



Birmingham Quality

Fluids adding colour to the spectrum of EQA provision

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Introduction

Clinical Biochemistry laboratories analyse fluid specimens on clinical chemistry analysers despite the fact that methodologies have rarely been validated for all matrices. There is only limited IQC available and until recently no EQA scheme has given laboratories confidence in the numerical values and interpretations that they produce.

The UK NEQAS for Fluids was launched in 2019 and distributes genuine clinical fluid material (Pleural and Ascitic) for a wide range of clinical chemistry analytes and has grown exponentially to over 200 participants giving us confidence in the quality of the statistics calculated.

It is well known that haemolysis, icterus and lipaemia affect serum chemistry assays, but little attention is played to the 'colour' of fluids that are analysed by the same method principles.

We ask participants to analyse specimens for Haemolysis, Icterus and Lipaemia indices as part of the Fluid Scheme. This is allowing for the first time evidence to be gathered about the impact of fluid appearance on analytical results.

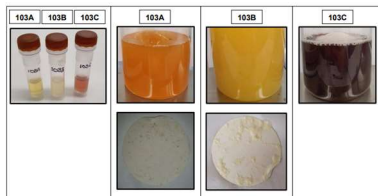


Figure 1. Photo of individual specimens and the fluid in bulk, as well as the residue on the filter paper

Total Protein

Analysis of Total Protein in Pleural and Ascitic Fluid is used to determine whether an ultrafiltrate is a transudate or an exudate (exudates have a higher protein concentration).

From our UK NEQAS for Serum Indices Scheme it is known that some of the Biuret Assays are affected by the colour 'red'.

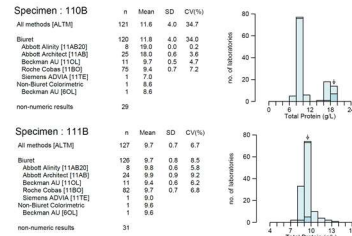


Figure 2. Specimen data for Total Protein in two different genuine Ascitic Fluid specimens

The two examples above show a similar concentration of Total Protein in Ascitic fluid for the majority of methods, but a bimodal distribution is evident for Specimen 110B and not for 111B. The concentration of Total Protein is not clinically significant; however, one could predict the same effect would be seen at slightly higher concentrations. The main difference between the two specimens is that both Abbott methods showed a significant negative Icterus Index.

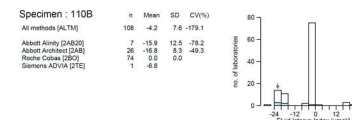


Figure 3. Specimen data for Icterus Index for Specimen 110B

Creatinine

Creatinine is typically measured to identify whether there is a urinary tract leakage following surgery. The presence of Creatinine in significant measurable quantities is often more important than the accuracy of the result. However, laboratories should be aware of the impact of non-Creatinine chromagens on Creatinine assays, particularly Jaffe assays.

The example below for Ascitic Fluid shows the data from the Roche Compensated Kinetic Jaffe method highlighted for Specimens 103A and 103B (see also Figure 1). Visibly there is very little difference between the two specimens, the bulk is more clearly of different colours; however, the difference between the Creatinine results is markedly different. The Jaffe mean is greater than the Enzymatic mean for Specimen 103A, and vice versa for Specimen 103B.

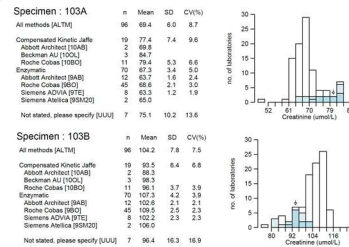


Figure 4. Specimen data for Creatinine in two different genuine Ascitic Fluid specimens

Clinically this would make no difference to interpretation but this example does highlight the potential for interferences which you may not be aware of. Serum Indices were unremarkable in these specimens.

Discussion

Feedback from the Scheme has shown that on January 2020, 62% of participants do not analyse Indices on fluid specimens, but the majority of those that do use serum based cut-offs.

Initial review of data shows differences between manufacturers for all three indices which are not observed in the UK NEQAS for Serum Indices scheme.

It is important to remember that the majority of assays are not validated for fluid types other than serum/plasma and urine. Any compound with an absorbance in the wavelength range of an individual assay has the potential to affect the result of that assay. This may not necessarily be identified through the use of Serum Indices as these are measured at specific wavelengths. Therefore applying serum cut-offs to fluid assays is not necessarily valid as assays have been optimised for serum. Further evidence is required to provide guidance for fluid assays.

Conclusion

Clinical fluids present in a wide range of colours and consistencies and this needs to be taken into account when results are reported and interpreted. However, the full impact of the level of interference is not known at present but though Quality Assurance of Fluid analysis is in its infancy this will be a focal point for accumulating data. The UK NEQAS for Fluid Scheme has begun to generate an evidence base to look at this the impact of different colours and consistencies of fluid matrices.

There are still many questions to answer; some practitioners even doubt the clinical utility of fluid analysis in the first place.

Ensuring valid and commutable material at clinically important decision limits remains a challenge.