# The Role of Vitamin C in Pediatric Critical Care

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## Background

**Vitamin C**

- **Vitamin C (Ascorbic Acid)**
  - Water soluble nutrient
  - Not synthesized by humans
  - Antioxidant

**Oxidative Stress**

- Critically-ill patients typically generate excess oxidizing species
- Counteracting these depletes Vitamin C Levels

**Pediatric Critical Care**

- Vitamin C levels in critically-ill pediatric patients has yet to be explored

## Physiological Roles of Vitamin C

<table>
<thead>
<tr>
<th>Role</th>
<th>Function</th>
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</thead>
<tbody>
<tr>
<td>Collagen synthesis</td>
<td>connective tissue integrity and wound healing</td>
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<tr>
<td>Catecholamine synthesis</td>
<td></td>
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<tr>
<td>Important in immune system function</td>
<td>Anti-inflammatory</td>
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<tr>
<td>Biosynthesis of L-carnitine</td>
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<tr>
<td>Powerful anti-oxidant</td>
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<tr>
<td>Protein metabolism</td>
<td></td>
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<td>Co-enzyme in iron and folic acid metabolism</td>
<td>Alveolar fluid clearance</td>
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<tr>
<td>Cortisol production</td>
<td>Vascular endothelial cell stabilization (decreases microvascular permeability)</td>
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</tbody>
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## Objectives

- Determine if Vitamin C levels are low in pediatric patients admitted to the ICU
- Evaluate if levels decrease over the first four days for patients expected to be NPO for at least 24 hours
- Examine if disease severity correlates with low levels of Vitamin C

## Aims

- Obtain three serial plasma levels of Vitamin C in critically-ill pediatric patients
  - Analyze if levels deplete
  - Explore correlation with inflammatory biomarkers
- Identify patients’ nutritional status using body anthropometrics (BMI, Growth %) to determine correlation with nutritional profile
- Study whether levels correlate with severity of illness based on use of mechanical ventilation, length of ICU stay, and accepted pediatric scoring systems validating illness severity (PRISM, PELOD, PIM II)

## Methods

- **Setting**: UCLA Mattel Children’s Hospital
- **Design**: Single center prospective observation pilot study with sample size of 73 pediatric ICU patients

## Results

- Study currently ongoing
- **Target Enrollment**: 73 patients

**Inclusion Criteria**

- Males/Females
- 0-16 years old
- Expected ICU stay of 4 days
- NPO on admission

**Exclusion Criteria**

- TPN dependent
- History of bowel surgery
- Do not take enteral feeds

## Significance & Future Work

- Pilot study examining effects of oxidative stress on Vitamin C levels in the setting of nutritional compromise and critical illness in children
- **Vitamin C**
  - Widely-accessible
  - Cost-Effective
  - Favorable Side-Effect Profile

- **Ongoing adult studies**
  - Evaluating high dose IV Vitamin C therapy in treatment of septic shock

- **Future Studies**
  - Determine highest risk patient groups
  - Evaluate Vitamin C therapy

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