

INFLUENCE OF A MEAT-FREE DIET ON THE URINARY EXCRETION OF 3-METHYLHISTIDINE AND CREATININE IN CHRONIC RENAL FAILURE

A Gutierrez, G A Qureshi, J Bergström

Department of Renal Medicine, Karolinska Institute, Huddinge University Hospital, Huddinge, Sweden

Summary

Steady-state conditions with respect to plasma concentration and urinary excretion of 3-methylhistidine were reached 14 days after exclusion of meat from the diet.

In patients with advanced renal failure a period of at least 14 days on meat-free diet is therefore necessary before muscle protein breakdown can be evaluated from endogenous 3-methylhistidine production.

Reduction in the intake of meat (exogenous creatine and creatinine) reduces plasma creatinine to the extent that it becomes misleading for evaluation of changes in renal function. This has to be considered when comparing patients before and after protein (meat) restriction.

Introduction

3-methylhistidine is synthesized by methylation of histidine and is not reutilized for muscle protein synthesis after muscle breakdown and is quantitatively excreted in urine. 3-methylhistidine urinary excretion has therefore been used as an index of muscle protein catabolism [1]. Plasma concentration and urinary excretion of 3-methylhistidine depend on the myofibrillar content in the diet and on the endogenous production of 3-methylhistidine [2]. In normal subjects 3-methylhistidine excretion equilibrates within 48–72 hours after institution of a meat-free diet, provided that the protein intake is constant [3].

This study determines the time period required for equilibration of 3-methylhistidine excretion in patients with advanced renal failure after exclusion of meat from the diet.

Patients and protocol

Eleven patients with advanced renal failure (creatinine clearance: 10.0 ± 1.9 ml/min) who had adhered to a 40g-protein diet for at least six months participated in the study.

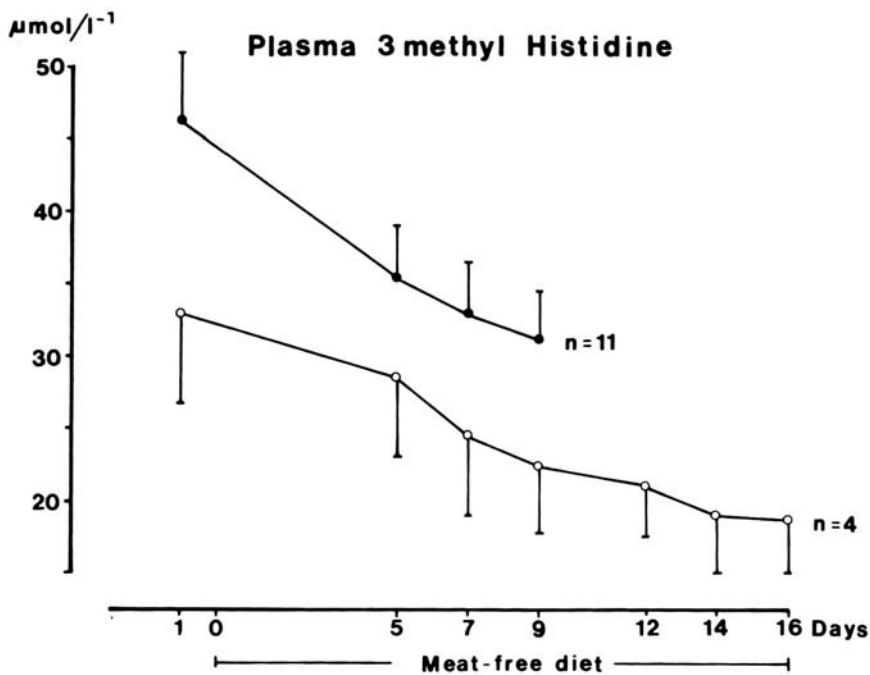


Figure 1

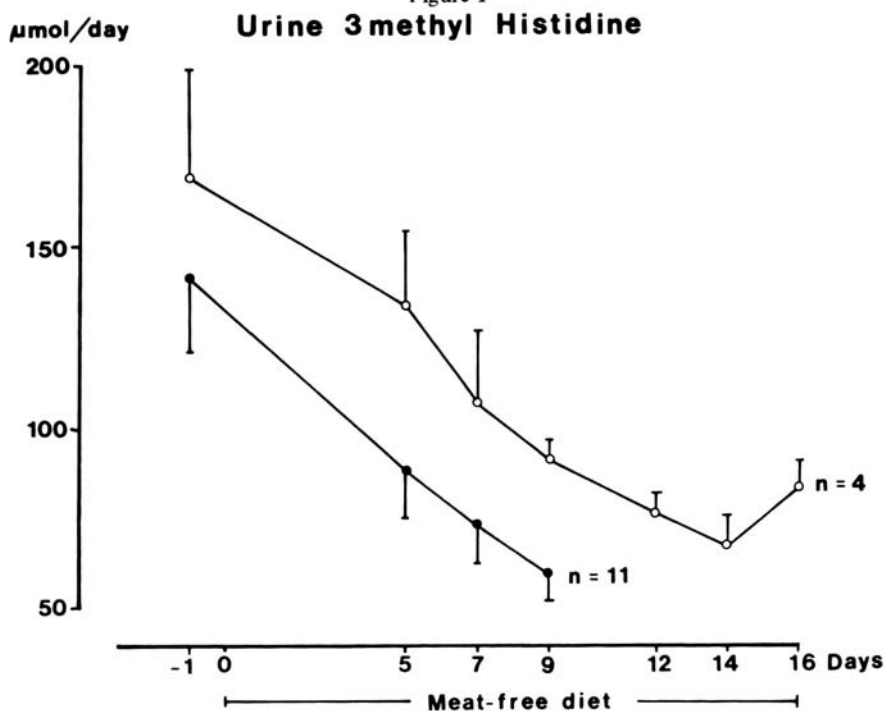


Figure 2

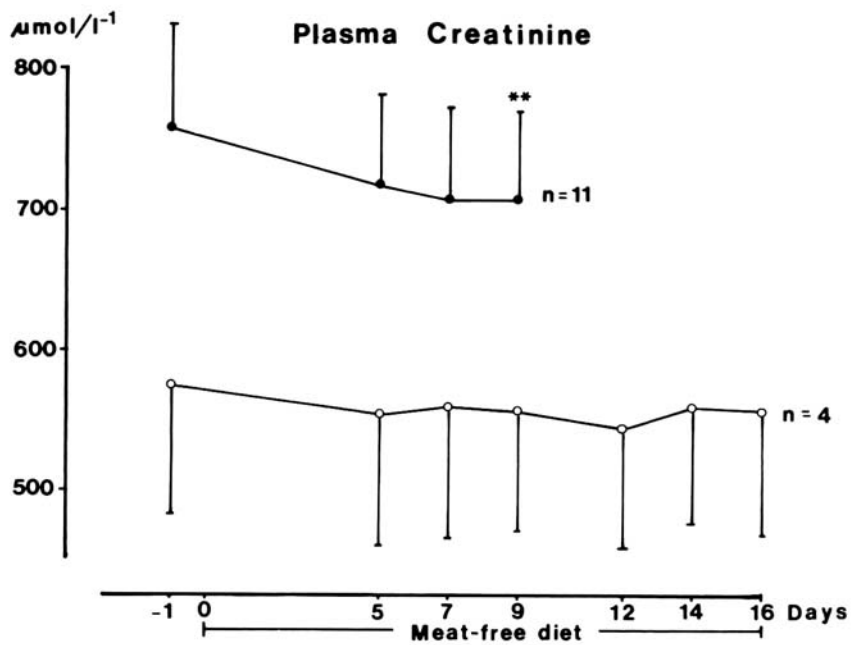


Figure 3

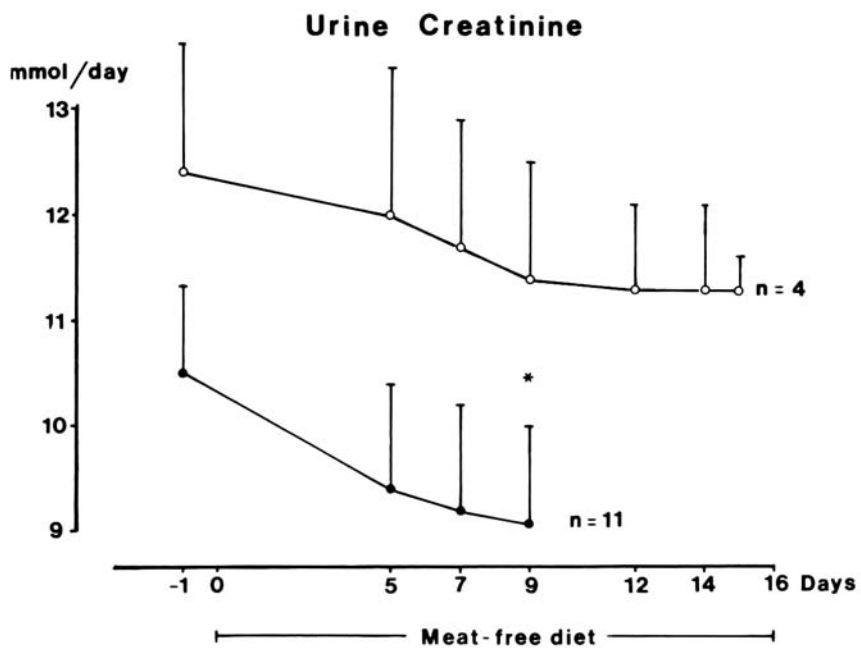


Figure 4

During the first three days of the study the subjects were given a 40g-protein diet containing 80g of meat. Meat was then excluded from the diet, but the protein intake remained unchanged for the following nine days. In four patients the period on the meat-free diet was prolonged to 16 days.

3-methylhistidine in plasma and urine was analysed by HPLC technique [4].

Results

3-methylhistidine: Plasma 3-methylhistidine was elevated in all the patients when receiving a 40g-protein diet containing 80g meat. After exclusion of meat from the diet plasma 3-methylhistidine markedly decreased. The four subjects who continued the study showed an additional decrease reaching equilibrium at day 14. Parallel decreases in urinary excretion of 3-methylhistidine were observed and a plateau could be obtained after day 14 (Figures 1 and 2).

Creatinine: Plasma concentration and urinary excretion of creatinine decreased initially after exclusion of meat from the diet and reached a plateau after about nine days.

The decrease in creatinine cannot be explained by a loss in muscle mass due to negative nitrogen balance since all the patients had a constant urea generation rate during the whole period (Figures 3 and 4).

References

- 1 Young VR, Munro HN. *Fed Proc* 1978; 37: 229
- 2 Munro HN, Young VR. In Klute & Klatz, eds. *Histidine First Int Workshop, Freiburg*. 1978
- 3 Long CL, Haverger LN, Young VR et al. *Metabolism* 1975; 24: 929
- 4 Qureshi GA, Van den Berg S, Gutierrez A et al. *J J Chromatography* 1984; 297: 83