1. INTRODUCTION

The effect of oral creatine (Cr) supplementation on performance has received a considerable amount of attention in recent years, and has been shown to be effective for enhancing both aerobic and anaerobic exercise performance. The majority of Cr research has used men as subjects; therefore, findings reported for men may not necessarily be generalized to women, and there has been some controversy regarding the effectiveness of Cr supplementation for improving high intensity exercise performance in women. For example, Forsberg et al. (1) reported that women have an approx 10% higher total muscle-Cr (TCr) content compared with men, suggesting that they may have a lower potential to Cr load and, therefore, may not experience improvements in performance similar to those observed for men. However, more recently, a number of studies have reported that there are no gender differences in the magnitude of change in phosphocreatine (PCr) and/or TCr content following Cr loading (2,3), and that short-term supplementation is equally effective between genders for increasing indices of high intensity exercise performance (4). The purpose of this chapter was to examine the morphological potential for women to respond to Cr supplementation, and its effects on exercise performance and body composition. Based on the findings, practical applications and recommendations for future study are discussed.

2. PHYSIOLOGICAL PROFILES OF CR RESPONDERS

Not all studies have found positive results on performance following Cr supplementation (5–11). Conflicting findings between studies may be explained, in part, by methodological issues; however, some of
the disparity may also be explained by apparent differences in the physiological profiles of responders and nonresponders. Greenhaff et al. (12) have reported that approx 20–30% of individuals are nonresponders to Cr supplementation, which they defined as less than a 10 mmol/kg dry mass (dm) increase in resting TCr following 5 d of Cr loading (20 g/d), and suggested that it may be necessary to increase resting TCr stores by at least 20 mmol/kg dm to experience significant improvements in performance. Based on these guidelines (12), Syrotuik and Bell (13) recently reported that responders to Cr supplementation (>20 mmol/kg dm in TCr) had lower initial levels of intramuscular free-Cr and -PCr, a greater percentage of type II muscle fibers, greater fiber type cross-sectional area, and a larger amount of fat-free mass (FFM) at preload when compared with nonresponders (<10 mmol/kg dm in TCr). In their study (13), the loading dose was 0.3 g/d for 5 d and included 11 young men as subjects (mean age = 22.7 yr).

Although these findings may not be directly extrapolated to women, studies which have compared muscle morphology between genders (14–16) have shown that there are no significant differences in fiber type distribution (types I, IIA, and IIB), and that the differences in strength between men and women are largely because of the greater cross-sectional area of these fibers in men. Given that the distribution of fiber types is similar in men and women, it seems reasonable to suggest that women exhibiting the same physiological characteristics as the responders in the study by Syrotuik and Bell (13) would also be considered to be the best candidates for Cr supplementation. Further research is necessary to not only replicate the findings of Syrotuik and Bell (13) using a larger number of subjects, but to also directly compare the results with women.

3. CHANGES IN MUSCLE TCR AND PCR FOLLOWING CR LOADING

Reported increases in muscle-TCr content following Cr loading range from 9.5 to 27.6% (2,3,17–20) with most studies reporting an increase of approx 18–20% (2,3,17–19), whereas increases in PCR have been reported to range from 6 to 17.8% (3,17–19,21,22). A number of studies that have examined the effect of Cr loading on TCr and/or PCR content have used women as subjects (2,3,21–23). In a study using 19 college-age women (19–22 yr), Vandenberghe et al. (22) reported that 4 d of Cr loading (20 g/d) increased (p < 0.05) muscle-PCR content by 6% compared with placebo (Pl), whereas Smith et al. (21) reported a 15%