

## Are we infusing acids into our patient's blood?

Sir,

Add sugar to water it turns into acid! Add salt to water to drink it also turns into acid! This may not be happening at home but this is what happens daily in a hospital. Five percent dextrose has a pH of 4.2 and normal saline has a pH of 5.5 when the molecules used in them are neutral. Lebowitz *et al.* pointed out the same concern a nearly half a century ago in their study to calculate titerable acidity of commonly used intravenous fluids.<sup>[1]</sup> The literature is silent about the cause of this, however, it reflects in clinical outcomes, as this acid we infuse is associated with increased incidence thrombophlebitis with decreasing pH of the infusate. On analyzing it can be seen that dextrose based fluids are most associated with venous thrombophlebitis followed by normal saline and least by ringer lactate which is in coherence with the concept of decreasing pH-increasing thrombophlebitis. Gaudry and Duffy in their comments on pH of intravenous fluids attributed the probable cause of this acidity to their method of sterilization by heat.<sup>[2]</sup> The exact mechanism is yet not commented upon by any available literature. It is unlikely for the constituents of fluids to cause this acidosis as normal saline and hypertonic saline both have same pH of 5.5. So if Sodium chloride (a neutral salt) were to be linked to acidosis it would have caused hypertonic saline to be more acidic.

This acidity may not be of concern when smaller volumes of fluids are used but in case of major infusions they may actually be significant but unless we know what causes it, we can't treat it. The pH of 4.2 of dextrose compared to a patient in severe acidosis with a pH of 7.1 has a Hydrogen ion concentration greater by 1,000 times. The only thing that the label of these fluids carries is a quote that says "buffered in hydrochloric acid" so in operative or critical care settings this infusion becomes questionable in acidotic patients. On the one end, all the modern fluids tend to add bicarbonate precursors in the form of lactate, malate, gluconate and acetate but on the other hand we just infuse hydrogen ions in concentrations more than 1,000 times the normal blood. A recent letter to editor by Viktor Rosival in Indian journal of critical care itself talks about clinical ineffectiveness of these bicarbonate buffers in the presence of acidosis.<sup>[3]</sup> With this letter, we wish to draw attention towards the dilemma of using acidic infusions while worrying about acidosis. Furthermore, in terms of acidosis where large infusions are needed it may be more physiological to use "balanced" fluids like Plamalyte with a pH of 7.4.

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