The Shrewsbury and Telford Hospital NHS Trust

ACETATE FREE BIOFILTRATION (AFB) POLICY
(Via Nikisso DBB05 or DBB07)

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1.0 INTRODUCTION

AFB is a modified haemodiafitration technique performed with base free dialysate and concurrent reinfusion of isotonic sodium bicarbonate solution 1.67mmol/l. The main benefit is the combination of effective toxin removal, correction of acidosis and the gentle effect on the cardiovascular and respiratory system.

The use of a base free (and therefore acetate free) dialysate has the effect of releasing the patient's liver form the duty of converting acetate to bicarbonate for the purposes of a buffer. Acetate can also cause vasodilation.

AFB via High Flux dialysers is also beneficial due to the removal of middle molecule toxins (which need to be removed). However, it also removes bicarbonate (which ideally should not be removed). Therefore bicarbonate is replaced by post-dilution reinfusion of isotonic bicarbonate solution, AFB replaces what it removes plus a percentage more to proactively or ambiently correct acidosis.

The volume of fluid consequently removed can be up to approx 6litres per treatment.

2.0 PURPOSE

That Renal Unit staff are aware of the pros and cons of using AFB and that they will understand when to appropriately use AFB.

3.0 OBJECTIVE

That all staff will understand and use AFB appropriately and follow Renal Policy once assessed as competent.

4.0 DEFINITIONS

AFB - Acetate Free Biofiltration (explained above)
AKI (Acute Kidney Injury), CKD (Chronic Kidney Disease)
Conductivity
Dialysate
Titration
Acidosis
Potassium Trimmer (see below)
BFR – Blood Flow Rate

5.0 SPECIFIC DETAIL

a) *Competency*

AFB is a complex method of haemodiafiltration and should only be performed by Renal Unit Nurses who are deemed competent by the SaTH Renal Unit Band 7 Sisters and Education Sisters (ITU has their own competency pathway.)

b) *When to use AFB*

AFB is the default SaTH choice of dialysing a patient with AKI. Indications for AFB should be determined by the Renal Nurse, some of the following would benefit (however, this is not an exhaustive list)

AKI
The acidotic patient
Patient with Cardiac issues/ events
Unwell or “unstable” CHD patient
The “Septic” patient

(The only patient who needs extra consideration would be a patient with COPD due to the higher than normal pCO2 needed for respiratory drive. However, AFB effect on this appears to be self-limiting. The reason for this is not clearly understood.)

c) *Conductivity*

The bicarbonate infusion fluid that is used for AFB yield a slightly positive sodium balance. The relationship of dialysate sodium with conductivity (in millisiemens or mSm/cm) is different to that of conventional haemodialysis.

Haemodialysis 140mmol/l Na+ = 14.0 mSm/cm
AFB 140mmol/l Na+ = 15.0 mSm/cm

Therefore the slightly positive Na+ balance of the bicarbonate infusion is compensated for by a slight decrease in Na+ concentration in the dialysate.
For our purposes at SaTH and to enable serum Na+ to remain near “normal” the machine conductivity is set to

AFB = 14.5mSm/cm.

The conductivity setting may also be changed to correct hyper or hyponatraemia. *(see (f) below)*

d) *Acid base balance, bicarbonate reinfusion, titration techniques.*

As already stated the patient on AFB will lose some bicarbonate via the process. The bicarbonate reinfusion rate should be set to 10% just to compensate for this loss.
Therefore, to proactively correct acidosis, a higher rate should be used. The more acidotic the patient is the higher % reinfusion rate should be used.
The % required (i.e. need for ambient or proactive acidosis correction) can be set on a Nikisso machine. It automatically takes into account BFR, size of dialyser and dialysate flow.
A holistic approach to interpretation of acid base balance is required and prevention of alkalosis is vital. The reinfusion rate is determined by a venous blood gas sample (VBG)
See Policy for taking VBG.
The titration amount should not be “set in stone” and the nurse needs to rely on his/ her interpretation, experience and analytical skills to determine/ change reinfusion rate and decide on reassessment time schedule.
See appendix 1 Acidosis Reinfusion Suggestion.

There are other reasons why a patient may be acidotic, notably respiratory acidosis. It is sometimes difficult in a Respiratory patient with CKD or AKI to determine whether they are acidotic due to respiratory or renal issues. Appendix 2 is useful to use in this instance.

See appendix 2 Determination of Acid Base Balance.

e) <u>The need for a Potassium (K+) Trimmer</u>.

Dialysate is made from purified water and concentrated at a specific ratio (usually 34:1) Therefore 34 parts water mixed with 1 part concentrate, makes up 35 parts of the dialysate
It is usual for potassium to be added to dialysate for any method of dialysis. This allows the patient's blood to be diffused against a set level of potassium. (Thus ensuring the level is never too low.)
The standard concentration of K+ in dialysate is 2mmol/ml.
In some circumstances the concentration needs to be raised to prevent the patient's serum K+ falling either too far or too rapidly.
The process of adding potassium to dialysate is called "Trimming".
5mmol/l is the highest dialysate concentration SaTH Renal Unit normally use.
The dialysate is usually trimmed if the patient has a serum K+ of less than 4.0mmol/l. Refer to Potassium trimming policy.

f) <u>Hypo/ Hypernatraemia</u>

Hyponatraemia = serum sodium level below normal values.
Hypernatraemia = serum sodium levels above normal values.
The patients serum sodium level should be kept within normal limits (135-145 mmol/l.
For our purposes, if the serum sodium is below **127**mmol/l or above **149**mmol/l then the SaTH Renal Nurse should follow the Hypo/Hypernatraemia Titration Chart to change the machine conductivity. Otherwise the "normal" conductivity setting (14.5 mSm/cm) is used.

Hyponatraemia/ Hypernatraemia could be due to many reasons including:

- Kidney failure (AKI, CKD)
- Diabetes/ Diabetic Ketoacidosis.
- Congestive heart failure/ fluid overload
- Diurectics
- Anti-depressants/ other drug therapy
- Vomiting, diarrhoea or dehydration
- Excessive thirst.

If the patient is hyponatraemic or hypernatraemic and is dialysed against normal sodium, the effect of a rapid correction by diffusion could be dangerous. It may cause too rapid inter-compartmental fluid shifts which may lead to cerebral oedema.

The Na+ level should be corrected slowly, usually by means other than dialysis**.** When dialysing the hypo/ hypernatraemic patient on AFB, the machine conductivity should be titrated in line with serum Na+ level.
See Appendix 3 Hyper/ Hyponatraemia Titration Table.

g) Other considerations

- The type of "Dialysis Access" the patient has and how good the "flow" is.
- Anticoagulation (The process of AFB is reliant on the dialyser's effective ability. ie if the dialyser is clotting the reinfusion process is severely hampered and may result in incorrect reinfusion amounts.)
- Sepsis.
- Respiratory Compensation.(See Appendix 2)
- Catabolism and inter-compartmental electrolyte shifts
- Determination of the frequency to reassess all the above factors.

6.0 AUDIT

Weekly review of AKI/ AFB documents by SaTH Clinical Lead Sister.
Review of staff competency pack completion by training sisters.

Appendix 1: Acidosis Reinfusion Suggestion

Degree of Acidosis	Nikisso Reinfusion Rates	Std Bic	BE
No acidosis	10 -11%	24-30	-2 - +2
Mild acidosis	12-13%	15-23	-3 - -8
Severe acidosis	13-15%	6-14	-9 - -15
Extreme acidosis	15-20%	< 5	< -15

Appendix 2 : Determination of Acid Base Balance

Problem	pH	PCO_2	HCO_3^-	B.E.
Respiratory Acidosis	↓	↑	↕	↕
Respiratory Alkalosis	↑	↓	↕	↕
Metabolic Acidosis	↓	↕	↓	↓
Metabolic Alkalosis	↑	↕	↑	↑
Respiratory Acidosis with compensation	↓ or ↕	↑	↑	↑
Respiratory Alkalosis with compensation	↑ or ↕	↓	↓	↓
Metabolic Acidosis with compensation	↓ or ↕	↓	↓	↓

Appendix 3: Hyper/ Hyponatraemia Titration Table.

AFB Titration Conductivity Chart For Severe Hyponatraemia or Severe Hypernatraemia

(Specifically Nikisso DBB05, DBB07 machines in AFB mode)

This table is to be used to titrate dialysate conductivity in the case of severe Hyponatraemia and severe Hypernatraemia

Do not correct by more than 5 mmol/l in one session. Discuss with Senior Sister and/ or Renal Consultant if unsure.

Titrate according to VBG half hourly.

If Na+ still “high” reduce conductivity by 2.0 mSm/cm. or Na+ still low increase conductivity by 2.0mSm/cm and increase monitoring to every 15 minutes.

Actual serum sodium		**Desired Serum Sodium (Na+)**		**set AFB conductivity to….**	
116	mmol/l	**120**	mmol/l	**12.6**	ms/cm
117	mmol/l	**121**	mmol/l	**12.7**	ms/cm
118	mmol/l	**122**	mmol/l	**12.8**	ms/cm
119	mmol/l	**123**	mmol/l	**12.9**	ms/cm
120	mmol/l	**124**	mmol/l	**13.0**	ms/cm
121	mmol/l	**125**	mmol/l	**13.1**	ms/cm
122	mmol/l	**126**	mmol/l	**13.2**	ms/cm
123	mmol/l	**127**	mmol/l	**13.3**	ms/cm
124	mmol/l	**128**	mmol/l	**13.4**	ms/cm
125	mmol/l	**129**	mmol/l	**13.5**	ms/cm
126	mmol/l	**130**	mmol/l	**13.6**	ms/cm
127	mmol/l	**131**	mmol/l	**13.7**	ms/cm
128	n	132		13.8	
129	o	133		13.9	
130	r	134		14.0	
131	m	135		14.1	
132	a	136		14.2	
133	l	137		14.3	
134		138		14.4	
135-143		**139**		**14.5**	ms/cm
144	r	140		14.6	
145	a	141		14.7	
146	n	142		14.8	
147	g	143		14.9	
148	e	144		15.0	
149	mmol/l	**145**	mmol/l	**15.1**	ms/cm
150	mmol/l	**146**	mmol/l	**15.2**	ms/cm
151	mmol/l	**147**	mmol/l	**15.3**	ms/cm
152	mmol/l	**148**	mmol/l	**15.4**	ms/cm
153	mmol/l	**149**	mmol/l	**15.5**	ms/cm
154	mmol/l	**150**	mmol/l	**15.6**	ms/cm
155	mmol/l	**151**	mmol/l	**15.7**	ms/cm