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The Major Subacrosomal Occupant of Bull Spermatozoa Is a Novel Histone H2B Variant Associated with the Forming Acrosome during Spermiogenesis

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Abstract

Recent studies on the structural composition of mammalian sperm heads have shown a conglomerate of unidentified proteins occupying the periphery of the mammalian sperm nucleus, forming a layer of condensed cytosol. These proteins are the perinuclear theca (PT) and can be categorized into SDS-soluble and SDS-insoluble components. The present study focused on identifying the major SDS-insoluble PT protein, which we localized to the subacrosomal layer of bovine spermatozoa and cloned by immunoscreening a bull testicular cDNA library. The isolated clones encode a protein of 122 amino acids that bears 67% similarity with histone H2B and contains a predicted histone fold motif. The novel amino terminus of the protein contains a potential bipartite nuclear targeting sequence. Hence, we identified this prominent subacrosomal component as a novel H2B variant, SubH2Bv. Northern blot analyses of SubH2Bv mRNA expression showed that it is testis-specific and is also present in murid testes. Immunocytochemical analysis showed SubH2Bv intimately associates, temporally and spatially, with acrosome formation. While the molecular features of SubH2Bv are common to nuclear proteins, it is never seen developmentally within the nucleus of the spermatid. Considering its developmental and molecular characteristics, we have postulated roles of SubH2Bv in acrosome assembly and acrosome-nuclear docking.

Keywords

spermatozoa; perinuclear theca; spermiogenesis; acrosome development; histone; H2B; bipartite nuclear targeting sequence




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