

normal mouse model study. For the SBS rat model study, villus height, weight and length of the small intestine were measured at the end of treatment.

**Results:** In the normal mouse study, treatment of HLB1-006 showed significant increase in the weight of small intestine dose-dependently. The small intestine's weight was increased up to 65% by the treatment of HLB1-006 compared to that of the treatment with teduglutide. It indicates that the HLB1-006 shows significantly higher efficacy compared to the teduglutide. In the SBS rat model study, treatment of HLB1-006 shows significant increase in both weight and length of the small intestine and villus height which was dose-dependent. The small intestine weight with HLB1-006 was increased up to 57% over teduglutide, small intestine length was increased up to 27% over teduglutide, and villus height was increased in duodenum and jejunum up to 30% and 36% over teduglutide, respectively. The SBS rat model study confirms that the weekly treatment of HLB1-006 provides significantly higher efficacy than that of the daily treatment of teduglutide, as shown in the normal mouse model study.

**Conclusion:** The GLP-1 activity is known to increase the length and width of small intestine and to proliferate villus in small intestines, and the GLP-2 activity is known to enhance intestinal cell proliferation and to prevent apoptosis. More than 50 candidates of the modified GLP-1/GLP-2 dual peptides have been designed by combining amino acid substitutions/additions and attaching a linker to contain both dual synergistic effect of the modified GLP-1 and GLP-2 peptides and longer injection interval for the convenience of use. In conclusion, the weekly SC treatment of HLB1-006 candidate showed significantly higher efficacy with dose-dependency than the daily SC treatment of teduglutide in the animal models tested. The higher efficacy and longer weekly regimen of the HLB1-006 would provide an innovative option to the SBS patients for better treatment. Additionally, the drug product of the HLB1-006 will be prepared in a stable liquid formulation for ease of use instead of the lyophilized form of teduglutide, and also evaluated for monthly treatment of the HLB1-006 to provide better convenience for the patients.

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#### P45 - Incidence of Micronutrient Deficiencies in Inflammatory Bowel Disease

Amir Kamel, PharmD, BCNSP<sup>1</sup>; Zachary Johnson, PharmD<sup>2</sup>; Devika Dixit, MD<sup>3</sup>; Isabela Hernandez, BS<sup>3</sup>; Thakul Rattanasuwan, PharmD<sup>1</sup>; Nicole Ruiz, MD<sup>4</sup>; Steve Qian, MD<sup>3</sup>; Naeen Chaudhry, MD<sup>3</sup>; Angela Pham, MD<sup>3</sup>; S Devi Rampertab, MD<sup>3</sup>; Ellen Zimmermann, MD<sup>3</sup>

<sup>1</sup>University of Florida Health, Gainesville, Florida; <sup>2</sup>UF Health, Gainesville, Florida; <sup>3</sup>University of Florida, Gainesville, Florida; <sup>4</sup>Emory University, Gainesville, Florida

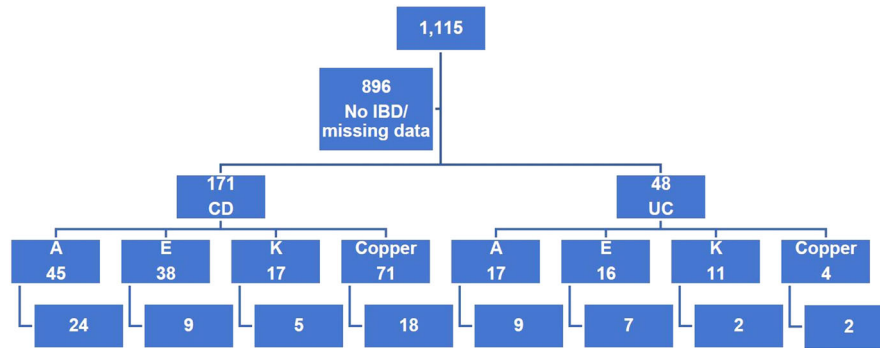
**Background:** Micronutrient deficiencies associated with malnutrition in patients with inflammatory bowel disease (IBD) can lead to complications including anemia, coagulopathy, poor wound healing, and colorectal cancer. The aim of this study was to investigate micronutrient deficiencies (vitamins A, E, K, and copper) in IBD patients and highlight symptoms or historical features to aid in recognition of micronutrient deficiencies.

**Methods:** A retrospective electronic chart review was performed on adults with an ICD-9/10 code diagnosis of Crohn's disease (CD) or ulcerative colitis (UC) during their index hospitalization for IBD flare to a tertiary care center between 1/2013 to 6/2017. Adult patients with serum or whole blood micronutrient levels were included and standard serum or whole blood thresholds for each micronutrient were used. Pregnant and incarcerated patients were excluded.

**Results:** 219 IBD patients (171 CD, 48 UC) met inclusion criteria. Micronutrients were assessed in a subset of IBD patients (A: 53.2%, E: 29.6%, K: 25% and copper: 26.7%). Overall, 34.7% of patients had micronutrient deficiencies. The proportion of patients with A, E, K, and copper deficiencies were 25.4%, 23.7%, 29.4%, and 25.4% for CD and 52.9%, 43.8%, 18.2%, and 50% for UC, respectively. The most common symptoms or historical features associated with micronutrient deficiency were dry skin, hyperkeratosis, pruritus, frequent infections, anorexia/loss of appetite/weight loss and elevated CRP (A), muscle weakness (E), bleeding, osteoporosis, vascular calcification (K) Anemia, thrombocytopenia, fatigue, muscle weakness (copper).

**Conclusion:** Micronutrient deficiencies are common in IBD patients, yet they are not routinely assessed. A, E, K, and copper deficiencies are particularly underrecognized. Factors contributing to micronutrient deficiencies in IBD patients include reduced absorption, chronic inflammation, reduced intake, drug interactions and prior surgeries. Associated historical features should raise suspicion and prompt assessment and treatment.

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**Figure 1.** Flow chart of unique IBD patients with Micronutrient levels. 1115 patients were screened and 219 patients with CD or UC met criteria. Micronutrients were tested in a subset of patients and found to be deficient as shown. The number of patients with each deficiency is shown in the bottom row.

#### P46 - Intestinal Failure I, II, and Intestinal Insufficiency in Enteroperitoneal Tuberculosis

Mario Ferreyra, MD PhD<sup>1</sup>; Luisa Guerrero, RN Ms<sup>2</sup>; María Ocaña, Ms Dr<sup>2</sup>; Max Small, MD<sup>2</sup>; Marco Montiel, MD<sup>2</sup>; Rosario Holguin, RD Ms<sup>2</sup>; Roxana Soto, RN Ms<sup>2</sup>; Consuelo Mera, RN<sup>2</sup>

<sup>1</sup>Edgardo Rebagliati Hospital, Lince Lima, Lima; <sup>2</sup>Edgardo Rebagliati Hospital, San Miguel Lima, Lima

**Background:** Tuberculosis(TB) is a systemic disease and is on the rampage. Each year about 1.7 million people die of TB and 9 to 13 million new cases occur worldwide. For every 25 to 30 cases of lung TB there is one case of enteroperitoneal TB(ETB). Humans are the natural reservoir of *M. tuberculosis* and about 500,000 people are infected with a multidrug-resistant strain of *M. tuberculosis*.ETB is a tragic life threatening condition associated with a completely “frozen” abdomen: an abdominal catastrophe. Mortality is up to 26%. Clinical presentation makes even the situation worse for it presents in some cases without concomitant lung disease so the first clinical impression is pelvic malignant disease. The concept that antibiotic/chemotherapies are the only way of curing very serious cases of ETB is full of prejudice, as the corner stone is the association of antibiotic/chemotherapies with NS.

**Methods:** From 2008 to 2022, 15 patients were included in a strict prospective protocol. We were especially interested in severe cases of ETB. Once they had a diagnosis of ETB, the patient was included. Diagnosis was made by laparotomy in 10/15 caes, laparoscopy in 2/15, endoscopy in 1/15, and 1/15 by polymerase chain reaction in ascitic fluid. Protocol: (1) Nutritional support (NS) in the form of Total Parenteral Nutrition (TPN) or Total Enteral Nutrition (TEN) was started at the same time that multidrug treatment was started, with TB specific intravenous antibiotic and chemotherapy treatments. (2) TPN and TEN were given sequentially, not simultaneously. Once patients were discharged, they were given daily oral supplements with enteral nutrients that would supplement oral food. (3) In case of surgical complications, the operation was performed by the surgeon (3/15 patients) of the NS team who was also responsible of supervising NS treatment and follow up until the patient was declared free of disease.

**Results:** Age and range of diagnosis:  $36.2 \pm 18.91$  and 16 to 91 years of age. Patients had NS from 13 to 260 days with a mean of  $143.92 \pm 95.29$  days. Eleven out of 14 patients started NS with TPN as enteral tolerance was impossible. Two out of 14 patients could start NS with TEN as TPN was not necessary. Periods of TEN (Intestinal Insufficiency) were from 41 to 260 with a mean of  $177.66 \pm 104.6$  days and periods of TPN (Intestinal failure Types I and II) were from 13 to 240 with a mean of  $90.25 \pm 76.32$  days. (4) Thirteen out of 15 patients collaborated with careful follow up, after discharge were considered cured of the disease at the end of multidrug and NS treatments. (5) Six out of 15 patients required surgery either for diagnosis or treatment of complications by the surgeon of the NS team. Three out of 15 patients had fistulas during the protocol, 2/15 required surgical treatment and 1/15 closed spontaneously with TPN. (6) Nine out of 15 patients had no lung TB, making diagnosis more difficult

**Conclusion:** The corner stone, we firmly believe, to cure severe cases of enteroperitoneal TB is NS as multidrug treatment is the conventional approach that will only be properly delivered once NS is conceived as such, whatsoever.

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