sights into this possibility

controls—which is mandatory for each laboratory in Germany—gives insights into this possibility (15). Some assays slightly underestimate and others overscore the control sample consistently, although all manufacturers calibrate their assays to International Reference Preparation (IRP) 80/558. Of course, the intra-method variation is acceptable.

In conclusion, it seems useful to redefine the upper limit of the TSH reference interval to a value lower than ~4.0 mIU/L, following the NACB criteria. Despite a family history of thyroid disease, thyroid ultrasonography, and sensitive thyroid autoantibody measurement, the iodine status of the reference population should be known to define a representative TSH reference interval usable for therapeutic decisions, especially in elderly patients. Thyroid-releasing hormone testing might be helpful in central hypothyroidism, as recommended by the NACB (4, 6).

Considering the diversity of problems that impact the establishment of reference intervals for TSH, which were mentioned in the reports of Kratzsch et al. (1), Voelzke et al. (10), and in our own (8), we question whether it makes sense at all to define a common upper limit for TSH determinations.

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Klaus Zöpfl* Gerd Wunderlich Jörg Kotzerke

Department of Nuclear Medicine
Carl Gustav Carus Medical School
University of Technology Dresden
Dresden, Germany

* Address correspondence to this author at: Department of Nuclear Medicine, Carl Gustav Carus Medical School, University of Technology Dresden, Fetscher-strasse 74, D-01307 Dresden, Germany. Fax 49-351-458-5347; e-mail Klaus.Zopfl@uniklinikum-dresden.de.

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Serum Creatinine Values in Elite Athletes Competing in 8 Different Sports: Comparison with Sedentary People

To the Editor:

The concentration of creatinine in serum is the most widely used and commonly accepted measure of renal function in clinical medicine. Reference values of biochemical variables specific for sportsmen have never been defined, and those used for the general population are also applied to athletes. The common reference interval for creatinine in the general population corresponds to 62–115 μmol/L (0.7–1.3 mg/dL) for adult males (1). In our experience with athletes, we frequently observed high creatinine values, near or higher than 115 μmol/L (1.3 mg/dL). We studied 220 elite athletes: 15 triathletes of the Italian National Team, 29 basketball players of an Italian First Division team, 35 cyclists from 2 professional teams, 13 racing motorcyclists of a professional team, 27 soccer players of an Italian First Division team, 23 sailors of an America’s Cup yacht, 34 alpine skiers of the Italian National Team, and 44 rugby players of the Italian National Team. The athletes were all males, and the age range was 17–36 years. Serum was always analyzed within 5 h from blood drawing on an Aeroset c8000


References

sured during periods of competition

However, these values were mea-

tures (Abbott) by an alkaline picrate reac-
tion method. Blood samples were

obtained before the start of training for the competitive season, when ath-

letes were not undergoing specific

training loads or psycho-physical stresses. We selected age-matched sedentary, nonobese, apparently healthy males, without biochemical and hematologic signs of diseases, as

controls (n = 100).

We found mean (SD) creatinine values of 97 (18) μmol/L [1.1 (0.2) mg/dL] in the athletes and 88 (9) μmol/L [1.0 (0.1) mg/dL] in con-

trols. The frequency distributions of serum creatinine in the 2 groups are shown in Fig. 1. The mean (SD) values in the different sports groups were as follows: 88 (9) μmol/L [1.0 (0.1) mg/dL] in triathletes, 97 (9) μmol/L [1.1 (0.1) mg/dL] in basketball players, 80 (9) μmol/L [0.9 (0.1) mg/dL] in cyclists, 80 (9) μmol/L [0.9 (0.1) mg/dL] in motorcyclists, 115 (9) μmol/L [1.3 (0.1) mg/dL] in soccer players, 97 (9) μmol/L [1.1 (0.1) mg/dL] in sailors, 106 (9) μmol/L [1.2 (0.1) mg/dL] in skiers, and 115 (9) μmol/L [1.3 (0.1) mg/]

dL] in rugby players. There were significant differences (Student t-test, P <0.01) between each group of ath-

letes in the different sports and the control group.

Our data seem to be discordant with those reported for endurance athletes (Nordic skiers and cyclists), who showed creatinine values lower than controls: 71–88 μmol/L [0.8–1.0 mg/dL] for skiers and 62–80 μmol/L [0.7–0.9 mg/dL] for cyclists. However, these values were measured during periods of competition (2). To our knowledge, no other study has been published describing creatinine values in elite athletes at rest. In general, creatinine is not in-

fluenced by training and competition

(3), even during extreme effort (4). We found that the creatinine values in elite athletes were generally higher than in controls, as expected in part because of their higher muscle mass. The athletes competed in 8 different sports with different char-

acteristics of aerobic/anaerobic met-

abolism, different training loads and frequency of competitions, different lengths of competitions, and different periods of training and competi-

tions. The athletes’ diets were moni-


tored and controlled by team physicians; no creatinine supplemen-


tation was administered to the ath-

letes.

The use of reference intervals based on general populations is not recommended in sports medicine, to avoid misinterpretation of data and additional, unnecessary investigations. This does not necessarily im-

ply that specific reference intervals should be calculated for the creati-

nine concentrations of athletes. The individuality index (ratio between intra- and interindividual variability) of creatinine is 0.33, lower than the value of 0.60, which is universally considered the threshold for classify-

ing a reference interval as useful in a

population. We recommend that for each athlete, consecutive creatinine assessments be monitored, with one of the values determined before the start of training and competitions used as the basal value.

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(1) Istituto Ortopedico Galeazzi

(2) Facoltà di Scienze Motorie

(3) Dipartimento di Scienze Cliniche “L. Sacco”

Università di Milano

Milan, Italy

* Address correspondence to this au-

thor at: Istituto Ortopedico Galeazzi, Via R. Galeazzi 4, 20161 Milan, Italy. Fax 39-02-6621-4806; e-mail giuseppebanfi@supereva.it.

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Giuseppe Banfi1,2*

Massimo Del Fabbro1,3

1 Istituto Ortopedico Galeazzi

2 Facoltà di Scienze Motorie

3 Dipartimento di Scienze Cliniche “L. Sacco”

Università di Milano

Milan, Italy

Nanotechnologic Nutraceuticals: Nurturing or Nefarious?

To the Editor:

The use of nutraceuticals (herbal medicines, minerals, and vitamins) has increased dramatically, and it is estimated that approximately one third of Americans consume some form of dietary supplementation (1). Adverse clinical side effects of nutra-

ceutical ingestion have been well docu-

mented (2), as have interfer-

ences from these agents in laboratory tests (3).

Colloidal suspensions of metal particles (e.g., copper, gold, plati-

num, silver, molybdenum, palla-

dium, titanium, and zinc) have been marketed as oral health supplements (2, 4). Metal colloids are reactive and can act as reducing agents, bind to proteins, and denature enzymes, and they are efficacious as bactericides in topical formulations (2); however,