

Supplementation of the suckling piglet with creatine

LM Kennaugh, PG Arthur, PE Hartmann

Dept of Biochemistry, The University of Western Australia, WA, 6907

Creatine supplementation is presently used to enhance sports performance, based on evidence that oral creatine supplementation increases the amount of total creatine in muscle and increases body mass (1). The unexplained presence of creatine and, phosphocreatine in the milk of some mammalian species, including the sow, has led to our investigation of creatine as a nutrient for piglet growth and development during the suckling period.

Six piglets from six sows were dosed with either 0.1 g creatine plus 0.3 g glucose per kg body weight, or 0.3 g glucose only per kg body weight. A total of 18 piglets received the creatine plus glucose dose, 3 from each litter, and 18 piglets similarly selected received the glucose only dose. Piglets were dosed 4 times per day on days 1 to 5, then twice daily until weaning (day 24). A blood sample (100 μ L) was collected from the ear vein daily, after the administration of the first dose. Piglets were weighed daily and the right leg muscle was biopsied on days 1, 5, 18 and 24, using a disposable biopsy gun and the sample assayed for the concentration of total creatine. The excretion of creatine and creatinine in urine was monitored.

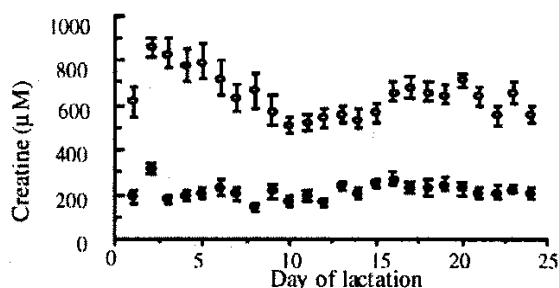


Figure 1. Concentration of creatine in plasma after dosing with creatine (○) or glucose (●) Values are means \pm sem.

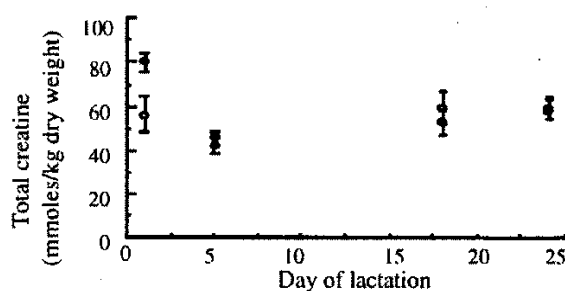


Figure 2. Concentration of total creatine in muscle after dosing with creatine (○) or glucose (●) Values are means \pm sem.

Over the 24 day lactation, the mean concentration of creatine in piglet plasma was greater for creatine dosed piglets ($644 \mu\text{M} \pm \text{sem } 20$) than for glucose only dosed piglets ($216 \mu\text{M} \pm \text{sem } 7$) ($P < 0.001$). The concentration of creatine in plasma was constant for glucose only dosed piglets, but higher in creatine dosed piglets on days 2 to 5 compared to days 6 to 24 ($P < 0.005$) of lactation. Although, there was no difference in the concentration of urinary creatinine between dose types, excess creatine was detected in the urine of piglets dosed with creatine (results not shown). The concentration of total creatine in muscle was variable between piglets of both dose types ($\text{CV} = 25\text{-}55\%$) and not significantly different between dose types ($P > 0.5$).

As in human subjects (1) the oral dose of creatine was absorbed from the gut, increased plasma creatine and altered urinary creatine excretion. However, in contrast to human subjects, oral creatine supplementation did not increase the concentration of total creatine in the skeletal muscle of suckling piglets. Nevertheless, the concentration of creatine in sow milk is high compared to other mammals. Therefore, the benefit of creatine as a minor nutrient requires further investigation as it may have a sparing effect on the essential amino acids, arginine and methionine, which are required for creatine synthesis at a time of rapid tissue growth.

1. Harris RC, Söderlund K, Hultman E. Elevation of creatine in resting and exercised muscle of normal subjects by creatine supplementation. *Clinical Science* 1992;83:367-374.