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## Supplement contamination: detection of nandrolone metabolites in urine after administration of small doses of a nandrolone precursor

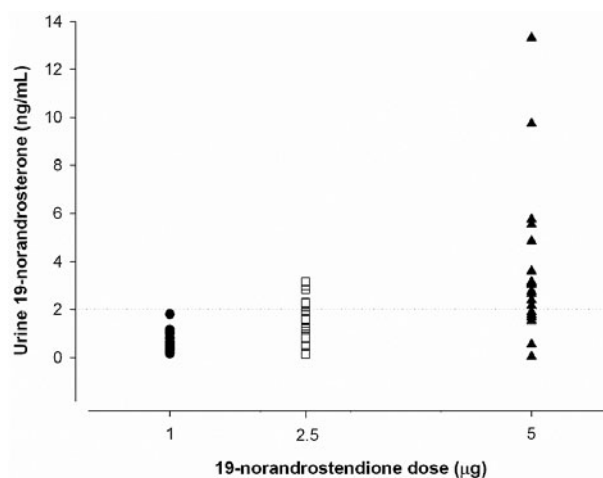
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Trace quantities of anabolic and androgenic steroids have been found in dietary supplements without their presence being disclosed on the label<sup>(1)</sup>. It has previously been demonstrated that ingestion of 10 µg 19-norandrostendione added to a creatine supplement results in urinary 19-norandrosterone (19-NA) levels >2 ng/ml in all subjects<sup>(2)</sup>. This result constitutes a positive doping result under current World Anti Doping Agency (WADA) guidelines. The aim of the present investigation was to monitor the appearance of nandrolone metabolites in the urine following the ingestion of smaller doses of 19-norandrostendione.

Eleven male and nine female volunteers (age 25 (SD 4) years, height 1.68 (SD 0.06) m, body mass 68.6 (SD 13.1) kg, BMI 24.2 (SD 3.2) kg/m<sup>2</sup>) were recruited to participate in the study. On three occasions subjects entered the lab in the morning following an overnight fast. An initial urine sample was collected and body mass was measured. Subjects then ingested 500 ml water containing 5 g creatine monohydrate and 1.0, 2.5 or 5.0 µg 19-norandrostendione. All urine passed throughout the remainder of the day was collected, the volume measured and an aliquot taken. All samples were analysed for the metabolites 19-NA and 19-noretiocholanolone (19-NE) by GC-MS.

The mean total urine volume passed during each trial was 1.79 (SD 0.73) litres: this volume was not different between trials ( $P=0.731$ ). Baseline urinary 19-NA concentrations were 0.19 (SD 0.14) ng/ml. Ingestion of the supplement resulted in peak urinary 19-NA concentrations (ng/ml) of 0.68 (SD 0.36), 1.56 (SD 0.86) and 3.89 (SD 3.11) in the 1.0, 2.5 or 5.0 µg dose trials respectively. Under current WADA regulations the 1.0 µg dose produced no positive doping tests, whereas five (20%) subjects would have tested positive in the 2.5 µg dose trial and fifteen (75%) exceeded urinary 19-NA concentrations of 2 ng/ml after ingesting the 5.0 µg dose (Figure). There was an inverse relationship between the dose ingested and percentage total recovery of 19-NA + 19-NE (1.0 µg, 55 (SD 19); 2.5 µg, 46 (SD 14); 5.0 µg, 40 (SD 19);  $P<0.001$ ). No significant association was found between body mass and the peak 19-NA concentration measured in the urine following the 5 µg dose ( $r\ 0.377$ ;  $P=0.102$ ).



The present study demonstrates that the ingestion of trace amounts of 19-norandrostendione can result in a marked elevation in urinary 19-NA and 19-NE concentrations. These data show that the addition of 2.5 µg 19-norandrostendione to a fluid-based supplement (0.0005% (w/v) contamination) was sufficient to result in a doping violation in some individuals.

- Geyer H, Parr MK, Mareck U, Reinhart U, Schrader Y & Schanzer W (2004) *Int J Sports Med* 25, 124–129.
- Judkins C, Watson P & Russell C (2006) In *Recent Advances in Doping Analysis*, vol. 14, pp. 477–480 [W Schänzer, H Geyer, A Gotzmann and U Marek, editors]. Köln, Germany: Sportverlag Strauss.