



# Small intestinal bacterial overgrowth in Fontan patients with protein-losing enteropathy: preliminary results.

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## BACKGROUND

- The composition of the microbial community colonizing the human gut plays an important role in disease progression of many chronic disorders.
- Small intestinal bacterial overgrowth (SIBO) is characterized by excessive proliferation of colonic bacterial species in the small bowel.
- Symptoms related to this disorder are abdominal discomfort, diarrhoea, malnutrition, vitamin D deficiency, intestinal and systemic inflammation, susceptibility to bloodstream infection, and growth failure, which are also common features of protein-losing enteropathy (PLE) in Fontan patients.
- We postulated that Fontan patients with PLE may be at risk for developing small intestinal bacterial overgrowth.
- The aim of this study was to test failing Fontan patients for the presence of SIBO with an intention-to-treat.

## METHODS

- Six Fontan patients (n = 5 with chronic relapsing PLE, n = 1 with newly diagnosed PLE) were scheduled for a glucose hydrogen breath test (GHBT) between June 2013 and December 2015 at our institution.
- Medical charts were reviewed for cardiac diagnosis, demographics, gastrointestinal signs and symptoms, serum albumin, 25-OH-Vitamin D, Vitamin B12, fecal calprotectin and alpha-1 antitrypsin levels.
- Vitamin B12 and vitamin D deficiencies were defined as a serum level < 300 pg/mL and a serum 25-OH-D level of <20 ng/mL
- SIBO was diagnosed if a fasting breath hydrogen concentration was ≥ 10 ppm or an increase in hydrogen levels of ≥ 12 ppm above the baseline value was measured after ingestion of glucose.

## RESULTS

- One patient was not able to drink the glucose solution and was excluded from the study.
- Six Fontan patients (median age 7.5 yrs, 83.3% male) underwent a glucose hydrogen breath test (chronic PLE: n = 4; newly diagnosed PLE: n = 1; failing Fontan: n = 1).
- Patient demographics and clinical characteristics are presented in **TABLE 1**.
- All Fontan patients experienced gastrointestinal complaints (pain, swelling, no appetite, discomfort).
- Results of the GHBT test are shown in **TABLE 2**.
- Patients with SIBO were treated with Rifaximin (200 mg once daily for 12 days), followed by a mixture of several probiotic preparations (Ominflora, ColibioGen, Pro-Symbioflor) as maintenance therapy.

## Acknowledgements

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TABLE 1	1	2	3	4	5	6
Age (yrs)	4.9	4.7	10.9	7.7	7.2	11.0
Gender (M/F)	M	M	M	M	F	F
Diagnosis	HLHS	HLHS	SV, AVSD	HLHS	SV, AVSD	HLHS
	chronic PLE	chronic PLE	chronic PLE	chronic PLE	newly diagnosed PLE	failing Fontan
Albumin (g/l)	20	23	19	24	22	44
A1AT (mg/dl)	590	245	280	210	> 1800	16
Calprotectin (mg/kg)	397	34	463	356	244	17
25-OH-D (ng/ml)	3.0	15.7	3.5	17.9	12.4	3.0
Vitamin B12 (pg/ml)	667	196	500	-	207	-

**TABLE 1.** Patient demographics and clinical characteristics of Fontan patients undergoing a glucose hydrogen breath test. Patients 2 and 5 (YELLOW) were diagnosed having SIBO. Failing Fontan hemodynamics in patient 6 were caused by systemic ventricular dysfunction. Albumin was measured in serum. A1AT = alpha-1 antitrypsin.

TABLE 2	Hydrogen value in (ppm)					
Patient	baseline	30 min	60 min	90 min	120 min	Result
1	8	6	5	6	6	negative
2	16	9	9	6	5	positive
3	3	5	4	3	10	negative
4	3	0	1	2	6	negative
5	31	30	27	29	-	positive
6	2	1	0	0	1	negative

**TABLE 2.** Results of the glucose hydrogen breath test (GHBT). Patients 2 and 5 (YELLOW) tested positive, with high baseline hydrogen values.

## CONCLUSIONS

- We identified an additional pathophysiological mechanism that might contribute to long-term outcome in these patients.
- SIBO seems a common finding in Fontan patients with overt PLE (33.3%).
- Alterations in the gut microbiome may complicate the course of disease in Fontan patients with PLE.
- Patients can be successfully treated with rifaximin and oral probiotics.
- Vitamin B12 deficiency accompanied all cases of SIBO.
- Screening Fontan patients with PLE for SIBO seems mandatory.