

Creatine Kinase (CK)

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AKA

- Creatine phosphokinase (CPK)
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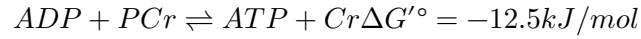
1 Overview

Creatine Kinase (CK) is an enzyme

CK functions to catalyze the reaction of [creatine](#) and [adenosine triphosphate \(ATP\)](#) to [phosphocreatine \(PCr\)](#) and [adenosine diphosphate \(ADP\)](#)¹

2 Chemical Reaction

CK is used to catalyze the following reversible reaction:



ATP can be generated from PCr and ADP.

The phosphocreatine (PCr) created from this reaction is used to supply tissues and cells that require substantial amounts of ATP, like the brain, skeletal muscles, and the heart, with their required ATP

3 Chemical structures

See McLeish (2005) Relating structure to mechanism in creatine kinase²

4 Elevated CK Blood levels

- Increased by physical activity³

4.1 Physical activity

- CK levels transiently rise after exercise or heavy manual labor
- Post-exercise (strenuous physical activity) Serum CK levels increase (up to 30x) within 24 hours and then declines over 7 days³
- Amount of CK increase is dependent upon the type and duration of exercise³
 - Untrained individuals experience greater elevation³

4.2 Nonneuromuscular causes

- Endocrine disorders³
 - Hyperthyroidism (rare)³
 - Hypothyroidism³
 - Hyperparathyroidism³
 - Acromegaly³
 - Cushing syndrome³
- Metabolic disturbances³

- Hyponatremia³
- Hypokalemia³
- Hypophosphatemia³
- Muscle trauma³
 - Strenuous exercise³
 - Intramuscular injections³
 - Needle electromyography³
 - Seizures³
- Medications³
 - Statins³
 - Fibrates³
 - Antiretrovirals³
 - Beta-blockers³
 - Clozapine³
 - Angiotensin II receptor blockers³
 - Hydroxychloroquine³
 - Isotretinoin³
 - Colchicine³
- Others³
 - Celiac disease³
 - Malignancy³
 - Macro CK³
 - Surgery³
 - Pregnancy³
 - Cardiac disease³
 - Acute kidney disease³
 - Viral illness³
 - Predisposition to malignant hyperthermia³

5 Further reading

Journal club

- [Effects of Cold Bath Post-Exercise](#)
1. Aujla RS, Patel R. Creatine Phosphokinase. In: *StatPearls*. StatPearls Publishing; 2023. Accessed January 22, 2024. <http://www.ncbi.nlm.nih.gov/books/NBK546624/>

2. McLeish MJ, Kenyon GL. Relating structure to mechanism in creatine kinase. *Critical Reviews in Biochemistry and Molecular Biology*. 2005;40(1):1-20. doi:[10.1080/10409230590918577](https://doi.org/10.1080/10409230590918577)
3. Moghadam-Kia S, Oddis CV, Aggarwal R. Approach to asymptomatic creatine kinase elevation. *Cleveland Clinic Journal of Medicine*. 2016;83(1):37-42. doi:[10.3949/ccjm.83a.14120](https://doi.org/10.3949/ccjm.83a.14120)