A medical technologist receives an amniotic fluid sample from the Labor and Delivery Unit requesting fetal maturity studies. These include a lecithin/sphingomyelin (L/S) ratio and phosphatidyl glycerol (PG) measurement by one and two-dimensional, thin-layer chromatography (TLC), respectively.

The technologist performs the TLC analysis and obtains an L/S ratio of 1:2 and a borderline positive result for PG (that is, the presence of a PG spot). The technologist is not satisfied with these results and reviews them with the laboratory’s clinical chemist.

QUESTIONS

1. Why is the technologist doubting the accuracy of these results?
2. The technologist and the clinical chemist review the TLC plates and decide that there was excessive streaking of the analyte spots. The actual amniotic fluid sample is clear and uncolored. There was no visible pellet of cells following the centrifugation step. That is, there seems to be no blood contamination.

The clinical chemist calls the patient’s physician, who explains that the sample was obtained from the fluid draining from the patient's vagina. The clinical chemist asks the technologist to perform a “renal profile” (electrolytes, creatinine, urea, and glucose) on the sample. Why is the “renal profile” being performed on the sample?
3. The results of the “renal profile” are: Na 50, mmol/L; K, 10 mmol/L; glucose, 100 mg/L; urea, 10,000 mg/L; and creatinine, 1,320 mg/L. What do these results indicate about the nature of the sample?

Questions to Consider

1. What values for the L/S ratio are associated with fetal lung maturity and immaturity?
2. How is the detection of PG used to assess fetal lung maturity?
3. What are the major interferents in the TLC assay for the L/S ratio and PG?
4. What other fluids can contaminate an amniotic fluid sample?
5. Which fluid do you think the clinical chemist is most concerned about?
6. What effect would the contamination named in #5 have on the TLC pattern for the L/S ratio?

Answer:

1. The technologist doubts the accuracy of these results because they are discordant: a very low L/S ratio but a borderline positive PG result.
2. The “renal profile” was ordered to determine whether its urea and creatinine composition was more like urine or amniotic fluid (more like serum levels, Chapter 26). This will indicate the degree of contamination with maternal urine.
3. The results of the renal profile indicate that the sample is heavily contaminated with maternal urine. The sample should be rejected as unacceptable, and a proper amniotic fluid sample requested.

Answers to Questions to Consider

1. The TLC analysis for the L/S ratio is very imprecise and is subject to methodological and technologist-induced biases. However, L/S ratios greater than 2.0 are generally associated with mature fetal lungs, while L/S values less than 1.5 tend to be associated with fetal lung immaturity (Chapter 40, and L/S and PG Methods in CD-
2. The presence of PG is usually associated with mature fetal lungs, while the absence of PG is generally associated with fetal lung immaturity (Chapter 40 and L/S and PG Methods in CD-ROM). However, the test has a low sensitivity and a negative PG result does not necessarily indicate the absence of mature fetal lungs. The most clinically important results are concordant ones, that is, L/S > 2, positive PG; and L/S < 1.5, negative PG. These results indicate a high probability of mature and immature fetal lungs, respectively.

3. The primary interferents in the TLC assays are blood or meconium (fetal stool). The L/S ratio of blood is approximately 1.0 while that of meconium is greater than 2. So the presence of blood tends to lower the L/S ratio, while meconium tends to falsely increase the L/S ratio (Chapter 40 and L/S and PG Methods in CD-ROM).

4. The fluids that can contaminate an amniotic fluid sample obtained by amniocentesis (Chapter 40) are blood (maternal or fetal) or, rarely, fetal urine from the fetal bladder. If the amniotic fluid sample is obtained from fluid leaking from the placental membranes and draining from the vagina, maternal urine is a possible contaminating fluid.

5. The clinical chemist is concerned about contamination from maternal urine.

6. If maternal urine contaminates the amniotic fluid to a great extent, streaky TLC chromatograms can be produced with poorly defined spots for lecithin, sphingomyelin, and PG.