Invited Commentary

Invited Commentary: The Association Between Marijuana Use and Male Reproductive Health

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Approximately 15% of all couples are unable to conceive after a year and are labeled infertile. In recent years, increasing attention has been given to lifestyle factors that may impact fertility. In the United States, it is estimated that there are more than 17 million current users of marijuana with 4.6 million using marijuana almost daily. Although common, to date, little data exist on the impact of marijuana use on male fertility. In the current issue of the *Journal of Epidemiology*, Gundersen et al. (1) provide data examining the relationship between marijuana use and semen quality from young men recruited out of the general Danish population. Men who reported daily marijuana use displayed significantly lower sperm concentration and sperm counts compared with nonusers, while testosterone levels were higher. The current report provides important information for patients and providers regarding the negative association of marijuana use on semen quality. Although the benefit of marijuana cessation on recovery is uncertain, further study on the impact of marijuana use on male reproductive health is warranted as more states explore marijuana legalization.

cannabis; male infertility; marijuana; spermatozoa

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An increasingly common exposure with less data surrounding reproductive impact is marijuana use. As of this commentary, 4 states (Alaska, Colorado, Oregon, and Washington) and the District of Columbia have passed laws to legalize use of recreational marijuana for adults aged 21 years or older (10). Currently, over 40% of American men report having ever used marijuana, with approximately 25% of young men reporting use within the past month (11, 12). Thus, there are approximately 17.4 million current users of marijuana with 4.6 million using marijuana almost daily (13). Moreover, up to 22% of men who intended to have children (or more children) reported using marijuana within the past 12 months (14). As usage of marijuana may rise with further legalization, more information regarding the reproductive health impacts is needed. Prior reports examining the association between marijuana use and semen quality recruited men with a history of drug abuse or infertility, thus limiting generalizability of identified relationships (15–17).

The current study by Gundersen et al. (18) is one of the first to rigorously examine the association between marijuana use and semen quality in men from the general population. These authors take advantage of a unique opportunity that exists in Denmark. As a result of the military draft, all young men in the country are required to undergo a physical examination to determine suitability for military service after the completion of schooling. Beginning in 1996, the investigators have invited these young men to participate in a program to better understand the reproductive health of men in Denmark. Participants complete a questionnaire, give semen and blood
Marijuana is reported to impair sperm production and semen quality. In a study of 1,215 men, those with higher alcohol consumption displayed impairments with weekly marijuana usage, whereas those with lower alcohol consumption had a low weekly alcohol usage displayed impairments with marijuana usage. Although men who had a low weekly alcohol usage displayed impairments with weekly marijuana usage, those with higher alcohol consumption showed minimal association between smoking marijuana and semen quality. The authors also explored the association of marijuana use and reproductive hormone levels. The active ingredient in marijuana is Δ9-tetrahydrocannabinol that binds to cannabinoid receptors in the brain and testes, implying both direct and indirect mechanisms whereby male reproduction could be affected. Although no differences in leutinizing hormone, follicle-stimulating hormone, or sex hormone-binding globulin levels were found, men with more than weekly marijuana usage had 7% higher testosterone levels.

Prior reports of the other health impacts of marijuana usage are extensive, while limited in male reproduction. Investigators have reported improved or minimal impact on pulmonary function in marijuana smokers followed for over 20 years. In addition, recent reports using data from the National Health and Nutrition Examination Survey (NHANES) suggest that marijuana users display improved insulin resistance, and indirect mechanisms whereby male reproduction could be affected. Although no differences in leutinizing hormone, follicle-stimulating hormone, or sex hormone-binding globulin levels were found, men with more than weekly marijuana usage had 7% higher testosterone levels.

Several stratified analyses were also performed to assess effect modification to better identify subjects at highest risk. Body mass index did not alter the findings, suggesting applicability to men at all weight levels. However, the authors did identify a relationship with alcohol usage. Although men who had a low weekly alcohol usage displayed impairments with weekly marijuana usage, those with higher alcohol consumption showed minimal association between smoking marijuana and semen quality.

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Prior reports of the other health impacts of marijuana usage are extensive, while limited in male reproduction. Investigators have reported improved or minimal impact on pulmonary function in marijuana smokers followed for over 20 years. In addition, recent reports using data from the National Health and Nutrition Examination Survey (NHANES) suggest that marijuana users display improved insulin resistance, lower fasting insulin levels, smaller waist circumference, and lower prevalence of diabetes. Given the association with favorable health profiles, one could plausibly surmise no impact or even benefit from marijuana use on male reproductive function. Although a slight positive association was identified with testosterone, a negative association was identified with sperm production.

Denmark has a long history of exploring male reproduction. Although many of the investigators of the current report have published landmark studies on male reproductive health, the population is unique in the world. Recent longitudinal data suggest that median sperm concentration in Denmark is 48 million/mL, which is noticeably lower compared with other countries where systematic reviews report values of 73 million/mL. Moreover, up to 77% of Danish men have impaired semen quality. In addition, although approximately 1.5% of US births are attributed to in vitro fertilization, that number is 4.5% in Denmark. Certainly, prior reports from Denmark have informed the world of many conditions including male reproduction, but findings should also be confirmed in other populations.

It is also important to note that marijuana users were distinct in several ways from nonusers. Marijuana users reported higher rates of alcohol, caffeine, and tobacco use. Moreover, they had higher tobacco exposure in utero, stress, prevalence of sexually transmitted diseases, and use of recreational drugs, all of which are associated with impaired fertility. Indeed, a man’s health may impact sperm production. Although these factors were adjusted for in regression models, residual confounding may remain.

The current report provides important information for patients and providers regarding the negative association between marijuana use and semen quality. Usage more than once per week is associated with lower sperm concentration and total sperm counts, impairments which are made worse with the use of other recreational drugs. While the benefit of marijuana cessation on recovery is uncertain, further study of the impact of marijuana use on male reproductive health is warranted for states exploring marijuana legalization.

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