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Title:

RACIAL VARIATION IN SEMEN QUALITY FROM NEARLY 2,000 U.S. SPERM DONORS

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Objective:

Racial variation in semen quality is not well studied in reproductive medicine. Recent estimates suggest that genetic abnormalities (including chromosome abnormalities and single gene mutations) contribute to 15% of male factor infertility.[1] Investigators continue to explore race and genetic contributions to male infertility with the aim of defining distinct genetic biomarkers that may affect spermatogenesis. Preliminary studies suggest that racial differences in semen analysis (SA) parameters do exist, but firm conclusions are limited by heterogeneity of the studied populations.[2,3] This study sought to identify racial differences in semen quality among US sperm banking donors.

Design:

Multi-center, retrospective cohort study

Material and Methods:

Semen analyses (SAs) collected between the years 2007-2017 from sperm donors (ages 19-38 with 2-5 days abstinence) who self-identified as White, Black/African American, or Asian between the years 2007-2017 were examined. Specimens from donors reporting more than 1 race were excluded from the study. Geographic region and BMI were noted. Primary outcomes were semen volume, total sperm count (TSC), sperm concentration (SC), percent motility, and total motile sperm count (TMSC). Data was analyzed using one-way ANOVAs, and a general estimate equation (GEE) model with an exchangeable working correlation structure to account for repeated measures.

Results:

A total of 94,592 SA specimens (from 1929 unique donors) were analyzed. Mean BMI and SA parameters are shown in Table 1. Controlling for BMI and geographic region, there were no significant differences in semen volume or percentage motility between specimens from men of different races. TSC was significantly lower in specimens from Asian men as compared to specimens from White men (β= -21.04, p=0.0013), but no significant difference was observed between specimens from White and Black/African American men, or between specimens from Asian and Black/African American men. There was a significant decrease in SC in specimens from Asian compared to specimens from White men (β= -5.27, p=0.0046), but no significant difference between specimens from Black/African American and White men, or between

specimens from Black/African American and Asian men. There was a significant decrease in TMSC in specimens from Asian men compared to specimens from White men (β= -15.4, p=0.0045), as well as in specimens from Black/African American men as compared to specimens from White men (β=-16.18, p=0.0293), but no difference between specimens from Black/African American and Asian men.

Conclusions:

Significant progress has been made in personalized reproductive medicine as advances in next generation sequencing have enabled us to make individualized treatment recommendations based on patient genotypes. Inherent to personalized medicine is the ability to leverage phenotypic and genotypic information, including detailed information about race, to develop predictive models and treatment recommendations. Our study was the largest to date to evaluate racial variations in sperm quality in a non-infertile population of males presenting for sperm donation. Confirming the preliminary findings of the Study for Future Families,[2] we found that specimens from Black/African American men had significantly lower TMSC when compared to those from White men; however, we found no difference in semen volume or SC. We also demonstrated significant differences in SA parameters of Asian men when compared to White men. While self-reported race provides some clues to patient origin, using ancestry informative markers (AIMs) based on genetic/genomic data will be more precise. Further efforts in sequencing donors may elucidate polymorphisms that are more prevalent in men of different races, providing even greater insight into differential expression of gene pathways regulating spermatogenesis.

Table 1:

BMI and semen analysis parameters by race

	Caucasian (N= 82,976)	Black/African American (N= 2306)	Asian (N=9310)	p-value
Body Mass Index (BMI)	24.31 ± 2.56	27.38 ± 3.44	24.22 ± 2.78	<0.0001
Volume (mL)	3.16 ± 1.35	2.93 ± 1.30	3.04 ± 1.31	<0.0001
Total Sperm Count (M)	255.43 ± 128.87	246.36 ± 129.24	223.99 ± 107.16	<0.0001
Concentration (M/mL)	85.54 ± 37.07	90.95 ± 45.18	77.73 ± 30.80	<0.0001
Motility (%)	75.14 ± 9.64	74.95 ± 10.02	75.99 ± 20.21	<0.0001
Total Motile Sperm Count	193.69 ± 104.58	185.65 ± 102.13	170 ± 87.30	<0.0001

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