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Prostatic disease is frequently seen in the dog. The clinical signs may be diverse and non-specific. Although prostatic enlargement may be easy to diagnose, both by rectal palpation and by ultrasound or radiographs, the nature of the disease is often difficult to assess. Histologic examination for a definitive diagnosis requires either excision biopsies obtained by laparotomy or large-bore needle biopsies, the latter with the risk of sepsis or haemorrhage. Compared to histology, cytology in the diagnosis of prostatic disease may have several advantages. The collection of material for cytologic evaluation is less invasive than with histological biopsies. It entails a significantly lower risk of septic complications and of seeding tumor cells. Another advantage is the speed of the method with results available within one hour after biopsy. Both flush techniques and transrectal or transabdominal biopsies techniques have been used to obtain material for cytological examination.

With the transabdominal Fine Needle Aspiration Biopsy (FNAB) technique specimens for cytology can be obtained by ultrasound-guided fine needle aspiration, using e.g. a 10 cm 21 gauge modified Menghini aspiration biopsy needle (Surecut®) with a 10 cc syringe\(^1\). The biopsy site in the parapreputial, prepubic area is first prepared surgically and infiltrated with a local anaesthetic. A small skin incision is than made to facilitate entry of the needle. The needle is directed to areas of lucency in the prostatic tissue, avoiding cysts or calcifications. In the author’s experience there is no need for preFNAB coagulation testing.

In addition, cytologic specimens can be obtained by the catheter biopsy technique as described by Mehlhoff and Osborne\(^3\) under ultrasound guidance, because guidance via the rectum cannot always be achieved. A urinary catheter is introduced into the urethra and the opening of the catheter is positioned in the prostatic area of the urethra after which cells are aspirated. No fluid is flushed during this procedure. Successful results have been reported for this method in the dog\(^4\).

The biopsy specimens are smeared on glass slides, air-dried, and stained by the May-Grünwald Giemsa technique or one of the Wright stain based quick stains.

In a study of 77 dogs with prostatic disease, the clinical signs appeared to be diverse and non-specific for the different causes of prostatic disease\(^1\). Both FNAB and catheter biopsy technique had a moderate sensitivity for detecting prostatic carcinoma (67% each). However, both techniques had a very high specificity for detecting prostate cancer (98%). By combining the two techniques the sensitivity can be enlarged. Both methods combined only failed to obtain sufficient material in 3 dogs (3.9%). No side effects were noticed due to the biopsy method in any of the 77 dogs.

Benign prostatic hyperplasia is cytologically characterized by large groups of epithelial cells, frequently in monolayers, with a cell morphology comparable to normal prostatic epithelial cells. The amount of cytoplasm may be enlarged giving the cells the typical columnar or polygonal appearance. The nuclei are uniform of size, round, often with a prominent small nucleolus, and with fine granular chromatin pattern. The nuclear/cytoplasm (N/C) ratio is usually low.

In prostatitis very often there is quite a degeneration of the epithelial cells, intermixed with many neutrophils with or without intracellular bacteria. Macrophages and other round nuclear inflammatory cells may also be present. Squamous metaplasia, associated with estrogen production of Sertoli cell tumours or iatrogenic causes, can be present in both benign prostatic hyperplasia and prostatitis. Several large squamous cells with a large amount of basophilic cytoplasm, without a nucleus or with a small condensed nucleus, can be seen. The amount of cells that can be seen in fluid from prostatic cysts can vary enormously. Usually only small numbers of prostatic epithelial cells with some inflammatory cells can be seen against a protein rich background pattern. Several types of neoplasia can be diagnosed in the prostate. However, most of them like the malignant lymphoma and sarcomas occur very infrequently. The most common prostatic neoplasia is the prostatic carcinoma. Especially in FNABs these tumours are easy to differentiate from benign prostatic hyperplasia. The majority of carcinoma are poorly differentiated carcinomas, sometimes transitional cell carcinomas and rarely adeocarcinomas can be diagnosed. Small to large clusters of very basophilic epithelial cells, with many malignancy criteria are
present like anisocytosis, anisokaryosis, prominent and multiple nucleoli, variable N/C ratio, abnormal mitotic figures, and irregular and clumped chromatin pattern. Occasionally the cytoplasm of the tumour cells may contain small to large vacuoles, filled with a granular magenta material, presumably of mucoid origin.
When collecting material for cytology one should try to avoid the use of gel, for the ultrasound guidance or for the introduction of the catheter in the urethra, as this may result in excessive amount of granular, often dark red coloured material.

References:
By examining exfoliated vagina cells one can have a simple technique to monitor the progression through the estrous cycle in the bitch. Cells are easily obtained by the use of a cotton swab or by means of imprint smears of the vestibular mucosa.

There are several types of vaginal epithelial cells. The classification of these different cell types is based upon the location of the cell in the layers of squamous epithelium. In order of development from basement membrane towards vaginal lumen, they are called basal cells, parabasal cells, intermediate cells and superficial cells.

**Basal cells**
The basal cells are usually not seen in vaginal smears. They are small cells, with a minimal amount of cytoplasm present. The basal cells are attached to the basement membrane and give rise to all other epithelial cells in the vaginal smear.

**Parabasal cells**
The parabasal cells are the smallest epithelial cells seen in vaginal smears. These cells are usually round-oval cells with a round nucleus and only a very slim amount of dark blue or dark grey cytoplasm present. The parabasal cells are very uniform in appearance. In very young animals sheets of parabasal cells can be encountered when the vagina is swabbed.

**Intermediate cells**
The size of intermediate cells may vary, although in general they are larger than the parabasal cells. The low, and small, intermediate cell has a darker cytoplasm color and is more rounded. This in contrast to the upper, and larger, intermediate cell, which has a lighter cytoplasm color. The large intermediate cell is usually also round, but becomes more irregular and a bit folded.

**Superficial cells**
This is the largest epithelial cell type seen in vaginal smears. As in the upper intermediate cells the cytoplasm is abundant, folded and angular. This cell type, however, starts to keratohyalinize and small droplets, vacuoles, can be found in the cytoplasm. At the same time the nucleus starts to fade away or become pycnotic. When they are completely cornified, no nucleus is seen any longer.

In addition to the cell types described above there are two other epithelial cell types that can be found in a vaginal smear:

**"Metestrum" cells**
The metestrum cell is thought to be a parabasal cell that has one or more neutrophils in its cytoplasm. Although its name suggest that they can only be found during metestrus, their presence is not as much related to the estrus cycle as such, but more to the presence of leucocytes in the vagina.

**"Foam" cells**
The foam cells are also believed to be parabasal cells. They contain cytoplasmatic vacuoles that may vary in size. Their significance is not known.

The change of cell pattern in vaginal smears reflects the change of the vaginal epithelium due to change of ovarian hormonal activity. During the follicular phase the estrogens promote the proliferation and maturation of the epithelial cells towards keratinized squamous epithelium.

**Anestrus**
During the anestrus some parabasal and intermediate cells can be found in a vaginal smear. Sometimes a few neutrophils can be seen. Typical is the absence of superficial cells. At the end of the anestrus and at the start of the follicular phase some erythrocytes may be present. Bacteria can be absent or present in low numbers.

**Onset of follicular phase**
In the onset of the follicular phase there is a proliferation of epithelial cells and a leakage of erythrocytes by the smaller capillaries. As a result many erythrocytes are present in vaginal cytologic smears. The main epithelial cell type is the intermediate cell, but some parabasal cells and superficial cells are usually also present. Neutrophils are also observed. Neutrophils become less prominent and may even be absent.

**Progressing follicular phase, ovulation, start luteal phase**
In addition to the erythrocyte, the superficial epithelial cell is the most common exfoliated cell in this stage, some bitches reaching 60%, others 90%. Although these cells have usually a pycnotic nucleus, anuclear cells can also be found. Large intermediate cells may also be present, but parabasal cells and small intermediate cells are absent. Bacteria may be seen. Characteristic no neutrophils are present.

**Progressing luteal phase or diestrus/metestrus**
A rapid shift in numbers of superficial cells is observed in this stage. The percentage of superficial cells decreases and at the same time parabasal cells and intermediate cells reappear again. Neutrophils are usually also coming back. As a result, an occasional ‘metestrum’ cell can be found. Erythrocytes may or may not be present.

One should realize that, although vaginal cytology gives an indication of the stage of the cycle, it is not a trusted indicator of the preovulatory LH surge or of ovulation.

**References**