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Publisher: Hans R. Larsen MSc ChE

VIRTUAL LAF CONFERENCE

Proceedings of 38th Session
March 5, 2005 –

SUBJECT: The PAC-Tamer: The Ultimate K-Supplement?

I have for quite a while been following the most interesting discussion in the Conference Room on the importance of a constant potassium intake throughout the day and night and first of all, want to acknowledge the pioneering work of Peggy, PC and George among others – as a prelude to what follows.

It is of course fairly easy to take potassium supplements with the main meals, but the periods between meals, particularly before bedtime and in the early morning pose a bit of a problem.

It seemed to me that a potassium-rich drink, henceforth known as the PAC-Tamer might be the answer. I set myself the following criteria for the drink:

- Each 8-oz glass should provide about 700-800 mg of elemental potassium in easily digestible form.
- The Drink (carrier) should be a complete meal in itself containing about 30% (of energy) as protein, 30% as fat and 40% as carbohydrate. In other words, a perfect Zone Diet meal.
- The ingredients required for the drink should be readily available in pure form and should, preferably cost less than $0.50 per 8-oz glass.
- The drink should contain no potential allergens or known triggers such as MSG, aspartame, caffeine, etc.

After much experimentation, I have pretty well settled on the following formulation:

- ½ cup blueberries or mixed berries (50 g)
- ½ medium-sized banana (60 g)
- 800 ml pure drinking water
- 100 ml pure apple juice (preferably organic)
- 2 heaping tablespoons rice protein (30 g)
- 2 heaping teaspoons lecithin granules (5 g)
- 5 level teaspoons potassium gluconate (17 g)
- 2 pouches Coromega fish oil or equivalent (4 g)

The lecithin serves as a source of fat and to help emulsify the mixture while the fish oil, of course, adds good fats and helps optimize the omega-6:omega-3 ratio.

Mix all of the above in a 1.5 liter blender, pour it in a glass bottle and store in refrigerator. I sip one 8-oz glass of the PAC-Tamer at around 5-6 AM, 10-11 AM, 2-3 PM and 9-10 PM taking as long as possible to finish it.

Each glass of the drink provides 775 mg of elemental potassium in instantly absorbable form and because of the formulation also provides excellent protection against hypoglycemia and excessive blood sugar variations throughout the day and night.

The nutritional analysis of the drink (24-hour intake, about one liter) is as follows (numbers in brackets are per 8-oz glass):

Energy – 325 kcal (81 kcal)
Protein (gram) – 24.9 (6.2)
Protein (% of energy) – 30.6
Fat (gram) – 11.1 (2.8)
Fat (% of energy) – 30.7
Carbohydrates (gram) – 35.4 (8.9)
Carbohydrates (% of energy) – 43.5
Glycemic Load – 16.6
Calcium (milligram) – 15 (3.7)
Magnesium (milligram) – 23 (5.7)
Potassium (milligram) – 3019 (755)
Sodium (milligram) – 24 (6)
Vitamin C (milligram) – 58 (14)
Vitamin E (milligram) – 7 (1.7)
EPA – 700 mg (175 mg)
DHA – 460 mg (115 mg)
Ca:Mg Ratio – 0.6:1
K/Na Ratio – 125:1
Omega-6 to omega-3 ratio – 1.4

The rice protein I use contains 80% protein (Nutribiotic brown rice), so it is a very concentrated protein source. If you prefer soy or whey protein you will have to adjust the formulation to ensure that you still end up with a proper balance between protein, fat and carbohydrates.

It is of course, also possible to use potassium chloride (KCl) instead of potassium gluconate, but I have personally found potassium gluconate far easier on the stomach (I have irritable bowel syndrome IBS). If you wish to use KCl one heaping teaspoon should substitute nicely for the 5 level teaspoons of potassium gluconate.

You can also change the fat source if fish oil does not agree with you. You can eliminate the fish oil and double the lecithin content to 4 teaspoons, replace the fish oil with one tablespoon (12 gram) of ground flaxseed or use a teaspoon of olive oil instead of the fish oil. These substitutions will do equally well in providing the fat portion of the drink, but do of course, not provide the same amount of the highly beneficial long-chain omega-3 fatty acids.

I did try to incorporate magnesium into the drink as well in the form of 200 ml of Waller water concentrate, but found that it irritated my stomach and was less effective than the PAC-Tamer in eliminating PACs. Perhaps the presence of so much MG prevented K from being properly absorbed.

I have now been using the PAC-Tamer for about two weeks and have found it highly effective in preventing PACs – I am not sure yet whether it also prevents afib episodes, but it would seem likely that it should. My next step is to cut back on the drink's content of potassium gluconate to see just how little I can get away with. As all my PACs occur just when I lie down to go to sleep I am also going to try and see if just taking the drink before bedtime will be sufficient to keep things under control. Stay tuned!

The cost of an 8-oz glass of the drink is about 40 cents which probably compares fairly favourably with that of low-sodium V8 juice and of course, the PAC-Tamer is a far better balanced drink nutritionwise than is V8 juice. However, it should certainly be possible to replace the fruits in the PAC-Tamer with vegetables if that was deemed desirable.

Now all I need is to find someone with access to a freezedryer pilot plant so we could see if the drink could be freeze-dried, packaged in pouches and used for convenience when traveling.

Please let me know if you try the PAC-Tamer and if you find it effective. BUT PLEASE !!!! Make sure your physician agree with your experiment and that your kidneys are able to handle the excess K excretion (have a BUN and creatinine test before you start).

Hans

PS. The rice protein, the lecithin, the Coromega fish oil and the potassium gluconate are all available in my “vitamin store” at http://www.afibbers.org/vitamins.htm

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I think Hans' idea to package K supplementation as a mini meal is excellent. There is just too much neurohormonal regulation that occurs with isolated K supplementation. If it were that simple, then everyone would have started taking K for PACs (and LAF) long ago.

PC

You know, PC, it has sometimes seemed to me that the people who could be persuaded to try isolated K supplementation in sufficient quantity [George Newman, Stan B., Allen, myself, others whose names can be gathered from The List] have had good success using it. I do not mean to contradict you, and i am sure that all this neurohormonal interaction is really taking place, but it seems to me that some of us can use rather simple, readily available means to get afib out of our lives. That being said, i can see a real benefit in this special supplement that Hans has concocted. As Joyce mentions, it would be unparalleled for a person traveling, far from access to one's own kitchen and trying to stay well enough nourished to keep the afib boogies at bay. I may even try it myself, to see if i can cut down on the numbers and expense of the supplement tablets, capsules, etc. that i take every day. What i am doing works, though, and i am reluctant to change a winning combination.

PeggyM

Hi Peggy,

I don't think that's any contradiction at all. It just further underscores what I keep saying and that is that LAF represents a spectrum composed of three variables. Potassium balance, autonomic tone and P cells (presumably somewhat oxidatively damaged).

There's no way that I can prevent LAF no matter how much potassium, no matter what form, no matter what timing regimen in the absence of disopyramide (strong vagolytic). However, once I've got sufficient vagolytic onboard, it's routine that I can prevent and/or terminate LAF with 500-1500mg of potassium taken at the onset of PACs.

ERP shortening due to (P cells + low potassium + ANS tone) => AF Risk

So, either I have more P cell damage or more ANS tone or both than those individuals you listed. I have a strong suspicion that it's the autonomic tone. My speculated exaggerated neurohormonal interaction to potassium supplementation fits well with the observed exaggerated neurohormonal interaction with orthostatic challenge in the fit.

If I were you, I wouldn't fiddle with a good thing. Don't rock your boat with the PAC Tamer, however helpful it may be to others.

PC

PC,

Your response to potassium supplementation certainly is more exaggerated than mine. I plan to continue my testing, however, with a bit of a twist. The last part that I hopefully need to assemble my very own 3 electrode EKG monitor is sitting in the UPS warehouse for delivery tomorrow. If I am successful, I will post how to acquire these parts for others who want to play with such a toy. It should be relatively cheap, about $220 plus a computer & simple (but not quite as portable as a Holter). I plan to study Eindhoven's triangle and then test with various dosages of KCl and see what the EKG response is. I can also check my Polar S810 monitor to see what is really noise for ectopics.

I too am pretty vagal, as my pulse overnight drops into the low 40's though the low during the day is usually 50 while quiet. When I've looked at correlations of resting pulse with physical condition (like VO2 max). I think that my pulse is lower than my conditioning level warrants. I'm in pretty good shape, but not that good.

I've been even more vagal earlier in my life, so when I think about the onset of afib in my life, it must have either been a decrease in cellular K or an increase in P-cell damage (or both). The only part I've been able to address is the lowered K, and this has worked for me. When I was diagnosed with afib, I thought that if I were to have success with a supplement approach, I should address the afib quickly and aggressively. My assumption was that the longer I was in chronic afib, to lower the probability of ultimate success using the supplement approach. Your comment in the Diurnal Rhythm of Potassium CR about ongoing oxidation of the P-Cells during afib reinforced belief.

By the way, you are lucky your son plays the sax. Rock bands practice at the drummer's home, so parents of other band members don't get to experience the band like we do.

Hans & all,

One approach that I've thought about to minimize the aldosterone problem is just to dissolve 750 mg of KCl in whatever water volume you would normally drink in the course of a morning (say 4 hours). Then do the same for the afternoon and evening. My guess is that ~200 mg per hour might be a low enough does to not cause the hormonal response. Of course if you're sipping Waller water at the same time, this could be an issue. Being fairly lazy, I've continued to just take my KCl and Mg with my meals 2x/day. I seem to absorb enough to keep me in NSR this way. I plan to get another EXATEST to see what has happened to my cellular Mg levels after many months of Mg supplementation.

George

PC,

re: it's routine that I can prevent and/or terminate LAF with 500-1500mg of potassium taken at the onset of PACs.

Does this mean you are virtually afib free?

Gregg

Hans,

Your potassium of 3000 mg/day is within the daily recommended dosage for people (http://www.ext.colostate.edu/pubs/columnnn/nn981104.html) which they claim is between 2,000 - 3,500. So there shouldn't be any worry about your recipe being excessive.

Also, is the natural foods approach as effective as a supplement (e.g. is PC's dosage of 1,500 mg accomplished by eating 3 bananas at 500 mg/banana)?

Gregg

Gregg,

Ideally, I think the foods approach is best. However it has several disadvantages: 1) how much K (or whatever supplement) does the food really have, since there can be wide variation & 2) it can take more organization to make it happen. Ideally, I'd like to move in this direction, but right now, with supplements I have a program that works. Fran certainly is someone who made it work using the whole foods approach, & she tamed a 20 year chronic afib with her

paleo diet.

George

Hi Gregg,

I can only do this if I have sufficient disopyramide onboard. I take 125mg of sustained release disopyramide q3h. Unfortunately it's hard to take when asleep. So I'm at risk for a low potassium induced episode around midnight, it's diurnal nadir (since I tend to hit the sack around 9PM or just after). But if the episode awakens me and I take 500-1000mg dissolved potassium immediately, then I can terminate it. K-Dur at bedtime (a sustained release formulation) seems to help prevent these, but I'm looking for the best way to take it, i.e., KCl can cause gastric problems.

Also, my disopyramide levels around 4-5AM are low and I can trigger an episode by lying on my right side at that time. Potassium supplements don't help for these episodes. But if I remember to take another disopyramide during my early AM bladder call, then these 4-5AM episodes can likewise be prevented. They also terminate upon going vertical (arising).

But I'm still searching for the right combination to minimize my dependence on meds.

Amiloride has no side effects (other than possible hyperkalemia), but it seems to have lost some of its punch. I'm awaiting a lab value to support this impression. Perhaps taking more and/or taking it more often will improve the situation.

PC

Gregg,

I agree with George insofar as food in general is the best vehicle. But I personally think that for potassium (and fish oils) food is not as effective as supplements. It is less quantifiable, less convenient and can pose an undesirable glycemic load problem.

Furthermore, how well is it absorbed? It appears that KCl (inorganic or mineral salt) is better absorbed than for example potassium gluconate (organic salt). Only 40% of the potassium in a banana (contains about 40mg elemental potassium per inch) is absorbed. This amount will be increase if taken with chloride.

So, there are all guides of variables, making correcting of a potassium imbalance more difficult. And we haven't even discussed the neurohormonal interaction.

PC

Hans,
What would you replace the banana with in your PAC tamer?? I am highly allergic to them - would an orange or two give you about the same amount of K??

LeAnn

LeAnn,

The banana (one half of a medium sized one) is mostly added to give the drink a bit of body. The vast majority of the potassium comes from the potassium gluconate. So you could just double the amount of blueberries or mixed berries and leave the banana out. The drink will be a bit more watery, but the effect should be the same.

Hans

PC:

So it isn't the potassium only that is helping your pacs/afib, it is taking disopyramide along with the potassium. Just taking more potassium--pac-tamer-won't necessarily stop/help afib. I can get my pacs/pvcs to stop just by taking a very small amount of atenolol, no doubt due to a high ANS tone, but, not stop an afib episode. (I understand about beta-blockers/vagal, and do not take them unless I really have to).

Are you saying if ones' P cells are not damaged greatly then potassium supplementation could be helpful, how can someone heal their P cells?

Liz

Hi Liz,

First of all, my thoughts on P cells, whether they are damaged or not, whether they are responsible for the shortened ERP in PVs of LAFers (v. normals) or not is all speculation. I think the evidence in favor of this is quite persuasive.

Second of all, the more I think about it the more I think that the P cells do not necessarily have to be significantly damaged, especially if autonomic tone is strong. In this case only a small dip in blood potassium might trigger AF and minimal attention to this might solve the problem. Again this is only speculation. But the fact that this approach seems to work only when I have adequate disopyramide onboard is provocative. In this scenario the disopyramide decreases my vagal tone, requiring a more significant dip in blood potassium to trigger AF. A more significant dip would be more easily addressed than a less significant dip.

At this point I've given up on the amiloride. Initially it was quite obvious that PACs were markedly decreased while on it. However, after a week or 10 days the effect seemed to wear off. And now I can't seem to terminate episodes as easily by immediately drinking or ingesting potassium.

I'm now thinking that increasing blood potassium via amiloride causes an increase in aldosterone directly secreted by the adrenals and a decrease in RAS induced aldosterone. In other words you are creating a hormonal milieu wrt renin induced aldosterone that is similar to that in resting fit individuals (both are low). It seems to me that this could actually be aggravating the situation. Remember that those with high vagal tone (the fit) hyperrespond with renin/aldosterone during orthostatic challenge. Perhaps amiloride is causing further upregulation of these receptors involved in responding to orthostatic challenge.

When I look back at my recent episodes they are always preceded by extended time on my feet and triggered when I sit down. Although this happened before, it was much less frequent and represented a small minority of episodes (v. 100% now).

So, to make a long story longer I plan to start taking an ACEI, specifically lisinopril. If that doesn't work, then I'll try an ARB, specifically candesartan.
Angiotensin II (subtype 1) receptors are increased in the left atria
(but not the right atria) of LAFers (v. normals). I'm unclear as to how these receptors might impact P cells, if at all.

I may never find a solution to this, but I will leave no stone unturned.

PC

Hans,

Any guess as to how long PAC-Tamer would last and stay fresh in the refrigerator?

Rick S.

Rick,

I should think it would be OK to keep a bottle (preferably glass) of the PAC-TAMER in the fridge for two or three days.

I have now done some further experimentation and thought you and others might be interested in the results.

My PACs occur almost exclusively when I lie down to sleep at night and an afib episode often starts around 1:30 AM after my nightly visit to the bathroom.

I have found that I can eliminate both by sipping one 8 oz glass of the PAC-TAMER over one half to one hour before bedtime and then taking one 0.5 mg sublingual Ativan (lorazepam) tablet just before going to bed. I believe the PAC-TAMER serves to maintain a steady potassium level during the night while the Ativan decreases vagal tone just enough to avoid an episode.

I am no longer using the PAC-TAMER four times a day, but may have a glass late in the afternoon if I feel "unsteady".

I am still experimenting, but so far I would say that the PAC-TAMER looks very promising. Please let me know your experience if you try it.

Hans

Hi Peggy,

No particular reason, except that Dr. Struthers, whom I quote often in my posts, recommended it. He did not seem too optimistic about its effect on LAF, but that certainly isn't going to stop me.

It peaks in about 6 hours and has a half life of about 13 hours. I like the fact that food does not affect absorption and it isn't that expensive.

PC

Concerning lisinopril's effect on afib, it never helped mine any that i could tell. I had been taking 10mg/day for several years prior to developing afib. But of course i was eating a very poor diet, was so short of potassium that i discovered that 99mg liquid potassium [from Twinlab] would eliminate a persistent dizziness i had for several years, was in a stressful life situation, had a stressful standup cashier job, etc. etc.

PeggyM

Peggy,

I guess I'll soon see. I started lisinopril today. However, I'll be trying 10mg t.i.d. This is a bit heftier than your dose, so I'll be monitoring K+ and BP closely.

I'll pop a few 99mg tabs elemental potassium, when I detect any PACs.

PC

Does t.i.d. mean three times a day? That is a lot. Do the 99mg K tablets work for you? I never thought they gave any effect when i took them, whereas the liquid used to have an effect both on bp and that mysterious dizziness that was relieved by the liquid form. I did not know anything about l.s.v8 at that time, i learned that here.

PeggyM

I'm going to try the direct potassium intake first before going with the pac-tamer.

I purchased a bottle of potassium gluconate (PC, they didn't have the chloride that you use) but the bottle says 595 mg usp and the back says 99 mg from that 595 mg. Is the rest filler? I couldn't find on the Web what USP stands for.

Also, I double-checked on the Web and the recommended dosage is between 2,000 - 3,500 as I posted above but this seems excessive. I would have to take from 20 - 35 pills a day if this was accurate.

What am I missing here?

Hans, I also frequently get afib after getting up and going to the bathroom in the early mornings (for me, it's usually around 2:30 a.m) -- I dread this as soon as I wake up and get the "urge to go." Sometimes I just dread laying down because that is my main trigger -- life is not easy for us sometimes.

Gregg

Gregg,

I really would recommend that you try the PACTAMER instead of just taking the potassium gluconate pills. Each 8 oz glass of the drink contains 700 mg of elemental potassium (without any fillers) and I have attempted to design the carrier so that the potassium will enter your system slowly over a long period of time like overnight. I believe the drink plus (if needed) 0.5 mg sublingual Ativan is the most effective protocol for preventing evening and nighttime ectopics and episodes. You can get the pure powdered potassium gluconate in my vitamin store.

Hans

Hi Peggy,

10mg t.i.d. (three times a day) of lisinopril was my target, but my BP will determine the ultimate intake. I may only do it b.i.d. (twice a day). I suspect that is what it will be at most.

It appears, at least initially, that ACEIs are vagolytic. They cause not only a drop in BP but also a drop in pulse pressure (difference between systolic and diastolic). Both are directly related to vagal tone. My HR is definitely higher. My BP is in the 90's/50's and my pulse pressure has dropped by 10-15 mm Hg. This might allow me to lower my disopyramide dosage. But there isn't any orthostatic hypotension (light headedness upon rising) YET.

I'll wait a week before looking at my blood K+. That's what the general recommendations seem to be.

Gregg,

Yes, you are correct in assuming that kgluconate has 99mg of elemental K+ in each tablet. But the rest is not really "filler" but gluconate.

I think Hans is right about taking the K+ via PAC tamer. Or try having a drink at your bedside containing dissolved K+ (500-1000gm). When you feel the 2:30AM bladder call, drink it about 5 minutes before your visit. And then afterward go horizontal by degrees - sitting, slumping, reclining. And never recline on your right side. This is clearly a vagal episode and I'm surprised that you don't get relief from one of the vagolytic antiarrhythmics.

PC

Hans and PC,

Ok, I'm game, I'll try the Pac-Tamer first.

But Hans (or anyone else), re: your caveat about the kidneys, in lieu of going to the doctor's for those two tests, can't we tell somehow if the drink is wrong for us after we start drinking it?

Going to the doctor's for any kind of test is a chore for me.

Gregg

Gregg,

Assuming you have never been diagnosed with kidney disease and have had a standard medical not too long ago (they usually include BUN and creatinine) I wouldn't worry about trying the PAC-Tamer. The key is to drink it fairly slowly - like taking 1/2 hour to finish an 8-oz glass. If you find it works then you could arrange for the tests if you want to take it long-term on a daily basis.

Hans

I really appreciate all the great information on this website. While reading some of the postings, I see that Magnesium and Lithium are listed as essential for afib/PAC treatment. The PAC-Tamer doesn't say much about these items, and I read that Magnesium and Potassium each cause the other to have a reduced absorption rate. How do we incorporate Magnesium and Lithium supplements into our daily intake, while also using the PAC-Tamer?

Neil

Neil, i think you must be mistaken about the lithium, i do not remember any mention of it in reference to afib. Why not go to the regular forum and use the search function there to research magnesium and potassium supplementation? A number of posts have given forms and dosages for both these substances.

PeggyM

Hans,

Last August '04 you wrote in the LAF forum:

"My problem is that there is something wrong with my potassium handling. I excrete it at an astonishing rate, but also have a very high aldosterone level. Supplementing with potassium would further increase the aldosterone level which would then cause even more potassium to be excreted. You see the picture? Sort of a no win situation in my case."

This might be an issue for me since I have noticed when I supplement with potassium my AFib seems to worsen -

much more frequent episodes (daily), but shorter in duration. Do you know if this is potassium excretion problem is very common?

Has your ablation changed this for you, where now the potassium is beneficial?

I am a AMAF'er like you used to be. Stress and just obsessing about AFib are my major triggers. Although I may be changing too since I seem to be having episodes at night now that I never had before. But I wonder if they are not vagal, but caused by me dreaming of AFib, getting scared and then it starting. Boy this is complicated!

Thanks,
Rick S.

Rick,

One of the (many) problems with LAF is that it's causes and prevention differ from individual to individual. I am pretty well convinced that magnesium supplementation (either as magnesium glycinate or as Waller water) is a bad idea for me. It definitely worsens my PACs and afib. Other afibbers of course have found it highly beneficial. A similar situation exists with coenzyme Q10.

So if potassium supplementation makes your condition worse then it is probably not a good idea. Have you had your K serum level tested?

I find that I benefit from the PACTamer now after my ablation, but of course can't say if I would have done so prior to the ablation as I had not yet formulated it at that time. I do know that straight supplementation with potassium had no beneficial effect prior to my ablation.

If I were in your position I would definitely try the Ativan before bed approach with or without the PACTamer. At least it should give you a good night's sleep.

Hans

Hi All,
I am hoping that some of our group might be willing to share their experience with Hans' PAC -tamer.
I am sorry to report that my experience with the drink was not good. In fact, the drink increased my ectopics, but then I generally have trouble with supplements (like Fran) and potassium gluconate is a supplement.

Lynn

Lynn, does low sodium v8 give you conniptions too?

PeggyM

Peggy,
Yes. I cannot take the KCL I think.

Lynn

Lynn,

Thank you for sharing your experience with the PACTamer. It just goes to show you that we are all an experiment of

one.

Hans

Peggy,

Doesn't low sodium V8 juice "deliver" its potassium in supplement form as well (KCl)? If so, perhaps it matters in what form you get the K-supplement. Maybe some afibbers tolerate the KCl better than the gluconate or vice-versa.

Hans

Just what i thought, Hans, that maybe one form would be tolerated better than another. Worth trying, anyway. Each an experiment of one, yes.

PeggyM

Hi Hans,
Just a thought. What is the pH of the PAC-Tamer? I ask this because some afibbers with GERD (diagnosed or undiagnosed) might be worse off if PAC-Tamer is acidic? Here is example of a recent post by John Bryan:

"I took some Pepcid AC, some extra mag, some extra potassium, and sat back down. The flutters continued, but got less and less. By 10:00, they were gone and I went to bed. No afib. That is the first time I have ever been able to pull that off! Usually when I get that far, I have a full blown episode. I don't know what it was, but I will definitely try that combo next time!"

Regards
Dean

Dean,

That is a really good question. Unfortunately, I don't know what the pH is, but I'll see if I can find a way to measure it.

Hans

Hi Hans and Peggy,

Your discussion about KCl v. potassium gluconate is provocative. For sometime now I've been contemplating the advisability of one over the other. I've been concerned that there might be a difference between the mineral salt, e.g., KCl and the organic salt, e.g., potassium gluconate, potassium citrate, etc.

LAFers usually want to avoid any kind of alkalosis. This causes and is caused by low potassium (vicious circle). Magnesium is similarly affected.

If one supplements via KCl, there are several avenues by which the body can adjust its chloride balance (GI, renal, sweat). If one supplements with potassium gluconate, only the kidneys can excrete the gluconate. That anion will drag out with it either H+ or K+.

Therefore, it would seem more prudent for LAFers to supplement with the mineral salt (KCl).

The below was lifted from a potassium supplement webpage:

"If the basic disturbance produces metabolic acidosis, as in some renal tubular disorders, an organic salt such as potassium gluconate may be more advantageous."
http://www.drugs.com/PDR/Rum_K.html

PC
