

A Technical Comprehensive Guide to Ascorbic Acid: Analyzing the 50 mg Vitamin C Formulation by Kimia Farma

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Ascorbic acid, colloquially known as Vitamin C, represents one of the most critical exogenous micronutrients required for human physiological homeostasis. As a water-soluble ketolactone with a specialized molecular structure (C₆H₈O₆), it serves as a potent reducing agent and a vital cofactor for numerous enzymatic reactions. In the pharmaceutical landscape of Southeast Asia, specifically within Indonesia, the **Vitamin C 50 mg tablet produced by Kimia Farma** has emerged as a foundational therapeutic tool for both prophylactic and restorative health interventions. This article provides an exhaustive technical analysis of the 50 mg ascorbic acid formulation, exploring its biochemical mechanisms, pharmacological profile, clinical dosing protocols, and manufacturing standards.

The Biochemical Framework of L-Ascorbic Acid

L-ascorbic acid is a hexose derivative and an electron donor. Humans, unlike most mammals, lack the enzyme **L-gulonolactone oxidase**, which is the final step in the biosynthesis of ascorbic acid from glucose. This evolutionary trait renders Vitamin C an essential dietary requirement. When administered in a 50 mg tablet format, such as the **Kimia Farma** variant, the molecule participates in redox (reduction-oxidation) reactions by donating electrons to neutralize free radicals and regenerate other antioxidants, such as alpha-tocopherol (Vitamin E).

Molecular Properties and Stability

The stability of ascorbic acid is a significant concern in pharmaceutical chemistry. It is highly sensitive to light, heat, and oxygen. The chemical structure contains two ionizable hydroxyl groups, giving it acidic properties. In the solid-state formulation of a 50 mg tablet, stabilizers and excipients are utilized to prevent premature oxidation into dehydroascorbic acid (DHA). The **Kimia Farma 50 mg** dosage provides a modular approach to supplementation, allowing for precise titration depending on the patient's specific metabolic demands.

Pharmacological Profile: Pharmacokinetics and Bioavailability

Understanding the transit of a 50 mg dose through the human body is essential for clinical efficacy. The pharmacokinetics of Vitamin C are non-linear and tightly regulated by specialized transporters.

Absorption and Transport Mechanisms

Upon oral ingestion, Vitamin C is absorbed primarily in the distal small intestine via **Sodium-Dependent Vitamin C Transporters (SVCT1 and SVCT2)**. For a low-dose administration like 50 mg, the bioavailability is nearly 100%. However, as the dose increases (e.g., beyond 1,000 mg), the efficiency of SVCT1 transporters decreases significantly due to saturation. This makes the 50 mg tablet an ideal delivery vehicle for frequent, smaller doses to maintain steady-state plasma concentrations without wasting excess via renal excretion.

Distribution and Cellular Uptake

Once in the bloodstream, ascorbic acid is distributed to various tissues. High concentrations are found in the pituitary gland, adrenal glands, leucocytes, and the eyes. The following table illustrates the typical distribution patterns in various biological compartments:

Biological Compartment	Concentration Level	Functional Role
Plasma	Low to Moderate (40–60 µmol/L)	Systemic antioxidant transport
Leucocytes	High (approx. 1.5 mmol/L)	Immune modulation and oxidative burst protection
Adrenal Glands	Very High	Cofactor for catecholamine synthesis
Cerebrospinal Fluid	Moderate to High	Neuroprotection against oxidative stress

Technical Breakdown of the Kimia Farma 50 mg Formulation

The **Vitamin C 50 mg 100 Tablet Kimia Farmabox** is a standardized pharmaceutical product often categorized under the Essential Medicines List in Indonesia (E-Katalog LKPP). Each tablet is formulated to deliver exactly 50 mg of active Ascorbic Acid.

Composition and Inactive Ingredients

While the active pharmaceutical ingredient (API) is Ascorbic Acid, the tablet matrix includes several functional excipients:

- **Diluents/Fillers:** Usually lactose or microcrystalline cellulose to provide bulk.
- **Binders:** To ensure the tablet maintains structural integrity during packaging and transport.
- **Disintegrants:** Critical for ensuring the tablet breaks down rapidly in the gastric environment for optimal absorption.
- **Glidants/Lubricants:** Magnesium stearate is commonly used to facilitate the manufacturing process.

Packaging and Shelf Life

The **Kimia Farma** variant typically comes in a box containing 10 strips of 10 tablets (100 tablets total). This strip-packaging is vital for protecting the individual tablets from moisture and light, which are the primary catalysts for the degradation of Vitamin C into inactive metabolites.

Clinical Indications and Therapeutic Dosing Models

The versatility of the 50 mg dosage allows healthcare providers to implement varying protocols based on age, physiological state, and pathology.

Standard Prophylactic and Treatment Protocols

Based on the provided data, the dosing logic follows a clear escalation path:

1. **Prevention (Prophylaxis):** 100 mg per day (2 tablets). This is intended to meet the Recommended Dietary Allowance (RDA) and prevent subclinical deficiency.
2. **Treatment (Therapeutic):** 200 mg per day (4 tablets). This is utilized to treat mild avitaminosis or support the body during acute illness.
3. **Pediatric Dosing:** The 50 mg tablet is particularly useful for pediatric populations where higher doses (e.g., 500 mg or 1,000 mg) would be inappropriate.

Detailed Dosage Matrix by Age and Condition

Patient Category	Daily Dosage (mg)	Frequency (50mg Tablets)	Indication
Infants (6–11 months)	50 mg	1 tablet (crushed/dissolved)	Essential growth support
Children (1–3 years)	40 mg	0.5 - 1 tablet	General health maintenance
Adults (Prevention)	100 mg	2 tablets (split dose)	Immune system optimization
Adults (Treatment)	200 mg	4 tablets	Scurvy or acute deficiency
Pregnant Women	85–100 mg	2 tablets	Fetal development support

The Role of Vitamin C in Collagen Synthesis and Immune Function

The primary technical reason for Vitamin C supplementation is its role as a cofactor for the enzymes **prolyl hydroxylase** and **lysyl hydroxylase**. These enzymes are responsible for the hydroxylation of the amino acids proline and lysine in collagen molecules.

Collagen Synthesis Mechanism

Without adequate Vitamin C, the collagen fibers produced are defective and lack sufficient tensile strength. This leads to the hallmark symptoms of scurvy: weakened blood vessels (bruising), poor wound healing, and gum deterioration. By maintaining a consistent 50 mg intake, the body ensures a steady supply of electrons to keep the iron atom in these enzymes in the ferrous (Fe²⁺) state, which is necessary for their activity.

Immunological Impact

Vitamin C enhances the function of various immune cells. It stimulates the production and function of leucocytes (white blood cells), particularly neutrophils and lymphocytes. Furthermore, it plays a role in **chemotaxis**—the process by which immune cells migrate to the site of infection—and **phagocytosis**, the engulfing of pathogens. The 50 mg dose, when taken twice daily, helps maintain these cells at their peak oxidative capacity.

Comparative Analysis: 50 mg Tablets vs. High-Dose Effervescent Formats

In the consumer market, 500 mg and 1,000 mg effervescent tablets are common. However, the **50 mg Kimia Farma** tablet offers distinct technical advantages in specific scenarios.

Feature	50 mg Tablet (Modular)	1000 mg Effervescent
Bioavailability Efficiency	Very High (~100%)	Lower (approx. 40-50%)
Gastric Irritation	Minimal	Can be high due to acidity/CO2
Dose Precision	High (easy to titrate)	Fixed high dose
Cost per Unit	Economical	Premium
Target Audience	Pediatric, Maintenance, Elderly	Acute recovery, General adult

Contraindications, Adverse Effects, and Toxicity Analysis

While Vitamin C has a high safety profile, it is not without potential risks, especially when metabolic pathways are compromised. One of the primary concerns with high-dose Vitamin C is the formation of **calcium oxalate kidney stones**, as oxalate is a metabolic byproduct of ascorbic acid.

Hypervitaminosis C and Side Effects

Symptoms of excessive Vitamin C intake (usually exceeding 2,000 mg/day) include:

- Diarrhea and gastrointestinal distress (due to unabsorbed Vitamin C drawing water into the intestine).
- Nausea and abdominal cramps.
- Potential for iron overload in patients with hemochromatosis (as Vitamin C increases non-heme iron absorption).

The **50 mg formulation** significantly mitigates these risks, as it is difficult to reach the Upper Limit (UL) of 2,000 mg through the consumption of standard 50 mg tablets unless done so with extreme negligence. This makes it a "safe-by-design" pharmaceutical product for general distribution.

Practical Implementation and Field Guide

For healthcare practitioners and pharmacists, the storage and administration of **Vitamin C 50 mg Kimia Farma** require adherence to specific guidelines to ensure therapeutic efficacy.

Storage Protocols

To prevent the oxidation of ascorbic acid, the following conditions must be met:

- Temperature: Store below 30°C in a dry environment.
- Light: Keep in original strip packaging to avoid UV-induced degradation.
- Moisture: Ensure the seal of the strip is not compromised.

Administration Best Practices

For optimal results, Vitamin C should be administered after meals. This reduces the risk of gastric acidity and may enhance the absorption of dietary iron from the meal. In pediatric cases where swallowing a tablet is difficult, the tablet can be crushed and mixed with water or food, provided it is consumed immediately to prevent oxidation.

Case Studies and Troubleshooting

Case Study: Managing Minor Avitaminosis in Rural Populations

In clinical settings where nutrition is inconsistent, the 100-tablet box of Kimia Farma Vitamin C 50 mg serves as an essential tool. Patients presenting with frequent bruising and slow wound recovery were prescribed 200 mg/day (4 tablets) for a period of two weeks, followed by a maintenance dose of 50 mg/day. The modular nature of the 50 mg tablet allowed the clinicians to adjust the dose downward as symptoms improved, demonstrating the utility of low-dose formulations in long-term care.

Common Troubleshooting: Discoloration

If a **Vitamin C 50 mg tablet** appears yellowish or brown, it is a technical indicator of oxidation. This usually occurs if the strip has been punctured or exposed to extreme heat. While not necessarily toxic, oxidized Vitamin C (as dehydroascorbic acid or further breakdown products) loses its biological activity as a reducing agent and should be discarded.

Supply Chain and Regulatory Context: LKPP E-Katalog

The presence of **Vitamin C 50 mg 100 Tablet** in the **E-Katalog 5.0 - LKPP** indicates its status as a government-procured essential medicine in Indonesia. This ensures that the product meets **CPOB (Cara Pembuatan Obat yang Baik)** standards, which are the Indonesian equivalent of Good Manufacturing Practices (GMP). For institutional buyers and hospitals, this registration (e.g., Nomor Izin Edar: SD191555791) guarantees chemical purity and dosage accuracy, which is critical for large-scale public health initiatives.

Summary of Broader Implications

The 50 mg Ascorbic Acid tablet by Kimia Farma represents more than just a simple supplement; it is a precisely engineered pharmaceutical tool designed for broad accessibility and safety. Its low-dose format respects the biological saturation limits of human Vitamin C transporters, offering a more efficient delivery mechanism than massive single-dose alternatives. By facilitating collagen synthesis, protecting against oxidative stress, and supporting the innate immune system, this formulation remains a cornerstone of preventative medicine.

As we move toward more personalized nutrition and pharmacology, the ability to titrate doses in 50 mg increments allows for nuanced health management that high-dose, "one-size-fits-all" products cannot provide. Whether used for the prevention of scurvy in vulnerable populations or as a daily boost for the immune system, the technical reliability of the Kimia Farma formulation ensures that the fundamental metabolic requirements for Vitamin C are met with pharmaceutical-grade precision.

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