MORPHOLOGICAL AND BIOCHEMICAL STUDIES ON INFERTILE BULL SPERMATOZOA

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SUMMARY

To determine the sperm fertility, semen analysis is the minimal requirement, the basic morphological and biochemical studies are needed. We have investigated the semen of 15 clinically proved infertile bulls (Holstein Fresian 75%) which has been trial for at least 1 year by light microscope, multiexposure photography technique (MEP), scanning and transmission electron microscope (SEM and TEM) as well as the acid urea polyacrylamide gel electrophoresis method. Four normal fertile bulls were served as control. The semen were obtained by artificial vaginal method.

Fertile and infertile bull semen was analysed in volume, sperm concentration, total sperm count and sperm motility. Based on the percentage of motility examined by multiexposure photography technique, we classified stages of infertility into 3 groups according to the percent of motility as mild, moderate and severe (40-60, 20-40 and < 20 respectively) of sperm movement. The velocities of sperm movement were also measured by MEP, and it was significantly different between fertile and infertile bull sperms. Abnormal sperm head and tail morphology, such as small, narrow, pear shaped head, maldeveloped sperm head, pathological acrosome, coiled tail, bent tail, proximal and distal cytoplasmic droplets and pathological middle piece were found in infertile group by LM. The most common head and tail abnormalities which found in all infertile groups were pathological acrosome and coiled tail. Maldeveloped sperm head and proximal cytoplasmic droplet were most commonly found in severe group.

In addition to LM studies, the absence of fibrous sheath was observed by SEM studies in severe group. TEM studies revealed that there was nearly homogeneous chromatin condensation of sperm head in

mild and moderate infertile bull sperms. In severe infertile bull sperms, the heterogeneity of sperm head with various degrees of chromatin noncondensation was frequently observed. These noncondensed cells were classified into 3 types according to the shape and size of chromatin bodies.

The abnormalities observed by TEM in all groups but especially in severe group were the absence of peripheral doublet microtubules, central microtubules and radial spokes. Adhesion, duplication and multiplication of sperm tails were only found in severe group. Analysis of biochemical properties revealed that additional to protamines in all groups, histones were present in only severe infertile group.

The result indicated that the MEP technique was useful to demonstrate and classify the infertility in bull. SEM as well as TEM and biochemical studies have provided the information about the ultrastructure of abnormal sperm in infertile bull. We have established kinds of abnormalities which are cause of infertility for diagnosis purpose. No doubt, the early diagnosis of essential defects in bull sperm manipulates by the present study will play a significant role in the successful breeding program.