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JOURNAL ARTICLE

Discriminant analysis indicates a single sperm protein (SP22) is predictive of fertility following exposure to epididymal toxicants

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In a previous study, we found that ethane dimethanesulphonate (EDS) compromised the fertilizing ability of proximal cauda epididymal sperm from the rat within 4 days of exposure, an effect that persisted in castrated, testosterone (T)-implanted animals, establishing direct action on the epididymis. This EDS-induced reduction in fertilizing ability was highly correlated with a quantitative decrease in specific sperm protein. Here we sought to determine whether the fertility of proximal cauda epididymal sperm recovered from animals exposed to a variety of male reproductive toxicants could be predicted by assessing quantitative changes in specific sperm protein(s), or whether more common endpoints (e.g., sperm motility, sperm morphology, serum and epididymal tissue T, cauda epididymal sperm reserves) also are required to predict fertility. Intact adult male rats were dosed with EDS (25 or 50 mg/kg), chloroethylmethanesulphonate (CEMS; 12.5 or 18.75 mg/kg), or epichlorohydrin (EPI; 3 or 6 mg/kg) daily for 4 days. Castrated, T-implanted rats were dosed with hydroxyflutamide (HFLUT; 12.5 or 25 mg/kg) daily for 5 days. On day 5, proximal cauda epididymal sperm were inseminated in utero into receptive, cervically stimulated adult females, and on day 9, fertility (implants/corpora lutea) was assessed. Fertility-was decreased by the higher dose of each toxicant ($P < 0.05$) and also by the lower dose of EPI and HFLUT. Likewise, an acidic 22 kDa sperm protein (SP22) was decreased quantitatively ($P < 0.05$) in silver-stained two-dimensional gels by the higher dose of each toxicant as well as by the lower dose of EPI and HFLUT. Although sperm motility and serum T were altered by specific exposures, these endpoints were not useful in predicting fertility. In contrast, SP22 was highly correlated ($P < 0.0001$; $r2 = 0.83$) with fertility. Indeed, the amount of SP22 correctly predicted 90% and 94% of the fertile (> 50% fertility) and subfertile (< 50 fertility) animals, respectively, when discriminant analysis was performed. Thus, the amount of SP22 in a cauda epididymal sperm sample may be a useful predictor of fertility in toxicant-treated animals.

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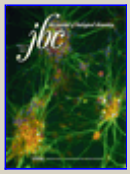

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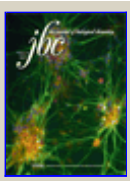

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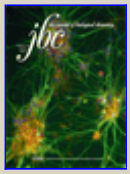

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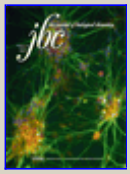

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