Gut: SIBO – Part 8

This one's an interesting result.

Data

H_2 = Hydrogen CH_4 = Methane CO_2 = Measured

	Sample	ppm H_2	ppm CH_4	Total H2 + CH4	CO_2 %*
1	Baseline	10	17	27	OK
2	20 min	13	18	31	OK
3	40 min	5	6	11	OK
4	60 min	12	16	28	OK
5	85 min**	17	19	36	OK
6	105 min**	14	14	28	OK
7	125 min**	20	17	37	OK
8	145 min**	34	25	59	OK
9	165 min**	52	25	77	OK
10	185 min**	101	43	144	OK

---△--- Hydrogen   ----□---- Methane   —○— Combined Hydrogen & Methane

*Dilutions of the sample may occur during the sampling procedure which may decrease the CO_2 concentration of the sample and render the sample invalid. If the concentration falls below 1.4 %, the entry for CO_2 will be marked as Quantity Not Sufficient (QNS) and the entries for H_2 and CH_4 will be highlighted. If the sample is otherwise unusable the entry for CO_2 will be marked as Not Available (N/A) and the entries for H_2 and CH_4 will be highlighted. See notes section for details if cells are highlighted and blank or highlighted and contain N/A or QNS.

Analysis

Combined baseline total =	27	H	≤20ppm
Greatest H_2 increase over the lowest preceding value within first 120 minutes =	15	-	≤20ppm
Greatest CH_4 increase over the lowest preceding value within first 120 minutes =	13	H	≤12ppm
Greatest combined H_2 & CH_4 increase over the lowest preceding value within first 120 minutes =	26	H	≤15ppm

Interpretation

SIBO Suspected - Elevated Hydrogen	Increases of hydrogen greater than 20ppm over the lowest preceding value within the first 120 minutes (+/- 5min deviation) are indicative of bacterial overgrowth.	NEGATIVE
SIBO Suspected - Elevated Methane	Increases of methane greater than 12ppm over the lowest preceding value within the first 120 minutes (+/- 5min deviation) are indicative of bacterial overgrowth.	POSITIVE
SIBO Suspected - Elevated Combined Hydrogen & Methane Gasses	Increases in combined hydrogen and methane gas values greater than 15ppm over the lowest preceding value are indicative of bacterial overgrowth.	POSITIVE

Notes

The following symptoms were reported during collection: none reported.

<u>Note</u>: The actual collection times were shifted 5 minutes later than the standard collection times, starting with Sample #5. Note that the 120 minute sample was collected at 125 minutes. See **bold times****
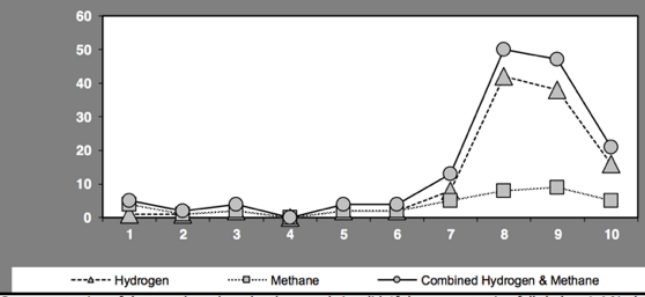
We see that the baseline levels of hydrogen are higher than typical at 10, and baseline methane is 17, so that already means that it is positive for methane. Sometimes when you see high levels of hydrogen at baseline that can be a result of improper test preparation, but in that case, they don't tend to drop back down, or they don't tend to go up as much later. Even in the consensus statement, there is still one of the unresolved questions that they mentioned was the significance of higher hydrogen at baseline, so we still don't really know that answer to that question.

We also see here that the gas levels drop down. They start out high at baseline. They drop down, both hydrogen and methane at 40 minutes, and then they start going back up again. At 90 minutes, hydrogen is only 17, which is an increase of only 7 from baseline, which again would be normal according to the 2017 consensus, but again, the methane of 17 is already positive at that baseline value. I would say this is a clear positive, particularly for methane. This is a 39-year-old with chronic inflammation, intestinal permeability, food sensitivities, and skin conditions.

Data

H_2 = Hydrogen CH_4 = Methane CO_2 = Measured

	Sample	ppm H_2	ppm CH_4	Total H2 + CH4	CO_2 %*
1	Baseline	1	4	5	OK
2	20 min	1	1	2	OK
3	40 min	2	2	4	OK
4	60 min	0	0	0	OK
5	80 min	2	2	4	OK
6	100 min	2	2	4	OK
7	120 min	8	5	13	OK
8	140 min	42	8	50	OK
9	160 min	38	9	47	OK
10	180 min	16	5	21	OK

*Dilutions of the sample may occur during the sampling procedure which may decrease the CO_2 concentration of the sample and render the sample invalid. If the concentration falls below 1.4 %, the entry for CO_2 will be marked as Quantity Not Sufficient (QNS) and the entries for H_2 and CH_4 will be highlighted. If the sample is otherwise unusable the entry for CO_2 will be marked as Not Available (N/A) and the entries for H_2 and CH_4 will be highlighted. See notes section for details if cells are highlighted and blank or highlighted and contain N/A or QNS.

Legend: ---▲--- Hydrogen   ····▢···· Methane   —○— Combined Hydrogen & Methane

Analysis

Combined baseline total =	5	-	≤20ppm
Greatest H_2 increase over the lowest preceding value within first 120 minutes =	8	-	≤20ppm
Greatest CH_4 increase over the lowest preceding value within first 120 minutes =	5	-	≤12ppm
Greatest combined H_2 & CH_4 increase over the lowest preceding value within first 120 minutes =	13	-	≤15ppm

Interpretation

|		
SIBO Suspected - Elevated Hydrogen	Increases of hydrogen greater than 20ppm over the lowest preceding value within the first 120 minutes (+/- 5min deviation) are indicative of bacterial overgrowth.	NEGATIVE
SIBO Suspected - Elevated Methane	Increases of methane greater than 12ppm over the lowest preceding value within the first 120 minutes (+/- 5min deviation) are indicative of bacterial overgrowth.	NEGATIVE
SIBO Suspected - Elevated Combined Hydrogen & Methane Gasses	Increases in combined hydrogen and methane gas values greater than 15ppm over the lowest preceding value are indicative of bacterial overgrowth.	NEGATIVE

Notes

The following symptoms were reported during collection:
at 32 minutes - "slight stomach cramping"
at 112 minutes - "diarrhea, intermittent gurgling"

Here is another interesting result. This test is normal according to the Quintron criteria and the NCMN standardized criteria, but it's positive if you use Dr. Pimentel's criteria for methane because there is an increase of more than 3 parts per million from the lowest preceding value of methane. There's a 1 part per million methane value at 20 minutes, and then at 120 minutes there is a 5 parts per million methane value. When you look at hydrogen, it's totally normal all throughout the test, and then it just zips up at 140 minutes. It goes from 8 parts per million at 120 to 42 ppm at 140, and that's pretty clear entry of lactulose into the colon right there. This patient was a 28-year-old male who we later found out had inflammatory bowel disease, and his transit time was on the fast side. To me, I discounted the idea that the very slight increase in methane that was seen from 20 minutes at 1 part per million to 5 parts per million at 120 minutes was part of a pathological SIBO pattern. He had elevated calprotectin and lactoferrin on the Doctor's Data stool panel. We ran the IBD blood panel, and he was positive for that. We sent him for a colonoscopy, and he did, in fact, have Crohn's, particularly inflammation in the terminal ileum. While it is possible for a patient to have both SIBO and IBD, and there is a correlation between those two conditions, in this case, I don't really think that's what we're seeing, and I didn't think that we would see a lot of benefit in treating him for SIBO. We instead turned our attention to treating him for IBD, and he made some really significant improvements after that.

SMALL INTESTINAL BACTERIAL OVERGROWTH REPORT SHEET - 10 SPECIMEN TEST

Patient Name..................
Patient Number...............
Date of Birth.................
Date Specimen Collected......
Date Received ....
Physician.....................
Physician ID#.................
Address.......................
Date Reported.................

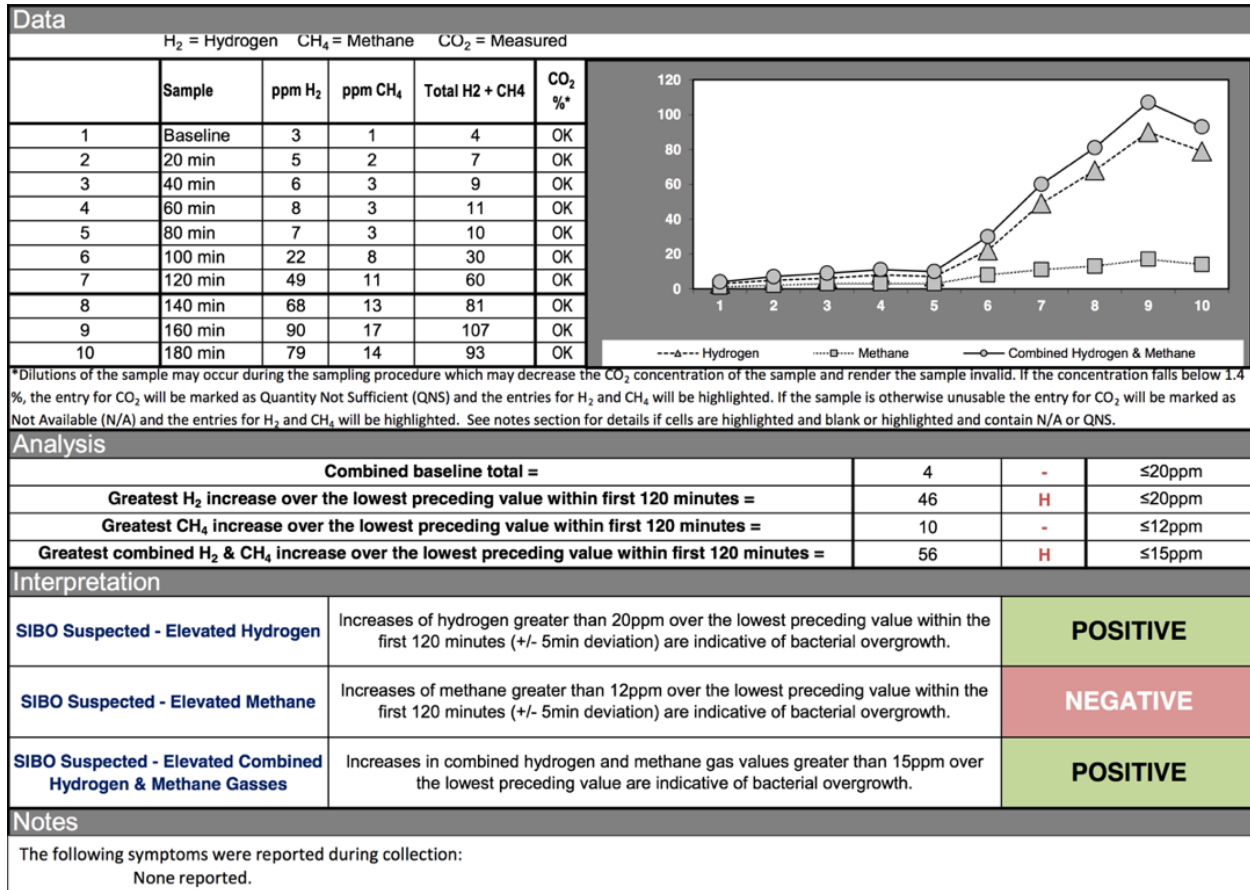| Sample Time	Sample #	ppm H_2	ppm CH_4	(f) CO_2
Control	1	0	0	1.25
20 min.	2	0	0	1.24
40 min.	3	2	0	1.06
60 min.	4	0	0	1.07
80 min.	5	8	0	1.11
100 min.	6	22	0	1.10
120 min.	7	43	0	1.24
140 min.	8	50	0	1.22
160 min.	9	58	0	1.11
180 min.	10	58	0	1.10

RESULTS CHART
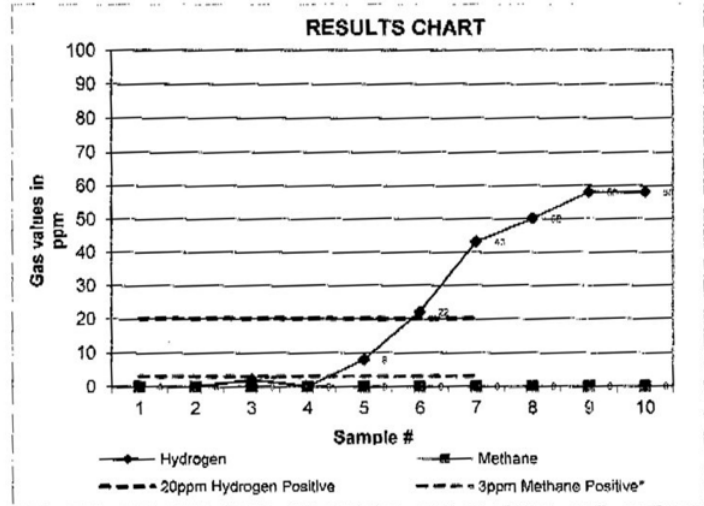
The 120 minute mark corresponds to the time the biomarker should transition from the small intestine and enter the colon.

Summary of 2 Hour Results
Peak increase values for each trace gas are presented below:

|			
Peak Hydrogen (H2) Production:	43	ppm	Normal <20 ppm
Peak Methane (CH4) Production:	0	ppm	Normal <3 ppm*
Peak Combined Gas Production:	43	ppm	Normal <20 ppm

RESULT: BASED ON THE CRITERIA USED IN THIS STUDY, PRESENCE OF BACTERIAL OVERGROWTH IS SUPPORTED*

Here is an example of a late single hydrogen peak. Hydrogen goes from 0 at baseline to 8 parts per million at 80 minutes, which would be negative, but then it jumps up to 22 parts per million at 100 minutes. At some point between 80 and 100 minutes, we see that increase. The cutoff is 90 minutes, as you know, so it is a little difficult to know, but I would say given that we see that significant increase at 100 minutes, it is likely at 90 minutes it would have been 20 or close to it. It is a little bit equivocal in this case. Methane is zero all the way through the test. When you have an equivocal result like this, you need to correlate it with the clinical picture and then consider things such as transit time. This patient was a 64-year-old woman. When she did her case review, she was running a marathon that weekend, so she was pretty fit and healthy overall. Her main issue was sleep difficult and a hamstring injury when she was really just coming from general health. Transit time was normal, one to two well-formed bowel movements a day, absolutely no digestive symptoms. Given this, I would probably not treat. Does this person have SIBO? Maybe, as it has been defined by the consensus, but we know that a certain percentage of healthy controls have SIBO and don't seem to be effected. There is still a lot that we don't totally understand about SIBO, and the testing, criteria, and the variables are somewhat controversial, as you can gather from this presentation. In this situation when the results are really equivocal and the symptoms don't really match or add up, I would probably not

treat for SIBO, at least not initially. I would start with other things and see how far we can get. Maybe then you could circle back to this and try a therapeutic trial if you weren't making the progress that you wanted to make.

Data

H₂ = Hydrogen   CH₄ = Methane   CO₂ = Measured

	Sample	ppm H_2	ppm CH_4	Total H2 + CH4	CO_2 %*
1	Baseline	3	1	4	OK
2	20 min	5	2	7	OK
3	40 min	6	3	9	OK
4	60 min	8	3	11	OK
5	80 min	7	3	10	OK
6	100 min	22	8	30	OK
7	120 min	49	11	60	OK
8	140 min	68	13	81	OK
9	160 min	90	17	107	OK
10	180 min	79	14	93	OK

---△--- Hydrogen   ····□···· Methane   ──○── Combined Hydrogen & Methane

*Dilutions of the sample may occur during the sampling procedure which may decrease the CO_2 concentration of the sample and render the sample invalid. If the concentration falls below 1.4 %, the entry for CO_2 will be marked as Quantity Not Sufficient (QNS) and the entries for H_2 and CH_4 will be highlighted. If the sample is otherwise unusable the entry for CO_2 will be marked as Not Available (N/A) and the entries for H_2 and CH_4 will be highlighted. See notes section for details if cells are highlighted and blank or highlighted and contain N/A or QNS.

Analysis

Combined baseline total =	4	-	≤20ppm
Greatest H_2 increase over the lowest preceding value within first 120 minutes =	46	H	≤20ppm
Greatest CH_4 increase over the lowest preceding value within first 120 minutes =	10	-	≤12ppm
Greatest combined H_2 & CH_4 increase over the lowest preceding value within first 120 minutes =	56	H	≤15ppm

Interpretation

SIBO Suspected - Elevated Hydrogen	Increases of hydrogen greater than 20ppm over the lowest preceding value within the first 120 minutes (+/- 5min deviation) are indicative of bacterial overgrowth.	POSITIVE
SIBO Suspected - Elevated Methane	Increases of methane greater than 12ppm over the lowest preceding value within the first 120 minutes (+/- 5min deviation) are indicative of bacterial overgrowth.	NEGATIVE
SIBO Suspected - Elevated Combined Hydrogen & Methane Gasses	Increases in combined hydrogen and methane gas values greater than 15ppm over the lowest preceding value are indicative of bacterial overgrowth.	POSITIVE

Notes

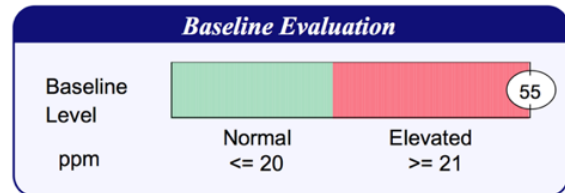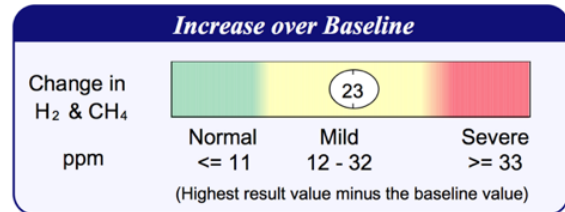The following symptoms were reported during collection:
        None reported.

Here is another example of a late single hydrogen peak. Hydrogen goes from 3 at baseline to 22 at 100 minutes. That is an increase of 19, which is negative according to the 2017 consensus. However, methane is at 11 at 120 minutes, so that is already a positive result. Then it goes up to 13, 17, and 14 at the 140-, 160-, and 180-minute marks. That is positive for methane. This is a 34-year-old male who lived in Argentina for three years. During his initial consult, his main complaints were fatigue, anxiety, and GI issues. He suspected he may have picked up a parasite. He was following a so-called healthy standard American diet, like a low-fat standard American diet I guess. We put him on a Paleo reset diet. By the time he returned for his case review, his fatigue, anxiety, and GI issues were mostly resolved. In this case, it is again a question about whether you treat in that situation. You certainly could, especially given the methane value, but since the diet and other changes pretty much resolved most of his issues, we decided not to treat immediately and just use probiotics and prebiotics to help with gut function. That turned out to be great for him, and he was relatively symptom-free within maybe a six-month period. We always have to remember that SIBO is a clinical diagnosis. The test is enormously helpful in making that determination of whether to treat, but it is not always the final word.

Total Hydrogen and Methane Breath Gases
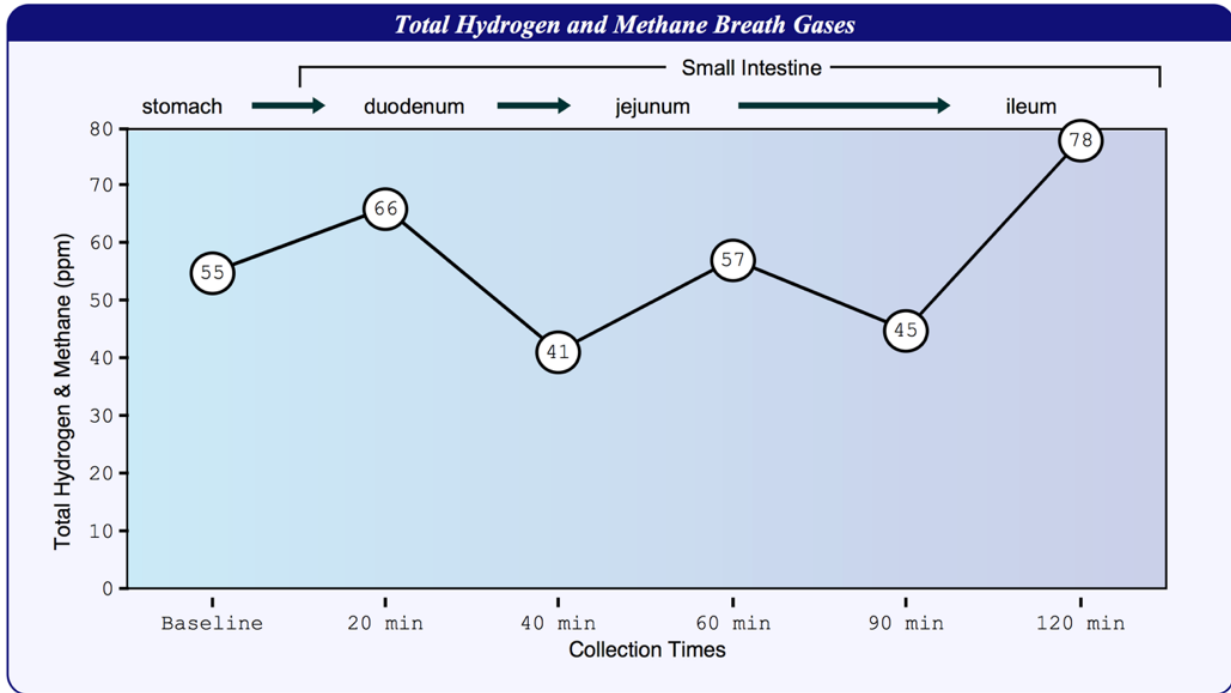
Hydrogen & Methane (ppm)

Minutes	Base-line	20	40	60	90	120
Hydrogen (H_2)	0	1	0	2	1	4
Methane (CH_4)	55	65	41	55	44	74
Total	55	66	41	57	45	78

Increase over Baseline

Change in H_2 & CH_4

ppm

Normal	Mild	Severe
<= 11	12 - 32	>= 33

23

(Highest result value minus the baseline value)

Baseline Evaluation

Baseline Level

ppm

Normal	Elevated
<= 20	>= 21

55

This test was developed and its performance characteristics determined by Genova Diagnostics, Inc. It has not been cleared or approved by the U.S. Food and Drug Administration.

Here's a test that illustrates high baseline methane levels. This is a Genova test, but in this case, the lack of a third hour doesn't really make a difference because you just see the methane baseline level is extremely high at 55. I've seen baseline methane levels over 90 in some cases, which is actually off the chart. You will just see a flat line of methane at the top of the chart. This is certainly pretty severe, but I have seen significantly worse. Oftentimes, in this pattern, you'll see when the patient has really high methane levels throughout the test, you'll see low hydrogen, and that's because the organisms that produce methane, called methanogens, are members of the archaea family, which is not bacteria and not yeast. They are a different class of organism altogether. They consume hydrogen, so in the case of hydrogen-producing bacteria, what happens there is that those bacteria metabolize fermentable carbohydrate, and they produce hydrogen as a byproduct of that metabolism, but with methanogens, they don't consume the carbohydrate. They actually consume the hydrogen that is produced by the

bacteria that ferment the carbohydrates, and that is why you see very low levels of hydrogen often when methane is high. As I've mentioned a couple times now, you'll see methane high typically right off the bat at baseline, and it may stay high throughout the test, or it may bounce around quite a bit like you see here, like a zig-zag line.

This is a 56-year-old female. Her chief complaint was severe acid reflux. She also had fatigue and depression, and she did have slow transit constipation, as you'd expect from this. High levels of methane are known to cause constipation. We're going to talk more about this when we talk about treating SIBO, but studies have shown that when you infuse methane gas into the intestines of rats, it just slows their motility down considerably and causes significant constipation. When you see a patient like this, and one of their complaints is constipation, that will make a lot of sense. If you see a patient like this and you haven't even talked to them yet, you can ask them if they're constipated, and they'll say, wow, how'd you know that because it's almost certain when you see methane levels this high that their motility is going to be impaired.

This woman's complaint was severe acid reflux. If you've read my series on GERD and heartburn, you'll know that I believe it's often caused by SIBO, and that leads to dysfunction of the lower esophageal sphincter, which leads to a reflux of acid into the esophagus, so in this case we did treat her SIBO. We reduced her methane levels, and after a period of time, her GERD completely resolved. This was after she had been on PPIs for over a decade and tried virtually everything that you can imagine for dealing with the GERD. No one had ever suggested that it might be related to SIBO, so she was extremely enthusiastic about the result and just elated that this had finally been resolved because if you have ever suffered from GERD, you know how debilitating and just incredibly difficult it can be. My patients who have severe GERD are just beside themselves, so this was really exciting for us to be able to resolve this for her.