

## Letter to the Editor

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# Significant increase of serum prostate-specific antigen after exercise

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To the Editor,

Prostate-specific antigen (PSA) is still widely used for diagnosis of prostatic adenocarcinoma and for deciding whom to biopsy. It is widely known that many factors can falsely elevate serum PSA, in addition to prostate cancer, including acute or chronic prostatitis and benign prostatic hyperplasia. The effects of other parameters, especially exercise and bicycle riding, are still controversial. While a few studies have found significant increases of serum PSA after cycling and vigorous exercise [1–5], a larger number of reports [6–14] found no effect of either vigorous exercise, including marathon running, or long-distance biking (e.g. 6 h or 120 km off-road mountain biking). These opposing findings have clinical significance for properly preparing patients, before the PSA test is performed.

The differences among the published studies are likely due to the following factors: Age of participants; degree and type of exercise; the status of prostate health (i.e. presence of benign prostatic hyperplasia, chronic prostatitis, etc.). The latter factor is likely to be the most important. Due to intraindividual variations, the PSA test may be highly affected by exercise in some patients, while in others it may not [4].

In this brief report, I present a case of a 63-year-old man who had acute prostatitis a year earlier, with

PSA elevation from 1.5 ng/mL (baseline) to 14 ng/mL. The patient was treated with Cipro (1000 mg/day) plus Rapa-flo (8 mg/day) for 6 weeks. Symptoms of prostatitis resolved within about a month, and PSA declined gradually over 10 months to 2.9 ng/mL. Eight weeks later, serum PSA was tested again and it was 5.5 ng/mL (90% increase from baseline), raising suspicion of recurrent prostatitis, but the patient had no symptoms and urinalysis was negative. Upon further inquiry, the patient revealed that he was on a vigorous exercise regimen of 5 days/weeks on a treadmill. This raised the possibility that the latest elevation in PSA was related to the exercise, and a protocol was developed to study this effect.

The patient was asked to follow his daily training regimen (70 min on a treadmill, with at least 20 min jogging at 8.5 km/h; the rest of the time included brisk walking at 6.4 km/h on 0%–7% incline, averaging approx. 600 calories per session). Blood was drawn after 4 consecutive days of abstention from exercise (Thursday, Friday, Saturday, Sunday) or just after exercise (within 1 h), for 3 consecutive days (Monday, Tuesday, Wednesday), as described above. This weekly cycle was repeated for 3 consecutive weeks, to study if the observed PSA changes were reproducible. Urine was also collected for total protein measurement, to verify the known effect of increased urinary protein excretion after strenuous exercise [15]. PSA and urine total protein were measured on a Roche modular automated platform according to the manufacturer's recommendations. The obtained results are shown in Table 1.

Serum PSA values after exercise were 50%–90% higher in comparison to resting values, and the effect of exercise was highly reproducible in all three rounds of experimentation. Increases in urinary protein after exercise were also confirmed.

These results suggest that for this patient, the effect of exercise on serum PSA values was highly significant. PSA results in this patient would have triggered an unnecessary prostatic biopsy, if the exercise effect was not considered. As the effect of exercise on serum PSA is controversial, and cannot be predicted for individual

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**Table 1:** Changes in serum PSA and urine protein concentrations after strenuous exercise.<sup>a</sup>

Sample collection	PSA, ng/mL	Urine protein, mg/mL
Baseline; after 4 consecutive days abstention from exercise	2.9	Not collected
After 3 consecutive days of strenuous exercise	5.5	Not collected
After 4 consecutive days abstention from exercise	4.0	58
After 3 consecutive days of strenuous exercise	5.9	172
After 4 consecutive days abstention from exercise	3.5	32
After 3 consecutive days of strenuous exercise	5.4	383
After 4 consecutive days abstention from exercise	4.2	114
After 8 consecutive days abstention from exercise	3.7	66

<sup>a</sup>Strenuous exercise is defined in text.

patients, it is advisable that patients who are taking the PSA test abstain from all forms of exercise for at least a week. For patients with moderately elevated serum PSA, before prostatic biopsy is considered, it would be useful to question the patients on their exercise habits. Exercise will also affect prediction algorithms for prostate cancer that are based on the total PSA and its derivatives [16, 17].

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