation when demand is high.
- **Dogs and Cats:** In companion animals, Vitamin A helps maintain healthy vision, preventing night blindness. It is also used topically or systemically to manage skin disorders like seborrhea and hyperkeratosis.
- **Veterinary Treatments:** Retinoids have been used experimentally to treat skin cancer (e.g., squamous cell carcinoma) in dogs, as they help control cancerous cell growth by promoting differentiation and inhibiting tumor proliferation. Topical retinoids can also accelerate wound healing.
- **Horses:** Vitamin A deficiency can cause bone weakness and joint issues, especially in foals. Supplementation helps prevent osteoporosis and maintains bone health.
- **Poultry:** Vitamin A is necessary for egg production and hatchability. A deficiency can lead to reduced fertility and egg hatchability.
- **Young Livestock (Calves, Lambs, Piglets):** Proper Vitamin A intake is crucial for skeletal development and overall growth. Deficiency can cause stunted growth, bone deformities, and increased susceptibility to infections.

In commercial livestock farming, feed is often fortified with Vitamin A to meet the nutritional needs of animals during growth, pregnancy, and lactation to ensure optimal health and productivity.

### Vitamin A Requirements in Different Species

| Animal       | Requirement (IU/Kg feed) |
|--------------|--------------------------|
| Beef cattle  | 2220-3800                |
| Dairy cattle | 2200-5000                |
| Goat         | 5000                     |
| Chicken      | 1500-4000                |
| Sheep        | 1500-2000                |
| Swine        | 1400-2200                |
| Horse        | 1600-2800                |
| Dog          | 3300                     |

(Source: Handbook of General Animal Nutrition: Udeybir Singh Chahal et al., 2008)



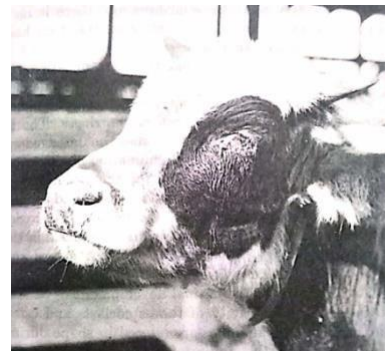
## Symptoms of Vitamin A Deficiency

Vitamin A deficiency often leads to symptoms affecting vision, growth, reproduction, and skin health. The most common symptoms include:

- **Night Blindness:** Poor vision in low light, one of the earliest signs of Vitamin A deficiency.
- **Xerophthalmia:** Drying and cloudiness of the cornea, leading to blindness in severe cases, especially in calves and other young livestock.
- **Infertility and Abortion:** In breeding animals, Vitamin A deficiency can cause infertility and, in pregnant animals, lead to abortion, stillbirth, or weak offspring.
- **Keratinization of Epithelial Cells:** This results in skin lesions, respiratory infections, and the formation of calculi in the genito-urinary tract.
- **Stunted Growth and Poor Reproduction:** Deficiency can cause reduced growth and reproductive efficiency in livestock.
- **Respiratory Infections and Skin Lesions:** The epithelial damage caused by deficiency can increase susceptibility to infections.



(Courtesy of G.H. Hart, Experimental station)



(Courtesy of S.W. Mead) California

**Advanced stage of eye lesions in Vitamin A deficiency: Copious lacrimation in cows**

### Prevention and Measures to Combat Vitamin A Deficiency

Preventing Vitamin A deficiency involves proper dietary management, supplementation, and monitoring. Ensuring adequate Vitamin A intake, either through natural feed sources or supplements, is crucial for the health of animals.

#### 1. Dietary Management

- **Vitamin A-Rich Feed:** Green leafy forages, carrots, and other fresh vegetables are rich in beta-carotene, a precursor to Vitamin A. Herbivorous livestock should graze on green pastures during the growing season, while preserved forages like silage and hay should be provided in winter or



drought conditions.

- **Fortified Commercial Feeds:** For animals without access to fresh forage, commercially prepared feeds fortified with synthetic Vitamin A can help meet their nutritional needs. This is critical in feedlot operations or indoor housing.

## 2. Vitamin A Supplementation

- **Oral Supplements:** These are effective for preventing and treating deficiency, particularly in animals with limited access to natural Vitamin A sources. Supplements are available as tablets, capsules, and liquid solutions.
- **Injectable Vitamin A:** In acute deficiency cases, injectable forms provide rapid relief. This is useful for anorexic animals or those with absorption issues.

## 3. Special Considerations for Vulnerable Groups

- **Pregnant and Lactating Animals:** These animals have increased Vitamin A requirements for fetal development and milk production. Supplementation during late pregnancy and early lactation ensures sufficient Vitamin A for both mother and offspring.
- **Young Animals:** Newborns rely on colostrum for Vitamin A. Ensuring they consume colostrum shortly after birth and receive adequate Vitamin A in their diet during weaning supports healthy growth.

## 4. Seasonal Considerations

- **Winter Management:** In colder months when green forage is scarce, feeding preserved forages supplemented with Vitamin A ensures animals remain healthy.
- **Drought Management:** During droughts, Vitamin A levels in forage decrease. Supplementation is necessary to maintain animal health during these periods.

## 5. Prevention of Vitamin A Toxicity

- **Avoiding Over-Supplementation:** While Vitamin A is essential, excessive amounts can lead to toxicity, causing bone abnormalities, liver damage, and decreased appetite. Following veterinary guidelines and feed manufacturer recommendations helps maintain balanced Vitamin A levels.

### Supplementation of Vitamin A indifferent species

| Animal Type           | Recommended Dosage  | Method of Administration  | Key Considerations   |
|-----------------------|---|---|--|
| Cattle (Beef & Dairy) | Maintenance: 30,000 - 50,000 IU/day<br>Lactating/Pregnant: 50,000 | Oral supplements (feed or water)<br>Injectable vitamin A (for acute deficiency) | Increased requirements for pregnant and lactating cows<br>Supplement especially during winter or drought periods |



|                           |   |  |   |
|---------------------------|---|--|---|
|                           | - 70,000 IU/day   |  |   |
| <b>Sheep and Goats</b>    | 15,000 - 20,000 IU/day  | Oral drenching<br>Injectable vitamin A                           | Vulnerable during late pregnancy and lactation Supplement during periods of poor forage availability            |
| <b>Pigs</b>               | Piglets: 3,000 - 6,000 IU/day<br>Adults: 15,000 - 30,000 IU/day               | Oral supplements in feed<br>Injectable vitamin A (for weanlings) | Ensure sufficient intake during gestation and lactation Vitamin A needs increase during growth and reproduction |
| <b>Poultry (Chickens)</b> | 1,500 - 2,000 IU per kg of feed<br>4,000 - 5,000 IU per kg of feed (broilers) | Feed fortification with vitamin A premixes                       | Essential for egg production and hatchability<br>Increased need for broilers and laying hens                    |
| <b>Horses</b>             | 15,000 - 30,000 IU/day  | Supplements (feed or water)                                      | Horses on poor-quality forage or no pasture need supplements<br>Pregnant mares need higher doses                |
| <b>Dogs</b>               | - 200 IU/kg of body weight/day  | Supplements (tablets or capsules)                                | High-quality commercial pet food often provides sufficient vitamin A  |
| <b>Animal Type</b>        | <b>Recommended Dosage</b>   | <b>Method of Administration</b>                                  | <b>Key Considerations</b>   |
|                           |   |  | Ensure proper dosing for puppies and seniors  |
| <b>Cats</b>               | - 200 IU/kg of body weight/day  | Supplements (tablets or capsules)                                | Vitamin A is preformed (retinol) in cats' diets since they cannot convert beta-carotene like other animals      |

## Conclusion

Vitamin A is critical for the overall health, growth, and reproduction of domestic and companion animals. Its role in vision, immune function, reproduction, and epithelial health makes it an indispensable nutrient. Deficiency can lead to significant health issues, including vision loss, reproductive failure, and increased susceptibility to infections. Proper dietary management, feed

fortification, and supplementation are essential preventive measures to ensure that animals receive adequate amounts of Vitamin A, supporting their well-being and productivity. Regular veterinary check-ups and monitoring can help detect early signs of deficiency and guide timely interventions, ensuring optimal health for both livestock and companion animals.

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