The presence of infection in the female genital tract may procure certain cellular changes in the epithelium. Such changes are seen in nucleus and cytoplasm surrounding the nucleus.

*Thus, there is two types of changes:
— Cytoplasmic changes
— Nuclear changes
1. **Cytoplasmic vacuolization:**
   It is the presence of vacuoles within the cytoplasm which indicate degenerative changes (death of cells) as a result of inflammation.

2. **Variation in outline of the cells:**
   Size varies from small to a very large cell.

3. **Peri nuclear halo:**
   The nucleus of degenerative cells are often surrounded by narrow clear zone (halos).
Peri nuclear halo
B- Nuclear changes:

1. **Nuclear enlargement and irregularity**, cell size will increase but not necessarily accompanied by hyperchromasia.

2. **Multinucleation**.

3. **Chromatin granulation**.

4. **Pyknosis and karyorrhexis** *(the fragmentation of the nucleus)*.

5. **Karyolysis** *(the nucleus become faint and lyses)*.
KARYOLYSIS

KARYORRHHEXIS
KARYOLYSIS: Nuclear fading
- Chromatin dissolution due to action of DNAases & RNAases

PYKNOSIS: Nuclear shrinkage
- DNA condenses into shrunken basophilic mass

KARYORRHEXIS: Nuclear fragmentation
- Pyknotic nuclei membrane ruptures & nucleus undergoes fragmentation

Nuclear dissolution
- ANUCLEAR NECROTIC CELL
THE COMMON CAUSES OF INFLAMMATION:

- Bacteria
- Parasites
- Fungi
- Viruses
**Bacterial Infection**

- **Doderlein bacilli** = *lactobacillus* = *bacillus vaginalis* these bacteria are considered to be vaginal normal flora, help maintaining the acidic ph. (3.5-4.5).

- These non-pathogenic bacteria may become pathogenic if the immune system of the host is weakened for any reasons.

- **The 2 main changes are:**
  - **Cytolysis** resulted from bacterial infection.
  - **Clue cells** which form by Coco bacilli
Cytolysis

Cocobacilli & Sperms
### 1- Doderlein bacilli (lactobacilli)

- **Lactobacilli** (gram +ve rods) induced cytolytic vaginosis results from Lactobacillus overgrowth.

- LB is characterized by a transformation in the length of lactobacilli.

- The delicate balance of the vaginal ecosystem is challenged constantly by several factors such as hormonal changes, medications, intercourse, stress, infection, douching, and hygiene.
Doderlin bacilli (lactobacilli)
Doderlin bacilli (lactobacilli)
**2- Gardnerella (Haemophilus) vaginalis**  
**[Coco bacilli]**

- A common vaginal bacterial infection which is usually accompanied with yeast, trichomonas or urinary tract infection.

- The infection diagnose by the presence of the masses in the background of the smear that covers the surface of large vaginal squamous epithelial cells (**clue cells**).

- Clue cells which form by Coco bacilli.
Coccobacilli
• A presence of amorphous cluster or balls of purple stained (dense central core), filament balls.

• Branching of the filaments may occasionally be seen.

• This invasion seems to be related to the prolonged use of INTRA UTERINE DEVICES (IUD).
Actinomyces
4- Leptothrix

- Larger and segmented unlike doderlein bacilli which is shorter and narrower.

- Usually elongated and very thin hair like structure with rare branching.

- Stain poorly and grayish in color.
Parasitic Infection

Trichomonas vaginalis

- One of the most common parasitic infections of the F.G.T.

- The disorder involves the vagina, urethra and bladder in women.

- The vagina is the most common site of infection in women. In men, it affects mainly the prostate gland and urethra (urine canal).
**Characteristics:**

- *Trichomonas vaginalis* is a parasitic protozoan flagellate, and organisms vary in size but are usually around 10 μm in length and 7 μm in width.
- It usually has an oval or pear-like shape, but can assume an amoeboid form when attached to vaginal epithelial cells.
- **In fixed and stained slides**, the parasites become circular in size, and different in shape. Has characteristic greenish or gray color. Flagella often seen
- Its cytoplasm contains reddish granules and the shadow nucleus is present.
Trichomonas vaginalis
Trichomonas vaginalis
Fungi Infection

*Vaginal Candiasis*

- Is an infection or inflammation of the vagina caused by a yeast-like fungus (usually Candida Albicans = single-celled fungus).
- It is the second most common vaginitis (bacterial vaginitis is the most common). Because candida is part of the body's normal flora.
- Yeast infections are common during pregnancy, due to the alteration in the acidity and the sugar content of vaginal secretions. Oral contraceptives, which have a similar effect in the body, also can lead to the development of yeast infections.
- Intrauterine devices (IUDs) can create a more favorable environment for fungal growth by decreasing normal vaginal secretions.
*Characteristics:*

- Easily identified
- **Hyphae and budding clearly visible.**
- **Stained light pink with Pap smears.**
- Weaves through the cells
- Associated inflammatory changes still identified
- **Shish Kebab appearance**
Candida albicans - spors
* Candida albicans hyphae
Viral Infection

Viral Cytopathic Changes:

- Late ballooning type of cytoplasmic and nuclear degenerative vacuolization.
- Nuclear enlargement followed by distortion and lysis.
- Inclusion body, surrounded by more or less prominent halo.
- Development of multinuclation.
- Disturbance of the texture of cytoplasmic ground substance, hypertrophy of the cytoplasm or the nucleus or both.
**1- HERPES SIMPLEX VIRUS (HSV):**

- Characteristic cytopathic effect is seen in both squamous and endocervical columnar cells.

- The infected cells maybe mononuclear, but more often contain several nuclei which mold on each another.

- The nucleus has a ground glassy appearance due to the accumulation of intra-nuclear viral particles.

- The chromatin pushed to the periphery, sharply demarcates the nuclear margin.
*One clumps of chromatin may be seen attached to the inner surface of the nuclear membrane.

- **Multinucleated giant cell**

- **Prominent molding of the nuclei**

- **Associated inflammatory appearance**

- **Often intermingled with endocervical and metaplastic cells**
Herpes simplex virus
Sexually transmitted viruses, known to cause Papillomas & warts.

The change is seen in intermediate squamous cells and consists of a large peri nuclear vacuole.

Surrounded by thick, deeply stained cytoplasmic rim, affected cells is referred as Koilocyte.
• Vacuole is large and the nucleus may be enlarged, irregular, hyperchromatic, binucleation or multinucleation is common feature.

• Increase N/C ratio

• Dyskeratosis
Human papillomavirus

Koilocytic zone

Bicultinucleation
Other inflammatory Features

ASPERGELOUS

ASBESTOS BOSIES