



# KRE-ALKALYN SUPPLEMENTATION DOES NOT EXHIBIT A SAFER CLINICAL PROFILE OR HAVE LESS SIDE EFFECTS IN COMPARISON TO CREATINE MONOHYDRATE



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## Abstract

**Background:** Creatine monohydrate (CrM) has repeatedly been proven to be a safe and healthy form of creatine with minimal side-effects. A number of new creatine formulations are being created and have been purported to be more efficacious than CrM. It is important to first consider the safety of consuming these new formulations. The purpose of this study is to determine if a pH balanced form of creatine (Kre-Alkayn® (KA), All American Pharmaceutical, Billings, MT, USA) is as safe as CrM ingestion. **Methods:** In a double-blind manner, 36 resistance trained participants (20.2±2 yrs, 181±7 cm, 82±12 kg, 14.7±5 % body fat) were randomly assigned to supplement their diet with CrM (Creapure®, AlzChem AG, Germany) for 28-days (20 g/d for 7-d, 5 g/d for 21-d), an equivalent amount of KA as a high dose supplement (KA-H), or the manufacturer's recommended dose of KA (1.5 g/d for 28-d, KA-L) while maintaining their normal training programs. Fasting blood samples and DEXA determined bone density data were collected at 0, 7, and 28-days. Data were analyzed by MANOVA with repeated measures and are presented as mean ± SD after 0, 7 and 28 d for liver and muscle enzymes and protein markers; blood lipids and triglycerides; bone mass and markers of bone metabolism; and, general hematology markers. Questionnaires were administered after each testing period asking participants to report any side-effects. **Results:** No significant time x group effects were seen for blood urea nitrogen (BUN, p=0.77), BUN to creatinine ratio (p=0.36), aspartate aminotransferase (p=0.71), alanine aminotransferase (p=0.53), total protein (p=0.45), total bilirubin (p=0.25), total cholesterol (TCHL, p=0.97), high-density lipoprotein (HDL, p=0.656), TCHL:HDL (p=0.08), triglycerides (p=0.47), bone mineral content (p=0.71), albumin (ALB, p=0.89), globulin (GLOB, p=0.43), the ratio of ALB to GLOB (p=0.46), calcium (p=0.79), alkaline phosphatase (p=0.66), glucose (p=0.43), white blood cell count (p=0.466), red blood cell count (p=0.69), hemoglobin (p=0.67), mean corpuscular volume (p=0.581), mean corpuscular hemoglobin (p=0.493), mean corpuscular hemoglobin concentration (p=0.71), red blood cell distribution width (p=0.929), platelet count (p=0.477) and hematocrit (p=0.693). There was a trend that higher doses of supplemental creatine promoted greater increases in serum creatinine (KA-L: 1.04±0.08, 1.08±0.11, 1.1±0.1; KA-H: 1.1±0.14, 1.2±0.18, 1.3±0.13; CrM: 1.1±0.19, 1.3±0.2, 1.2±0.15 mg/dl, p=0.071) but these values remained well within normal values for active individuals. Some group x time effects were also observed among groups in Low-Density Lipoprotein levels (KA-L: 83.4±16, 86.5±16.4, 81.4±17.9; KA-H: 79.4±18.2, 82.7±19, 83.7±16; CrM: 89.8±20.5, 81.4±14.7, 92.5±17.4 mg/dl, p=0.004). There were no side-effects reported by the participants at any time throughout the study. **Conclusions:** Neither manufacturers recommended doses or equivalent loading doses of KA compared to CrM resulted in any negative outcomes. These findings suggest that KA is just as safe to consume as CrM with minimal side-effects.

## Rationale

Creatine monohydrate (CrM) has been reported to be a safe and healthy form of creatine with minimal side-effects. However, a number of new creatine formulations have been purported to be more efficacious and/or safer than CrM. The purpose of this study is to determine if a pH balanced form of creatine (Kre-Alkayn® (KA), All American Pharmaceutical, Billings, MT, USA) is as safe as CrM ingestion.

## Experimental Design

- Subjects were informed as to the experimental procedures and signed informed consent statements in adherence with human subject guidelines.
- 36 resistance trained college-aged males (20±2 yrs; 181±7 cm; 82±12 kg; 15±5 % body fat, 25±3 kg/m<sup>2</sup>) with no recent history of creatine use participated in this study.
- Subjects were randomly assigned to 1 of 3 supplementation groups:
  - CrM: Creatine Monohydrate
  - KA-H: Equivalent dose of Kre-Alkayn
  - KA-L: Manufacturer's recommended dose of Kre-Alkayn
- The initial 7 days were a loading phase. Subjects consumed 20 g of CM (CrM), equivalent dose of KA (KA-H), and/or manufacturer's recommended dose of KA (1.5g/d) with a placebo (KA-L). During the remaining 21 days subjects consumed 5 g of CM (CrM), equivalent dose of KA (KA-H) or recommended dose of KA (1.5g/d) with a placebo (KA-L).
- Subjects were instructed to maintain their current training program and dietary habits. Dietary food and exercise logs were obtained before each testing session.

## Methods & Procedures

- Fasting blood samples and DEXA determined bone density data were collected at 0, 7, and 28-days.
- Serum samples were analyzed by Quest Diagnostics (Dallas, TX) while whole blood samples were analyzed by an Abbott Cell Dyn 3500 automated hematology analyzer (Abbott Laboratories, Abbott Park, IL).

## Statistical Analysis

Data were analyzed by MANOVA with repeated measures using SPSS for Windows version 19.0 software (Chicago, IL) and are presented as means ± SD changes for each group after 0, 7 and 28-d.

## Results

- Within subjects univariate analysis revealed no significant time x group effects were seen for blood urea nitrogen (BUN, p=0.77), BUN to creatinine ratio (p=0.36), aspartate aminotransferase

(p=0.71), alanine aminotransferase (p=0.53), total protein (p=0.45), total bilirubin (p=0.25), total cholesterol (TCHL, p=0.97), high-density lipoprotein (HDL, p=0.656), TCHL:HDL (p=0.08), triglycerides (p=0.47), bone mineral content (p=0.71), albumin (ALB, p=0.89), globulin (GLOB, p=0.43), the ratio of ALB to GLOB (p=0.46), calcium (p=0.79), alkaline phosphatase (p=0.66), glucose (p=0.43), white blood cell count (p=0.466), red blood cell count (p=0.69), hemoglobin (p=0.67), mean corpuscular volume (p=0.581), mean corpuscular hemoglobin (p=0.493), mean corpuscular hemoglobin concentration (p=0.71), red blood cell distribution width (p=0.929), platelet count (p=0.477) and hematocrit (p=0.693).

- There was a trend that higher doses of supplemental creatine promoted greater increases in serum creatinine (KA-L: 1.04±0.08, 1.08±0.11, 1.1±0.1; KA-H: 1.1±0.14, 1.2±0.18, 1.3±0.13; CrM: 1.1±0.19, 1.3±0.2, 1.2±0.15 mg/dl, p=0.071) but these values remained well within normal values for active individuals.
- Univariate analysis revealed some group x time effects were also observed among groups in Low-Density Lipoprotein levels (KA-L: 83.4±16, 86.5±16.4, 81.4±17.9; KA-H: 79.4±18.2, 82.7±19, 83.7±16; CrM: 89.8±20.5, 81.4±14.7, 92.5±17.4 mg/dl, p=0.004).

## Conclusion

Neither manufacturers recommended doses or equivalent loading doses of KA compared to CrM resulted in any negative side-effects or health outcomes. These findings suggest that KA is just as safe to consume as CrM with minimal side-effects.

## Practical Application

Creatine monohydrate is the gold standard for increasing muscle creatine content and promoting training adaptations. There is no evidence that Kre-Alkayn has less side effects than CrM.

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Marker	Group	0	7	28	p-level
TCHL (mg/dl)	KA-H	149±25	153±23	150±28	0.97
	KA-L	153±27	152±28	158±22	
	CrM	156±20	147±19	159±21	
HDL (mg/dl)	KA-H	48.8±11.3	51.0±9.3	52.9±11.4	0.65
	KA-L	53.0±15.9	53.9±18.4	53.6±14.4	
	CrM	45.5±6.5	47.6±7.3	48.5±8.4	
TCHL: HDL	KA-H	3.2±0.7	3.1±0.6	2.9±0.7	0.08
	KA-L	3.0±0.6	2.9±0.5	3.0±0.5	
	CrM	3.4±0.6	3.2±0.6	3.4±0.7	
TRIG (mg/dl)	KA-H	84.5±32.5	77.3±30.0	78.5±36.9	0.47
	KA-L	105.1±36.8	78.4±25.5	101.1±27.1	
	CrM	104.8±28.3	92.1±30.1	89.6±29.6	
Glucose (mg/dl)	KA-H	93.0±5.1	90.5±8.1	93.6±4.7	0.43
	KA-L	91.1±6.6	92.6±8.1	90.4±6.8	
	CrM	90.5±9.6	89.6±5.4	88.3±6.3	

Marker	Group	0	7	28	p-level
BUN (mg/dl)	KA-H	16.0±5.3	15.3±4.9	15.6±5.1	0.77
	KA-L	16.1±3.3	16.6±3.9	16.5±3.6	
	CrM	16.4±3.2	15.6±2.6	16.1±4.7	
Creatinine (mg/dl)	KA-H	1.04±0.1	1.08±0.1	1.13±0.1	0.02
	KA-L	1.07±0.1	1.23±0.2	1.26±0.1	
	CrM	1.11±0.2	1.28±0.2	1.23±0.1	
BUN:Creat	KA-H	15.5±5.1	14.5±5.6	14.1±5.6	0.36
	KA-L	15.1±3.4	13.6±3.4	13.3±3.4	
	CrM	15.2±3.7	12.4±2.6	13.2±3.7	
AST (U/L)	KA-H	25.4±9.6	26.5±8.3	29.5±12.9	0.71
	KA-L	27.3±10.5	25.5±8.3	32.0±11.9	
	CrM	24.9±7.9	23.8±7.5	26.3±7.8	
ALT (U/L)	KA-H	21.5±11	23.5±14	28.7±19	0.53
	KA-L	24.1±15	22.3±12	27.3±9.1	
	CrM	21.3±7.3	18.0±4.3	21.3±5.5	
Total Protein (g/dl)	KA-H	7.4±0.5	7.4±0.6	7.3±0.4	0.45
	KA-L	7.3±0.3	7.3±0.3	12.9±19.5	
	CrM	7.3±0.3	7.3±0.2	7.4±0.3	
Total Bilirubin (mg/dl)	KA-H	0.8±0.6	0.7±0.3	0.7±0.3	0.25
	KA-L	0.9±0.5	0.9±0.5	0.7±0.4	
	CrM	0.6±0.2	0.7±0.2	0.8±0.2	
Albumin (g/dl)	KA-H	4.8±0.3	4.8±0.4	4.8±0.2	0.89
	KA-L	4.8±0.2	4.7±0.2	4.7±0.1	
	CrM	4.8±0.2	4.8±0.2	4.7±0.2	
Globulin (g/dl)	KA-H	2.6±0.4	2.6±0.3	2.5±0.3	0.43
	KA-L	2.5±0.3	2.6±0.2	2.5±0.3	
	CrM	2.5±0.3	2.5±0.2	2.6±0.3	
Alb:Glob	KA-H	1.8±0.3	1.8±0.2	1.9±0.2	0.46
	KA-L	1.9±0.1	1.9±0.2	1.9±0.1	
	CrM	1.8±0.2	1.9±0.2	1.8±0.2	
Calcium (mg/dl)	KA-H	9.8±0.5	9.8±0.5	9.7±0.4	0.79
	KA-L	9.8±0.2	9.8±0.4	9.8±0.2	
	CrM	9.7±0.3	9.6±0.4	9.6±0.3	
ALK (U/L)	KA-H	82.0±16.4	84.1±20.5	83.9±17.0	0.66
	KA-L	81.1±29.7	83.8±30.3	87.1±27.6	
	CrM	78.9±20.7	80.6±26.4	78.8±23.1	

Marker	Group	0	7	28	p-level
WBC (x10 <sup>9</sup> /ul)	KA-H	5.7±0.6	6.1±0.5	6.1±1.5	0.46
	KA-L	5.8±1.1	5.7±0.9	6.3±1.1	
	CrM	5.9±1.2	5.7±1.0	5.9±1.2	
RBC (x10 <sup>6</sup> /ul)	KA-H	5.4±0.4	5.4±0.5	5.4±0.3	0.69
	KA-L	5.1±0.4	5.1±0.3	5.2±0.3	
	CrM	5.4±0.5	5.4±0.5	5.4±0.7	
Hemoglobin (g/dl)	KA-H	16.0±1.6	15.9±1.6	15.9±1.2	0.67
	KA-L	15.2±1.2	15.6±1.0	15.6±0.7	
	CrM	15.1±0.9	15.1±1.1	14.9±2.0	
MCV (fL)	KA-H	89.0±2.8	88.9±2.9	88.3±2.8	0.58
	KA-L	91.1±3.5	90.8±3.1	90.7±3.6	
	CrM	85.4±9.2	85.7±9.5	85.0±9.1	
MCH (pg/cell)	KA-H	29.4±1.5	29.6±1.2	29.3±1.2	0.49
	KA-L	29.8±1.6	30.2±1.5	28.4±4.9	
	CrM	28.1±3.5	28.3±3.7	27.9±3.3	
MCHC (g/dl)	KA-H	33.0±1.3	33.3±0.9	33.2±0.9	0.71
	KA-L	32.8±0.9	33.3±0.8	32.9±0.6	
	CrM	32.9±1.1	32.9±1.3	32.9±0.8	
RBCDW (%)	KA-H	12.9±0.5	12.9±0.9	12.9±0.7	0.92
	KA-L	13.7±1.1	13.7±1.0	13.5±1.5	
	CrM	13.7±1.4	13.7±1.7	13.5±1.6	
Platelet Count (x10 <sup>9</sup> /ul)	KA-H	266±45	266±52	280±45	0.47
	KA-L	253±54	248±62	269±65	
	CrM	222±69	222±74	216±65	
Hematocrit (%)	KA-H	48.4±3.4	47.9±4.3	48.1±2.9	0.69
	KA-L	46.5±3.2	47.0±2.8	47.4±1.8	
	CrM	45.9±2.3	46.1±2.5	45.2±5.4	