Dialysis Free Fluid Management: A New Approach to Kidney Disease

Hemodialysis became available in the early 1960s. Since then, people with kidney failure have had a method, besides a transplant, to filter excess fluid and blood borne waste from their body. A machine cleans the blood. Your blood travels through tubes from your body into a dialysis machine which removes some of the waste and extra fluid, and then, filtered blood is returned to your body.

Also in the late 1950s and early 1960s with the advent of the catheter, peritoneal dialysis became a safe and standardized practice. Peritoneal dialysis (PD) removes waste and extra fluid through the blood vessels that line the walls of your abdomen.

During peritoneal dialysis, a cleansing fluid called dialysate passes through a catheter tube into part of the abdomen known as the peritoneal cavity. The dialysate absorbs waste products from blood vessels in the lining of the abdomen, called the peritoneum. Then the fluid is drawn back out of the body and discarded.

While these methods are the accepted standard of care for chronic kidney disease, the processes are tough for a body to endure over and over again. People do, of course, but quality of life becomes a compromise.

Today, thanks to HB Biotechnologies Corporation, there's a dialysis free method to remove fluid from the body.

With dialysis free fluid management, fluid from the gastrointestinal tract that contributes to fluid overload when your kidneys aren't working is transformed into a gel that is excreted from the body — bypassing kidney function.

Dialysis free fluid management diverts the method of elimination of fluid from the renal route to the gastrointestinal route, where fluid is trapped — unable to be reabsorbed back into the body where it would need to be processed by the kidneys.

Fluid is transformed into a gel when it combines with an orally administered superabsorbent polymer that absorbs up to 65 times its weight. On a molecular level, each grain of the dry superabsorbent material is composed of a three-dimensional porous network. Ions that fit inside the pores of the polymer are also trapped and retained in the gel as it journeys through the gastrointestinal tract to be pooped out.

Clinical studies showed meaningful increases in the fecal content and concentration (and decreased urinary content) of sodium, potassium, calcium, phosphorous, and magnesium.*

Dialysis free fluid management has been studied for performance.

In a clinical study of people with heart failure and chronic kidney disease, gastrointestinal dialysis for eight weeks resulted in improvements in measures of fluid overload including blood pressure, body weight, ability to breathe, endurance, heart failure classification, and other quality of life measures.*

In a clinical study of people with ESRD who were maintained on three-times weekly hemodialysis, adding dialysis free fluid management resulted in lower pre-dialysis and post-dialysis body weight and blood pressure.*

In non-clinical studies, dialysis free fluid management in rats decreased the rate of rise of serum creatinine and allowed for 3 months extended survival time and return of BUN to normal in combination with 1/6th kidney function.

Dialysis free fluid management, as developed by HB Biotechnologies Corporation, provides an important additional method for fluid management and control. Edema — excess fluid in the body, fluid retention, and bloating can occur from numerous factors.

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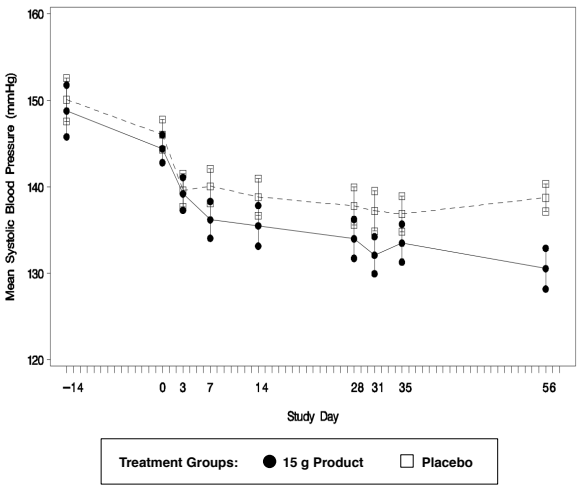
CLINICAL PERFORMANCE*

Improvements across measures of fluid overload, functional capacity, and quality of life as demonstrated in clinical studies support that dialysis free fluid management has shown beneficial effects when it is used to support fluid management and control.

A double-blind, randomized, parallel, placebo-controlled clinical study examining the effect of the product in people with heart failure and chronic kidney disease was conducted and had the following performance:

Blood Pressure

Subset analyses of people with baseline systolic blood pressure >130 mmHg revealed significant differences at Week 8 between product and placebo (p=0.019, systolic and p=0.012 diastolic) when using Repeated Measures Analysis of Covariance.



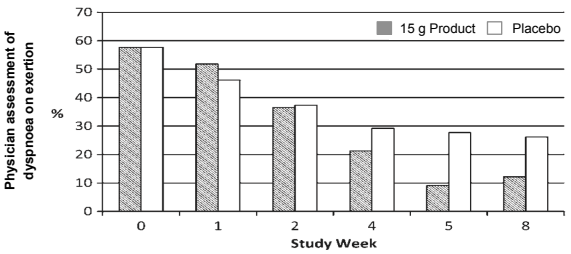
Heart Failure Detection: Changes in Neuroendocrine Markers

Frequency analysis of speople with NT-proBNP ≠1000 and >1000 pg/mL revealed a significant difference at Week 4 between product and placebo (p=0.0389) when using a chi-square test comparing proportions.

Study Visit	Variable	Product (N=59)	Placebo (N=52)	p-value
Screening	NT-proBNP ≠1000 pg/mL	0 (0.0%)	1 (1.9%)	0.2846
	NT-proBNP >1000 pg/mL	59 (100.0%)	51 (98.1%)	
End of Week 4	NT-proBNP ≠1000 pg/mL	4 (8.5%)	0 (0.0%)	0.0389
	NT-proBNP >1000 pg/mL	43 (91.5%)	48 (100.0%)	
End of Week 8	NT-proBNP ≠1000 pg/mL	5 (12.2%)	1 (2.2%)	0.0656
	NT-proBNP >1000 pg/mL	36 (87.8%)	45 (97.8%)	

Dyspnea on Exertion

The frequency of marked or disabling exertional dyspnea by physician assessment decreased over time. The percentage of people reporting moderately or markedly better breathing by the 7-point Likert scale was 21.3% in the product group at Week 4 (P=0.567), and 36.6% (P = 0.127) at Week 8.



Pulmonary Rales

A larger percentage of subjects who had pulmonary rales at Baseline had an absence of pulmonary rales at Week 8.

	Product	Placebo
Patients with pulmonary rales present at Baseline and **absent at Week 4**	26 (55.3%) (N=47)	27 (56.3%) (N=48)
Patients with peripheral edema present at Baseline and **absent at Week 8**	26 (63.4%) (N=41)	27 (58.7%) (N=46)

Improvements in NYHA Functional Classification (Heart Failure Class)

The difference in proportions of people with at least one class improvement from Baseline to Week 8 was significant in favor of the product (p=0.002)

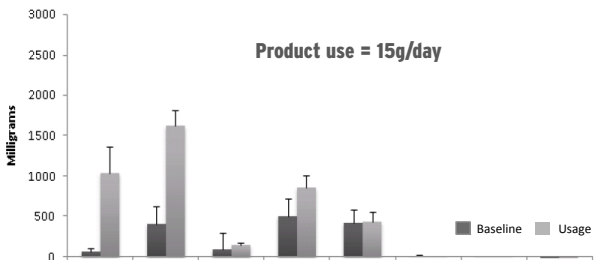
NYHA Class	Product (N=59)	Placebo (N=52)
II	17 (41.5%)	6 (13.0%)
III	24 (58.5%)	38 (82.6%)
IV	0 (0.0%)	2 (4.3%)

Subjects with at Least One Class Improvement from Baseline at Week 8	**20 (48.8%)**	**8 (17.4%)**

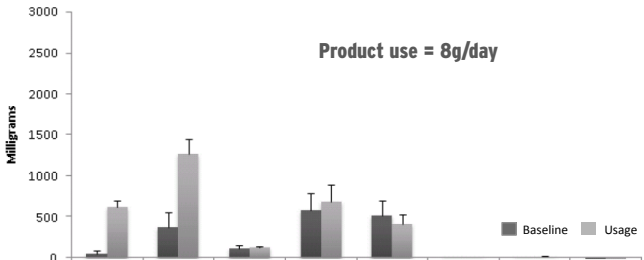
An open label, multiple dose study examining the effect of dialysis free fluid management in people with end stage renal disease (ESRD) was conducted and had the following performance:

Fecal Content and Concentration of Cations

Large increases in fecal sodium and potassium content occurred after two weeks of supplementation. Fecal content of sodium and potassium increased in a dose-dependent manner. while decreases in urinary content of sodium and potassium also occurred.



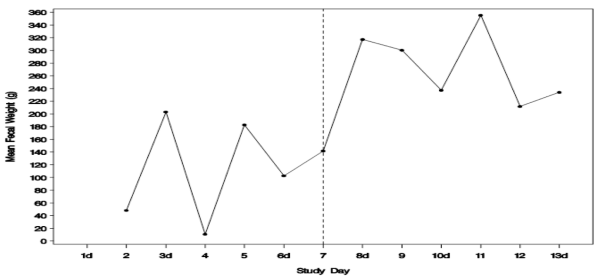
	Na	K	Mg	Ca	P	Fe	Zn	Cu
Baseline	67.189	411.596	100.642	499.135	418.255	13.939	11.045	0.886
Usage	1041.073	1626.77	150.85	861.072	435.399	12.837	13.787	0.739



	Na	K	Mg	Ca	P	Fe	Zn	Cu
Baseline	52.573	377.235	111.269	581.133	515.351	13.525	8.691	0.724
Usage	616.677	1273.769	126.346	690.217	415.954	15.083	15.149	0.587

Daily Average Fecal Weight

A mean increase from baseline in daily average fecal weight demonstrates the effectiveness of the product to absorb fluid from the body via the gastrointestinal route. Increases in fecal weight occurred within a day of supplementation.



Predialysis and Postdialysis Blood Pressure and Body Weight

In an open label, nonrandomized, multiple dose clinical study to assess the safety, tolerability, and efficacy of the product in people with ESRD who were maintained on 3-times/weekly hemodialysis, supplementation resulted in lower predialysis and postdialysis systolic and diastolic blood pressure as well as lower predialysis body weight during the supplementation period versus baseline.

Parameter	Statistic	Product use: 15 grams/day (N=5)					
		Predialysis			Postdialysis		
		Baseline Period	Supplementation Period	Change From Baseline During Usage	Baseline Period	Supplementation Period	Change From Baseline During Usage
		Days 3-6 Daily Average	Days 10-13 Daily Average		Days 3-6 Daily Average	Days 10-13 Daily Average	
Sitting Systolic Blood Pressure (mmHg)	n	5	5		5	5	5
	Mean	147.9	146.1	-1.8	141.1	129.7	-11.3
	SD	10.91	16.36	12.11	15.42	17.75	12.15
	Median	150.7	138.3	-5.7	139	125.3	-13.7
	Min, Max	132, 157	135, 174	-12, 17	123, 162	105, 148	-25, 7
Sitting Diastolic Blood Pressure (mmHg)	n	5	5	5	5	5	5
	Mean	83.5	83.3	-0.1	81.6	78	-3.6
	SD	9.85	4.71	6.98	9.72	14.94	6.89
	Median	82	86.7	-0.3	77	70.7	-5
	Min, Max	72, 97	77, 87	-10, 8	73, 94	64, 98	-10, 8
Weight (kg)	n	5	5	5	5	5	5
	Mean	91.86	90.79	-1.07	88.95	88.15	-0.79
	SD	14.253	13.662	0.855	14.055	13.431	0.735
	Median	94.17	92.5	-0.77	90.03	89.13	-0.67
	Min, Max	70.4, 107.5	70.0, 105.3	-2.2, -0.2	67.5, 104.3	67.5, 102.3	-2.0, 0.0