Journal of Andrology, Vol 22, Issue 3 464-470, Copyright © 2001 by The American Society of Andrology

JOURNAL ARTICLE

Susceptibility of glycolytic enzyme activity and motility of spermatozoa from rat, mouse, and human to inhibition by proven and putative chlorinated antifertility compounds in vitro

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Nonhormonal contraceptives that act by blocking energy metabolism within sperm have the advantage over spermatogenic inhibitors by their fast onset of infertility and their almost immediate restoration of fertility after withdrawal of the contraceptive agent. This study was done to test new chlorinated compounds for their contraceptive potency on rodent and human sperm in vitro. Cells were incubated in a medium containing glucose as the sole energy source with 1-chloro-3-hydroxypropanone (CHOP) and 1,6-dichloro-1,6-dideoxy-D-fructose (DCDF), chlorinated analogues of glycolytic substrates, as well as racemic (R,S)-alpha-chlorohydrin (ACH). After incubation, enzymatic activity and kinematic parameters were estimated. A dose-dependent inhibition of the glycolytic enzyme, glyceraldehyde 3-phosphate dehydrogenase (GAPDH), of rat and mouse distal cauda epididymidal and human ejaculated sperm by ACH, CHOP, and DCDF was demonstrated. Triosephosphate isomerase (TPI) was inhibited by ACH, but not by CHOP and DCDF, irrespective of species. All compounds inhibited sperm motility and kinematic parameters with increasing concentration. The results confirm that inhibition of glycolytic enzymes of sperm, including those of human, can be effectively brought about by a variety of chloro-compounds that can be converted to (S)-3-chlorolactaldehyde, the stereospecific chloro-derivative of the enzyme's natural substrate, (R)-glyceraldehyde 3-phosphate, and could be developed into contraceptive agents for men.

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