Summary
The plasma membrane of goat (Capra indicus) undergoes alterations accompanying epididymal maturation, \textit{in vitro} capacitation and acrosome reaction. Spermatozoa do not show increased or decreased affinity of the lectin binding on their surface in the order from caput to cauda epididymidis. Corpus epididymal spermatozoa disclose maximum number of lectin binding sites. Cauda epididymal spermatozoa display altered distribution of lectin labeling as compared with the caput spermatozoa inasmuch as the plasma membrane overlying the acrosome shows intense staining with DBA, MPA, PNA, SBA and WGA. The \textit{in vitro} capacitated and acrosome reacted spermatozoa also show redistribution of exposed carbohydrate moieties. After capacitation the surface coat components for MPA, SBA and WGA are shed from the spermatozoon head. Con A receptors retained in the capacitated spermatozoa are partially eliminated in the acrosome reacted spermatozoa. SBA receptor sites appear on the sperm tail of the capacitated spermatozoa. Unusual morphological changes attending capacitation involve the sperm tail end which develops a novel entity-the spatula.

Distribution of the IMPs of the plasma membrane of the goat spermatozoa are altered especially in the corpus and cauda epididymidis. Random dispersal of the intramembranous particles of the caput
epididymal spermatozoa is remodelled into a highly ordered linear arrangement of particles in the cauda epididymidis. On capacitation of the spermatozoa intramembranous particle clearings appear on the middle-piece and on the spatulated tail end.

Epididymal and ejaculated spermatozoa of buffalo - bull (Bubalus bubalis) show preferential localization of lectin binding sites on the plasma membrane overlying the acrosome. Quantitatively cauda epididymal spermatozoa exhibit minimum reactivity with Con A, DBA, MPA, PNA, SBA, UEA and WGA. There is no appreciable change in the distribution pattern of the intramembranous particles of the plasma membrane of the epididymal spermatozoa. In the fracture labeled preparations of buffalo-bull spermatozoa the WGA receptors of the spermatozoon head are identified on the IMP's of the protoplasmic face. These represents transmembrane glycoproteins which tend to preferentially go along with the spilt inner membrane halves.

The kinetics of reduction of TEMPO is sensitive to the quantity, quality and status of sperm maturation in the epididymis of goat and buffalo-bull. $^{31}$P-NMR nuclear magnetic resonance spectra of the ejaculate of buffalo-bull revealed variation in the phosphorous metabolites depending upon their metabolic activity. Resonance spectroscopy proved to be a useful tool to assess the functional integrity of cold shocked spermatozoa of goat, buffalo-bull and human and the cryoprotective effects of butylated hydroxytoulen, phosphatidylcholine and egg
yolk-citrate glucose diluent on these cells. The effect of lipid peroxidiation and antiperoxidative action of vitamin E on the spermatozoa was monitored by electron spin resonance spectroscopy.

Fluorescence microscopy and flow cytometric analysis of unfixed and acetone treated human (*Homo sapiens*) ejaculate spermatozoa displayed differences in the lectin binding features. Increased labeling in the acetone treated samples is attributed to the damage accruing to the sperm plasma membrane. Whole mounts of intact spermatozoa examined with transmission electron microscope showed distinct labeling of the colloidal gold linked PNA, DBA and UEA on the sperm head. Ultrathin sections of spermatozoa treated with colloidal gold linked PNA and UEA, prior to their fixation, revealed specificity of these lectins on the plasma membrane covering the acrosome (with PNA) and post acrosome (with UEA).

**Significant morphological transformations of the squirrel (*Funambulus pennanti*) spermatozoa on their entry and subsequent movement in the epididymis are:**

1. stacking together of the spermatozoa simulating the rouleaux formation of guinea pig spermatozoa. There is no evidence of any organic connection between the plasma membranes of the neighbouring spermatozoa,
(2) loss of curvature of the sperm head especially of its rostral region and

(3) existence of electron dense granular material between the plasma membrane and outer acrosomal membrane of the sperm head.

Throughout sperm ripening in the epididymis, IMP arrangement on the plasma membrane covering the sperm head remains unchanged. However, there are identifiable changes in the lectin binding features of the maturing spermatozoa. Con A shows decreased affinity in the cauda epididymal spermatozoa whereas DBA, MPA, SBA and WGA show enhanced reactivity. Regionalization of the sperm head is evident with the acrosome staining specially with Con A, MPA, PNA, SBA and WGA and the post acrosome with UEA.

Mongoose (*Herpestes auropunctatus*) spermatozoa are unusual with the middle-piece occupying only 8% of the sperm tail length. Large sized cytoplasmic droplet shows exuberance for UEA, WGA, MPA and SBA binding in the epididymal spermatozoa. Epididymal maturation of mongoose spermatozoa is accompanied with the increase of WGA and SBA and decrease of Con A, DBA and MPA binding. Acrosome exhibits preferential affinity for Con A and WGA in the cauda epididymal spermatozoa. Moreover DBA receptors occupy the entire length of the sperm tail whereas PNA is restricted only on the middle-piece. But in the caput epididymal spermatozoa middle-piece is occupied mainly by DBA.
and the entire surface of the sperm tail is occupied with PNA. Heterogeneity of the plasma membrane is exemplified by remodelling of the intramembranous particles of the plasma membrane covering the head. Plasma membrane covering the acrosome is distinguishable from the post acrosome segment of the sperm head as the former has random disposition of IMPs and in the latter the IMPs tend to pair. Mongoose spermatozoa differ from most of the mammalian spermatozoa in having miniscule sized, 'cords' and they do not seem to grow during epididymal maturation of the spermatozoa.

Qualitative and quantitative differences of lectin binding are noticeable on the surface of maturing spermatozoa of cat (*Felis catus*). Epididymal passage of the spermatozoa is accompanied with intensification of Con A and concomitant decrease of WGA labeling.

Various domains of the spermatozoa respond differentially to the lectin binding. The sperm head displays affinity for Con A, WGA and PNA and the sperm tail is decked with SBA.

In dog (*Canis domesticus*) the plasma membrane covering the acrosome of the testicular, epididymal and vas deferens spermatozoa shows variations in the localization of lectin receptors both qualitatively and quantitatively. However, in the ejaculate the entire sperm surface shows affinity for Con A, WGA and PNA. This pattern of lectin binding in the dog ejaculate sperm comes about without the contribution of secretory
products emanating from seminal vesicles as the latter are reported to be absent in dog. The lectin labeling of the cytoplasmic droplet is unusual because of its erratic affinity for lectin during the passage of the spermatozoa in the epididymis.

Corkscrew shaped spermatozoa of myna (Acridotheres tristis) show overall exuberance of lectin binding (BPA, Con A, GSI, MPA, SBA, UEA and WGA) on the testicular and storage sac spermatozoa. Saroupsid type, simple testicular spermatozoa of parrot (Psittacula krameri) are devoid of lectin receptors. But in the spermatozoa of the male excurrent duct WGA is prominent on the head and Con A, GSI, MPA and SBA are faintly expressed. On the other hand, in myna there is substantial increase of BPA, GSI, SBA, UEA and WGA as the testicular spermatozoa are stored in the storage sac. Glycocalyx coat is prominent in myna spermatozoa whereas such a coat is not noticeable in the parrot spermatozoa. Notwithstanding the absence of cytoplasmic droplet in the avian spermatozoa, the latter do show differences in the lectin binding between the testicular and male excurrent duct spermatozoa.