

Memory Joggers for Chemistry/Microscopy Correlation

White Blood Cell (WBC)/Leukocyte Esterase (LE)

Introduction

Microscopy and chemistry tests are complementary. The standard of care regarding urinalysis usually prescribes three components: physical examination, chemical examination and microscopic examination. All three components are usually required because there may be extenuating circumstances requiring a comprehensive evaluation to make a diagnostic decision.

When comparing macroscopic (physical/chemistry) and microscopic urinalysis results, it is important to note that such a comparison is not intended to ensure that results produce an exact match. **If results do not match, there may be logical reasons for this occurrence.** In addition to factors presented below, it is also important to be aware of any limitations or interferences that may occur for any chemistry strip.¹

Dry strip urine chemistry methods provide qualitative or semi-quantitative measurements for various parameters. These methods are not designed to offer quantitative results.

Positive Chemical Test for LE/No WBCs in the Microscopic Exam:

- “Five types of cells can be present in urine: neutrophils, lymphocytes, eosinophils, basophils and monocytes (macrophages). Because neutrophils predominate in the peripheral blood, they are the white blood cell most often observed in urine.”²
- “Because leukocytes readily lyse in urine, discrepancies can occur between the number of cells seen microscopically and the LE screening test.”²
- “An alkaline environment or hypotonic urine (SG ≤ 1.010) enhances cell lysis.”²
- “A positive LE test, despite few or no white blood cells present microscopically, can occur because of WBC lysis and disintegration.”²

- “Also, different populations of WBCs have varying quantities of cytoplasmic granules and therefore differing amounts of leukocyte esterase. In fact, lymphocytes have no leukocyte esterase.”²
- To provide optimal results, samples must be well mixed prior to aliquoting at the collection site and prior to running the samples. Intact WBCs easily “settle out”. Inadequate mixing of the sample may cause cells to be unevenly distributed in the assayed sample. This may lead to discordant results.

Intact WBCs in the Microscopic Exam/No LE on Chemistry Pad:

- “When increased WBCs appear in the urine, but the LE chemistry test is negative, it is important to consider that the WBCs present may not be of the granulocytic series—thus producing negative results (ex: lymphocytes).”²
- “Although the LE screening tests usually detects 10-25 white blood cells per microliter; the amount of esterase present may be insufficient to produce a positive response.”²
 - (10-25 WBCs/uL \approx 2-4.5 WBCs/hpf.
15 WBCs/uL \approx 3 WBCs/hpf).
- “Note that owing to hydration, hypotonic urine could cause the leukocyte esterase to be diluted such that it is below the detection limit of the LE reaction.”²
- The analytical output from urine chemistry and urine microscopy systems are not identical and should be used in a complementary manner to make a final diagnosis.
- **”Note: Diagnostics or therapeutic decisions should not be based on any single result or method”.**³

Preanalytical Variables:

- All urine chemistry strips have limitations.
- “Specimen collection, specimen handling, specimen integrity, interfering substances and patient factors are common causes of inaccurate test results. Some of the preanalytical variables that can contribute to false-positive and false-negative results are listed below.”¹⁴ **Note: Refer to the specific strips package insert for more detailed information.**

Possible False-positive LE Chemistry Reactions^{2,3,4}

- Preservatives; formaldehyde; formalin
- Contamination by oxidizing agents and detergents, formalin
- Vaginal contamination of urine
- Refer to actual strip package insert for detailed limitations

Possible False-negative LE Chemistry Reactions^{2,3,4}

- High concentrations of protein, glucose, cephalixin and gentamycin may diminish the color response
- High specific gravity
- Strong oxidizing agents (soaps and detergents)
- Refer to the actual strip package insert for detailed limitations

If you have any questions, feel free to contact Iris Diagnostics or your Local Iris Representative. Our contact information is listed as follows:

(800) 776-4747, Option 2 (Within the U.S.A.)
(818) 709-1244, Option 3 (Within the U.S.A.)
or email: support@proiris.com.

References:

1. iChem®VELOCITY™ Operator's Manual; Iris Diagnostics.
2. *Fundamentals of Urine and Body Fluid Analysis*; Nancy Brunzel; Third Edition.
3. iChem®VELOCITY™ package insert; Iris Diagnostics.
4. Becton Dickinson; Troubleshooting Preanalytical Variables In Urinalysis Testing; VS9012; 4/11.