Q & A Column, 10/14

Editor: Frederick L. Kiechle, MD, PhD

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Q. My laboratory reports the color of a body fluid after it's spun down. So bloody fluid may be reported as "color: yellow, appearance = bloody." Is this common practice? We have had phone calls from a neurologist who questioned the color and pointed out that it doesn't make sense, except for spinal fluid when it's important to record xanthochromia versus a bad tap.

A. Macroscopic examination of body fluids is important and should be performed on a noncentrifuged (unspun) well mixed sample. Macroscopic examination includes the fluid's color (e.g. colorless, yellow, orange, pink, red, or brown) and clarity (e.g. clear, cloudy and opalescent or very cloudy). Centrifugation of a body fluid and reporting the supernatant color is useful, especially for cloudy cerebrospinal fluid. Red/cloudy cerebrospinal and ventricular shunt fluid needs to be centrifuged to determine the clinical significance of the bloody sample. Centrifugation and examining the CSF supernatant will help to assist in distinguishing between a traumatic/bloody tap or recent subarachnoid/intracranial hemorrhage. A colored CSF supernatant is called xanthochromia (pink, yellow, or brown) and is observed in subarachnoid/intracranial hemorrhage, whereas a red/cloudy bloody CSF with a colorless supernatant signifies a bloody (traumatic) tap. For serous fluids (pleural, peritoneal, pericardial) it is not a common practice to examine the supernatant, unless clinically indicated. Globally, white/cloudy serous fluid could suggest infection or chylous/pseudochylous conditions. Centrifugation of a cloudy body fluid and evaluation of the supernatant is helpful in this circumstance since a clear supernatant implies turbidity secondary to cells/debris, while a cloudy supernatant is in keeping with a chylous/pseudochylous condition. In conclusion, the macroscopic examination of cerebrospinal fluid includes color and clarity on an unspun sample and supernatant color for xanthochromia on a centrifuged sample. Evaluation of serous fluid color post-centrifugation may have clinical utility in some circumstances.

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3. H56-A: Body Fluid Analysis for Cellular Composition; Approved Guideline. Wayne, Pa.: Clinical and Laboratory Standards Institute; 2007.

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Q. What is the validity of salivary cortisol test results?

A. Salivary cortisol has an established role as a screening test for assessing Cushing syndrome. A number of studies consistently showed a diagnostic sensitivity and specificity of more than 92 percent for late-night salivary cortisol.[1]

Cortisol in serum enters into saliva through intracellular diffusion and ultrafiltration of the free, nonprotein-bound fraction. Thus, salivary cortisol levels are assumed to reflect free cortisol concentrations in blood.[2]

Like all clinical tests, the validity of salivary cortisol test results relies on appropriate specimen collection, consideration of other preanalytical factors, and accurate and reliable measurements. A variety of saliva collection methods are available and are described in detail elsewhere.[2,3]

Saliva samples are typically obtained by direct spitting into a tube or by chewing on a wad of absorbent material. It is important that tubes and materials recommended for cortisol testing be used because some materials (such as polyethylene tubes) may absorb and retain cortisol, causing low analyte recoveries.

Contamination of saliva with topical hydrocortisone can lead to unusually high test results with some assays.[4]

Saliva stimulants such as citric acid can interfere with some immunoassays and lead to incorrect measurement results.[3]

Because blood contains about 100 times higher cortisol concentrations than saliva, contamination of saliva with blood needs to be avoided. To minimize contamination of saliva with other compounds, some investigators suggested abstaining for 30 or more minutes from brushing teeth, smoking, eating, or drinking anything but water, while others advocated rinsing of the mouth 10 minutes before sample collection.[3]

Furthermore, saliva is prone to bacterial growth, which can be controlled by storing and shipping the sample cooled, as described in a 2009 review.[2]

The high variability in measurement results for salivary cortisol was pointed out in the Endocrine Society's clinical practice guideline for the diagnosis of Cushing syndrome.[1] The authors suggested that salivary concentrations can be close to the functional limit of the assay, which can result in highly imprecise measurements. Furthermore, differences in assay accuracy exist that are caused by differences in assay specificity and calibration. As a consequence, among the current assays, the normal ranges vary greatly. However, differences in assay accuracy are not limited to salivary measurements, as indicated in a study on serum cortisol measurements.[5]

In summary, salivary cortisol is a well-established biomarker for assessing Cushing syndrome. The considerations related to specimen collection are different from and can be more complex than those for testing of cortisol in serum. The low concentrations of cortisol in saliva require assays with appropriate sensitivity in addition to the appropriate specificity and accuracy required for all cortisol assays.

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