COLLEGE of AMERICAN PATHOLOGISTS

Educational Discussion: Body Fluid

2016-A Body Fluid 2 Survey (FLD2)

Measurement of pleural and peritoneal fluid analytes is common practice in modern clinical medicine. Since Light published his classification in 1972, its most common use has become distinguishing transudative from exudative pleural effusions. Similar analysis for peritoneal fluid has also become routine practice for determining the etiology of ascites. Robust investigation on the utility of testing the analytes included in this Survey is much more limited. Of the limited publications on these tests, the best studied are in body fluids other than pleural and peritoneal, including synovial, vitreous and amniotic fluids. Given the limited data on the use of these analytes, they are likely to be performed primarily by subspecialists in much less common clinical scenarios. Tight regulation of these analytes is not only challenging because of the limited clinical data defining normal parameters, but also by the paucity of manufacturer validated instruments, and, as a result, the use of laboratory developed tests (LDTs).

In preparation for this challenge, we performed a literature review of current practices not only for pleural and peritoneal fluids, but also for synovial, vitreous and amniotic fluids. Our review included currently published guidelines, medical textbook recommendations and clinical decision support resources (eg, UpToDate.com).

Many of the analytes in this challenge would be expected to approach zero in the simulated clinical scenarios described below. However, in order to meet proficiency testing requirements each challenge includes measureable quantities of all analytes, even those that would be expected to approach zero by the simulated clinical scenarios described below.

FLD2-01 is consistent with peritoneal fluid early after small bowel perforation.

Setting	**Alk. Phos.**	Bilirubin	Calcium	Chloride	Lipase	Potassium	Sodium	Uric Acid
Normal	**0**[a]	0.7 ± 0.8 mg/dL[b]	-	**-**	-	-	**-**	-
Perforated Small Intestine	**>100 (estim.)**[a]	-	-	-	-	-	-	-
UOM	**U/L**	mg/dL	mg/dL	mmol/L	U/L	mmol/L	mmol/L	mg/dL
FLD2-01	**200**	5	11	50	200	40	20	15

[a]Utility of Lavage Alkaline Phosphatase in Detection of Isolated Small Intestinal Injury by John A. Marx.
[b]Ascitic fluid bilirubin concentration as a key to choleperitoneum by Runyon BA.

FLD2-01 is consistent with peritoneal fluid (ascites) in traumatic small intestinal (SI) injury. Alkaline phosphatase (AP) is expressed in high quantities in the gastrointestinal tract. As a result, individuals with intestinal trauma, specifically SI trauma, have been shown to have elevated peritoneal AP levels with normal serum levels. Peritoneal AP has also been shown to have clinical utility in differentiating malignant effusions (eg, peritoneal carcinomatosis) and traumatic hemoperitoneum.

References

1. Runyon BA, Hoefs JC, Morgan TR. Ascitic fluid analysis in malignancy-related ascites. *Hepatology*. 1988 Sep-Oct;8(5):1104-9.
2. Marx JA, Bar-Or D, et al. Utility of lavage alkaline phosphatase in detection of isolated small intestinal injury. *Ann Emerg Med*. 1985 Jan;14(1):10-4.
3. Runyon BA. Ascitic fluid bilirubin concentration as a key to the diagnosis of choleperitoneum. *J Clin Gastroenterol*. 1987 Oct;9(5):543-5.

FLD2-03 is consistent with normal vitreous fluid.

Setting	Alk. Phos.	Bilirubin	Calcium	**Chloride**	Lipase	Potassium	**Sodium**	Uric Acid
Normal Vitreous Fluid	-	-	2.8-8.0 (mg/dL)[a]	**105-135 (mmol/L)**	-	<15 (mmol/L)	**135-150 (mmol/L)**	-
UOM	U/L	mg/dL	mg/dL	**mmol/L**	U/L	mmol/L	**mmol/L**	mg/dL
FLD2-03	500	15	15	**110**	10,000	90	**150**	25

[a]"Postmortem Vitreous Analysis" by Kim A. Collins and "Postmortem Biochemistry" by Burkhard Madea.

FLD2-03 is consistent with vitreous fluid (VF) interpreted as normal (based on sodium and chloride results). However, normal is a relative and somewhat problematic term for vitreous chemistry, as the measurement is most commonly used after death as an indicator of the post-mortem interval (PMI). Therefore, for the purposes of this challenge, normal is intended to mean consistent with early post-mortem (<15 hours) levels from autopsies of individuals who did not suffer from one of the many conditions known to alter VF composition. Vitreous potassium is the most extensively studied parameter for estimating PMI (however, this sample exhibits too high potassium to be a "normal" specimen). Sodium and chloride levels can aid in differentiating deaths related to electrolyte imbalances, such as water intoxication, ethanol toxicity and vomiting. Studies on the utility of post-mortem VF calcium are extremely limited.

References

1. Collins KA. Postmortem vitreous analyses. *Medscape*. (July 25, 2013). Available at: http://emedicine.medscape.com/article/1966150-overview. Accessed December 20, 2015.
2. Burkhard M, Musshoff F. Postmortem biochemistry. *Forensic Sci Int*. 2007;165:165–171.

David N. Alter, MD, FCAP
Kathryn D. Matney, MD
Chemistry Resource Committee