INTRODUCTION

The liquid-based cytology sample preparations (liquid-based preparation [LBP]) include ThinPrep (TP) (Cytyc Corp, Marlborough, MA) and SurePath (SP) (TriPath Imaging Inc., Burlington, NC). In both of these systems, instead of smearing cells on a slide, cells are rinsed into a liquid collection media containing fixatives. This ensures the capture of an entire sample from the collection devices. For conventional smears, most of the sample (~80%) is discarded with the sampling device. Despite the difference in preparatory techniques, the two LBP, TP and SP, are similar in appearance (Table I).

ADVANTAGES OF LBP

• Almost 100% of the collected cells are captured, processed, and reviewed.
• Immediate liquid fixation prevents artifacts, such as air-drying.
• Easier to review slides (Tables 2 and 3).
• Smaller screening area (TP, 20-mm and SP, 13-mm).
• Preparatory technique reduces debris, cell clumps and obscuring elements.
• Cleaner background.
• Significantly fewer unsatisfactory cases.
• Homogenized specimen.
• Increased detection of high-grade squamous intra-epithelial lesions and above.
• Ancillary testing such as reflex human papillomavirus (HPV) test and other molecular tests (Chlamydia/gonorrhea), immunocytochemistry can be performed from the residual material.
• Potential for processing residual material as a cell block.

PREPARATION OF LBP SPECIMENS

TP Preparation Technique

1. Specimen collection and fixation. Sample is collected using either a broom-type device or a plastic spatula and endocervical brush combination. The collection device is then rinsed in a specimen vial containing PreservCyt solution, a methanol-based fixative, which also lysed blood.

Specimen is labeled and transported to the cytology laboratory.

2. Steps in preparation. TP processor is a semi-automated device and comes in two versions. TP2000 processes one specimen at a time. TP3000 batch processes 80 specimens at one time. The microscopic slides used for the ThinPrep Pap Test are provided by Cytyc Corp and are marked with a 20-mm diameter circle. The specimen vial and the
Table 1

Appearance on Liquid-Based Preparations

- Adenocarcinoma in situ, endocervix: nuclei show “feathering” and stippled chromatin.
- Atypical squamous cells cannot exclude high-grade squamous intra-epithelial lesion: cells may be smaller.
- Atypical squamous cells of undetermined significance (ASC-US): features of ASC-US are easily appreciated because of better cell preservation.
- Atrophy: nuclei appear smaller, autolysis (“bare” nuclei) is less common, pseudoparakeratotic cells may appear orangeophilic, and granular background debris is clumped and is similar to the granular diathesis of squamous-cell carcinoma. The distinction is made by the absence of malignant squamous cells in atrophy.
- Candida spp.: organisms stain eosinophilic to gray-brown. There is “spearing” of squamous cells along the long axis of organisms.
- Coccobacilli: cells are covered with coccobacilli and background is cleaner.
- Endometrial cells: cells tend to round up in three-dimensional clusters, intracytoplasmic vacuoles are more evident, and small nucleoli are visible in normal cells.
- Follicular cervicitis: lymphoid cells may appear in clusters and may mimic endometrial cells.
- Repair: less “streaming;” groups may appear more rounded, frayed cytoplasmic edges may be seen, and staining may be uniform with less polychromasia.
- Trichomonas vaginalis: Organisms appear smaller, eosinophilic granules are better seen, and flagella are preserved.

Additional morphology described in other chapters.

labeled slide are placed into the TP processor. Preparatory steps include specimen dispersion, collection, and transfer.

a. Dispersion. A disposable cylinder with a polycarbonate filter attached to one end is introduced into the vial. The pore size of the filter is 8 μm (pore size for nongynecological specimens is 5.5 μm). The instrument disaggregates blood, mucus, debris, and breaks up large cell clusters, mixes and homogenizes the cell suspension by spinning, either the cylinder (TP2000) or the vial (TP3000), for a few seconds.

b. Collection. A gentle vacuum is applied to the cylinder that aspirates the cell suspension through the filter. Most of the broken red blood cells and debris is allowed to pass through while the diagnostic cells attach and remain on the external surface of the filter. The instrument monitors cell density across the filter and the flow rate decreases when cells are evenly distributed on the filter with minimal cell overlap.

c. Transfer. The cylinder moves out of the specimen, is inverted 180°, is gently pressed against a positively charged slide, and with slight positive pressure, transfers the cells (~70,000) to the glass slide. The slide is immediately dropped into 95% ethanol fixative. Preparation time ranges between 30 and 90 seconds depending on cell concentration. Papanicolaou staining is either performed manually or in an automatic stainer. The staining process takes 30 minutes.

3. Residual specimen. The shelf life of the residual specimen is 3 months at room temperature. It can be used for reflex HPV test, other molecular tests, such as those for chlamydia and gonorrhea, and immunocytochemistry. TP has been approved by the FDA for the aforementioned molecular tests. TP can also be used to process multiple representative slides or a cell block.