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Improving the efficacy of the standard DNA differential extraction method for sexual assault evidence

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Highlights

- **Simple modifications to the standard DNA differential extraction procedure are described.**
- **The modifications reduced the female DNA carryover into the sperm fraction.**
- **The modifications resulted in no significant reduction of male DNA recovery in the sperm fraction.**
- **3- to 90-fold improvements of the male:female ratio in the sperm fraction were seen.**
- **The modifications used standard lab tools and methods.**

Abstract

The efficacy of a DNA differential extraction procedure relies on reducing the amount of non-sperm female DNA carryover into the sperm fraction, while providing a sufficient recovery of male DNA from the sperm cell component. A standard approach to this extraction is to use a mild initial lysis step to digest the female (epithelial cell) component in the mixture, followed by a series of centrifugation and wash steps to further purify the resulting sperm-pellet fraction. This sperm fraction is then digested in the presence of a chemical reducing agent in preparation for DNA extraction. This method has been employed with relatively few changes since its introduction in the mid-1980s, despite numerous attempts to develop new or improved procedures. In this report, we demonstrate that it is possible to improve the efficacy of the standard differential extraction by applying simple modifications that can reduce the amount of female DNA carryover into the sperm fraction, with no adverse effects on the recovery of male DNA. In one modification, the addition of a second mild lysis step at the beginning of the differential extraction procedure improved the average male-to-female DNA ratio in the sperm fraction by 3- to 6-fold. In another modification, a “tube transfer” step was added to move the re-suspended sperm pellet to a new tube for the second mild lysis and subsequent wash steps. With this