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UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

- - -

ELYSIUM HEALTH, INC.,	:	CASE NO.
Petitioner,	:	IPR2017-01795
	:	
vs.	:	
	:	
TRUSTEES OF DARTMOUTH	:	
COLLEGE,	:	
Patent Owner,	:	

- - -

Oral deposition of JOSEPH A. BAUR, Ph.D.,
taken at Saul Ewing Arnstein & Lehr, LLP, 1500
Market Street, 38th Floor, Philadelphia,
Pennsylvania, on Thursday, April 26, 2018, beginning
at approximately 9:00 a.m., before Maureen E.
Broderick, Registered Professional Reporter and
Notary Public in and of the Commonwealth of
Pennsylvania.

<p style="text-align: right;">Page 2</p> <p>1 APPEARANCES 2 FOLEY HOAG LLP BY: JEREMY A. YOUNKIN, ESQUIRE 3 Seaport West 155 Seaport Boulevard 4 Boston, MA 02210-2600 (617) 832-1000 5 jyoungkin@foleyhoag.com 6 Counsel for Petitioner 7 8 STEPTOE & JOHNSON LLP BY: JAMIE L. LUCIA, ESQUIRE 9 BY: JOHN L. ABRAMIC, ESQUIRE 1 Market Street 10 Steuart Tower, Suite 1800 San Francisco, CA 94105 11 (415) 365-6711 jluca@steptoe.com 12 jabramic@steptoe.com 13 Counsel for Patent Owner 14 15 16 17 18 19 20 21 22 23 24 25</p>	<p style="text-align: right;">Page 4</p> <p>1 - - - 2 JOSEPH A. BAUR, Ph.D., having 3 been first duly sworn to tell 4 the truth, was examined and 5 testified as follows: 6 - - - 7 COURT REPORTER: Stipulations? Will the 8 witness read and sign? 9 MR. YOUNKIN: He'll read and sign. 10 MS. LUCIA: Jamie Lucia for the patent 11 owner, Trustees of Dartmouth College. 12 MR. ABRAMIC: John Abramic for patent 13 owner as well. 14 MR. YOUNKIN: Jeremy Younkin, of Foley 15 Hoag, for the petitioner, Elysium Health, Inc., 16 and the witness. 17 - - - 18 EXAMINATION 19 - - - 20 BY MS. LUCIA: 21 Q Good morning, Dr. Baur. 22 A Good morning. 23 Q Could you please state your full name for 24 the record, please? 25 A Joseph A. Baur, B-A-U-R.</p>
<p style="text-align: right;">Page 3</p> <p>1 EXAMINATION INDEX 2 WITNESS PAGE 3 Joseph A. Baur, Ph.D. 4 By Ms. Lucia 4 5 By Mr. Younkin 48 6 7 8 9 10 (No exhibits were marked at this time.) 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25</p>	<p style="text-align: right;">Page 5</p> <p>1 Q And I gave to you three documents. They 2 have already been marked in our IPR as Exhibit 1001, 3 which is the '086 patent. 4 Are you familiar with that document? 5 A Yes. 6 Q And I gave you Exhibit 1002, which should 7 be the declaration that you submitted in this 8 review? 9 A Mm-hmm. 10 Q And finally, Exhibit 1005, which we've 11 been referring to as the Goldberger reference. 12 A Yes. 13 Q You're familiar with all three of those? 14 A Yes. 15 Q And Exhibit 1002 is, in fact, the 16 declaration that you submitted in this IPR, correct? 17 A Yes. 18 Q I had forgotten a document to give you, so 19 you'll give you one more. I've also given you 20 Exhibit 1007, which I believe we've referred to as 21 Trammell I. 22 You're familiar with that one? 23 A Yes. 24 Q If we could turn in your declaration to 25 paragraph 11, please. It's on page 7 of your</p>

Page 6

1 declaration.

2 A (Witness complies.)

3 Q You're there?

4 A Yes.

5 Q So you see in the first sentence of

6 paragraph 11, you state that: Nicotinamide riboside

7 (NR) is a form of vitamin B3 that has been carefully

8 and clearly documented to be present at a

9 substantial level in milk.

10 Did I read that correctly?

11 A Yes.

12 Q What do you consider to be a substantial

13 level of nicotinamide riboside?

14 A In that case, I meant a level that is

15 robustly detectable, so it couldn't have been an

16 error in the readings in the instruments.

17 Q What do you mean by it couldn't have been

18 an error in the readings in the instruments?

19 A I mean any of the instruments that you

20 would use to detect nicotinamide riboside of a

21 certain level of background noise. So at a certain

22 threshold, there would be some doubt as to whether

23 or not the signal was real. So primarily what I

24 meant here was that we were well above that

25 threshold and there should be no doubt that that was

Page 7

1 nicotinamide riboside.

2 Q Is that referring specifically to the

3 results reported in Trammell I?

4 A Yes.

5 Q Trammell I, Exhibit 1007, that article

6 published after the '086 patent issued, correct?

7 A I believe so. I don't have the date in

8 front of me for the patent to compare.

9 Q It should be on that face of the patent --

10 Exhibit 1001 should have the issue date in the upper

11 right-hand corner.

12 A Yes.

13 Q So Trammell I did publish after the '086

14 patent issued, correct?

15 A Yes.

16 Q And at the time that the Trammell I

17 published, the amount of nicotinamide riboside in

18 milk was not known, correct?

19 MR. YOUNKIN: Objection. Relevance.

20 THE WITNESS: That's correct.

21 BY MS. LUCIA:

22 Q And Trammell I reports very different

23 concentrations of nicotinamide riboside in each of

24 Rock House milk, organic skim milk and conventional

25 skim milk, correct?

Page 8

1 A I'm not sure how to define "very

2 different."

3 Q You report the different results in those

4 three types of milk in paragraph 11 of your

5 declaration, correct?

6 A Yes.

7 Q And how would you characterize the

8 difference between the levels of nicotinamide

9 riboside between those three types of milk?

10 A I guess I would characterize them as

11 different, but I think the word "very" is too

12 subjective to provide a legal definition for whether

13 or not they're very different.

14 Q And does it surprise you at all that

15 they -- that, in the Trammell I reference, they

16 reported different levels of nicotinamide riboside

17 in those three different types of milk?

18 A No.

19 Q Why not?

20 A Because the milk, you know, milk is coming

21 from different cows. There's normal biological

22 variability within about the range that was reported

23 for most things that you would measure in another

24 living organism. So nothing about that surprised

25 me.

Page 9

1 Q The biological variability that you

2 mentioned, how does that impact the activity of the

3 nicotinamide riboside in the milk?

4 MR. YOUNKIN: Objection. Form.

5 THE WITNESS: Presumably its activity is

6 proportional to its concentration, so it would

7 vary but always be present in these samples.

8 BY MS. LUCIA:

9 Q When you said biological variability in

10 the milk, what did you mean by that?

11 A I mean for just about any parameter you

12 can measure in living organisms, if you take a

13 random sampling across a population of different

14 individuals, you'll get a bell-shaped curve of

15 values. So they're just -- you don't get precisely

16 the same answer from two different individuals for

17 almost anything on any given day. So we expect a

18 certain amount of difference between repeat samples.

19 MR. YOUNKIN: Sorry. How do I get this

20 going again?

21 COURT REPORTER: The arrow at the bottom

22 will start the scroll again.

23 Also, there is a charge for the realtime,

24 just so you're aware, Counsel.

25 MR. YOUNKIN: That's fine.

Page 10

1 (Discussion off the record.)
 2 BY MS. LUCIA:
 3 Q So you mentioned the bell-shape curve of
 4 values. By "values," do you mean the amount of
 5 nicotinamide riboside measured in the given milk?
 6 A Right, in this concentration -- in this
 7 example, the concentration of nicotinamide riboside
 8 would be the value I was referring to.
 9 Q And given that bell-shaped curve, is there
 10 any other impact on the activity of the nicotinamide
 11 riboside in the measured samples?
 12 MR. YOUNKIN: Objection. Form.
 13 THE WITNESS: Other than
 14 concentration-dependent changes, I'm not aware
 15 of any reason to think there would be.
 16 BY MS. LUCIA:
 17 Q The Trammell I reference measured only
 18 certain of the NAD+ precursors, correct?
 19 A Yes.
 20 Q So, for example, it did not measure the
 21 tryptophan concentration in the milk samples that
 22 are reported, correct?
 23 A I believe that's true, but I would need a
 24 minute to look at the reference, if you want me to
 25 confirm.

Page 11

1 Q Please go ahead.
 2 I'll also point you to one spot that
 3 you could look, if you would like. On page 3, on
 4 the left-hand column, under Results, the third
 5 sentence there starts: We defined NAD+ precursor
 6 vitamin concentration. And then it goes on to
 7 describe the types of molecules that they're
 8 measuring.
 9 A Yes. I would agree that tryptophan is not
 10 on that list.
 11 Q And tryptophan is the precursor for NAD+
 12 that operates through the de novo pathway, correct?
 13 A Yes.
 14 Q Would you -- if they, if Trammell I had
 15 reported the amount of tryptophan in these milk
 16 samples, how would you have expected that to compare
 17 to the amount of nicotinamide riboside found in the
 18 samples?
 19 MR. YOUNKIN: Objection.
 20 THE WITNESS: I don't actually have a good
 21 answer to that, I'm afraid. I don't know what
 22 the relative concentration of tryptophan in
 23 milk is.
 24 BY MS. LUCIA:
 25 Q So you don't know whether it would

Page 12

1 generally be more or less than the amount of
 2 nicotinamide riboside in the milk?
 3 MR. YOUNKIN: Objection.
 4 THE WITNESS: I don't know for sure,
 5 without looking at a reference. I would expect
 6 the amount of tryptophan to be a little bit
 7 higher, but tryptophan is also not completely
 8 bioavailable for NAD synthesis.
 9 So in terms of saying which one would
 10 contribute more, I couldn't really do that
 11 without spending some time looking at a
 12 reference.
 13 BY MS. LUCIA:
 14 Q What do you mean by you -- in terms of
 15 saying "which one would contribute more," what did
 16 you mean by that?
 17 A So nicotinamide is generally only used for
 18 NAD biosynthesis. Tryptophan is used for protein
 19 synthesis, and a small amount of it is diverted to
 20 de novo NAD biosynthesis. So it's not a fair
 21 comparison to take a molecule of tryptophan and a
 22 molecule of nicotinamide.
 23 Q Fair enough.
 24 And there's no data in Trammell I
 25 regarding the amount of nicotinamide riboside that

Page 13

1 was in the milk used in the Goldberger reference,
 2 Exhibit 1005, correct?
 3 A That's correct.
 4 Q Trammell I also reports that nicotinamide
 5 riboside is bound to some other molecule in milk,
 6 correct?
 7 A Correct.
 8 Q And it reports that, in fact, it doesn't
 9 know which molecule in milk it is bound to, correct?
 10 A Correct.
 11 Q So looking again at paragraph 11 of your
 12 declaration, I'll read it for you: Trammell I
 13 states that the data presented in the article show
 14 that approximately 40 percent of niacin equivalents,
 15 (excluding tryptophan) in cow's milk are present as
 16 NR with the remainder present with nicotinamide.
 17 Did I read that correctly?
 18 A Yes.
 19 Q So that's saying that the amount of
 20 nicotinamide was higher than the amount of
 21 nicotinamide riboside in the milk that they
 22 measured, correct?
 23 A Yes. On average.
 24 Q Do you know, of all the different NAD+
 25 precursor molecules, which of those would have the

Page 14

1 lowest concentration in milk?
 2 A If you're talking about the typical
 3 precursors, which are nicotinamide, nicotinic acid,
 4 nicotinamide riboside and tryptophan, out of those,
 5 nicotinic acid is at the lowest concentration in
 6 milk, according to that reference.
 7 Q Do you agree with that?
 8 A That's the only data I have on the
 9 subject, so I agree.
 10 Q You haven't ever independently checked
 11 yourself as to whether or not those numbers are
 12 correct?
 13 A No.
 14 Q You also have in front of you
 15 Exhibit 1005, the Goldberger reference, correct?
 16 A Yes.
 17 Q In your opinion, this reference
 18 anticipates the claims of the '086 patent?
 19 A Yes.
 20 Q And specifically, if your opinion, the
 21 milk disclosed in the Goldberger reference is a
 22 pharmaceutical composition of nicotinamide riboside,
 23 correct?
 24 A According to the pharmaceutical
 25 definition -- "pharmaceutical composition"

Page 15

1 definition provided in the patent application, then
 2 yes.
 3 Q We'll go back to the definition. Focusing
 4 on the milk disclosed in Goldberger, in your
 5 opinion, it's the NR, or the nicotinamide riboside
 6 in the milk that's the ingredient that's increasing
 7 NAD+ biosynthesis, correct?
 8 MR. YOUNKIN: Objection.
 9 THE WITNESS: I don't think you can prove
 10 that from the available data.
 11 BY MS. LUCIA:
 12 Q Why not?
 13 A Because there are other precursors in milk
 14 that could contribute to NAD biosynthesis, including
 15 nicotinamide and tryptophan.
 16 Q Let's look at paragraph 36 of your
 17 declaration, which is on page 19. In the last
 18 sentence of that paragraph, you state: Thus,
 19 Goldberger, et al. teaches the oral administration
 20 of a composition containing NR that necessarily
 21 increases NAD+ biosynthesis upon oral administration
 22 as required by claim 5.
 23 Do you still agree with that
 24 statement?
 25 A Yes.

Page 16

1 Q So the nicotinamide riboside in milk is
 2 the ingredient that is increasing NAD+ biosynthesis,
 3 in your opinion, correct?
 4 MR. YOUNKIN: Objection. Relevance.
 5 THE WITNESS: I don't think that is
 6 proven.
 7 BY MS. LUCIA:
 8 Q But isn't that what the paragraph 36 of
 9 your declaration says?
 10 A No. I believe that sentence says -- makes
 11 two different statements; one, that nicotinamide
 12 riboside is contained in the milk; and, two, that
 13 the milk increases NAD biosynthesis after
 14 administration, but it doesn't require that the
 15 nicotinamide riboside be the reason for the
 16 increase.
 17 Q So you don't know what is increasing the
 18 NAD+ biosynthesis in the Goldberger reference?
 19 A No.
 20 Q Is it your opinion that milk qualifies as
 21 a pharmaceutical composition, under the claims of
 22 the '086 patent?
 23 A Under the claims of that patent, yes,
 24 based on the definition provided in that patent.
 25 Q And how would you define "pharmaceutical

Page 17

1 composition" in that patent?
 2 A My opinion of how it was meant to be
 3 interpreted in that patent was based on the
 4 dependent claim reciting food, claim number 3, I
 5 believe -- one of the dependent claims reciting food
 6 as an example of a pharmaceutical composition that
 7 would be suitable.
 8 Q Is that definition the same as what you
 9 would understand the plain and ordinary meaning of
 10 that term to be to a person of ordinary skill in the
 11 art?
 12 MR. YOUNKIN: Objection. Relevance.
 13 Foundation.
 14 THE WITNESS: I would find that term to be
 15 too vague to interpret. I would ask for a
 16 clarification, ordinarily, if I heard that
 17 term.
 18 BY MS. LUCIA:
 19 Q You don't have a general view of what the
 20 term "pharmaceutical composition" would mean?
 21 MR. YOUNKIN: Objection. Relevance.
 22 Foundation.
 23 THE WITNESS: No, I think to different
 24 people it can mean different things, and I
 25 would ask for clarification if I was using that

Page 18

1 term.

2 BY MS. LUCIA:

3 Q So let's go to paragraph 24 of your

4 declaration, on page 15. Sorry. It spills from --

5 it crosses page 14 and 15, to be clear.

6 But the last sentence of paragraph 24

7 of your declaration, which does appear on 15, says:

8 In my opinion, a person of ordinary skill in the art

9 in the relevant timeframe (i.e., mid-2000s) would

10 have had a Ph.D. in biology, biochemistry or a

11 similar field.

12 Do you still agree with that?

13 A Yes.

14 Q So using that definition, how would a

15 person of ordinary skill in the art define

16 "pharmaceutical composition" as it appears in the

17 '086 patent?

18 MR. YOUNKIN: Objection. Foundation.

19 It's outside the scope of the opinion.

20 THE WITNESS: Again, I think people of

21 skill in the art would have the same confusion

22 that I do, in that that term has been used to

23 mean very different things, and they would ask

24 for clarification.

25 BY MS. LUCIA:

Page 19

1 Q Clarification with respect to what?

2 MR. YOUNKIN: I don't want to interfere

3 with the deposition. I just have a running

4 objection to this line of questioning.

5 MS. LUCIA: Okay.

6 THE WITNESS: In terms of what would

7 actually constitute a pharmaceutical

8 composition.

9 I've heard it used to mean formulations

10 that are suitable for intravenous injection or

11 to be defined more broadly to include things

12 like food.

13 And I don't think that is consistent

14 enough for one of skill in the art to be

15 confident, without clarification.

16 BY MS. LUCIA:

17 Q When you say that you've heard it to mean

18 formulations that are suitable for intravenous

19 injection, you mean to humans, correct?

20 A Yes.

21 Q So generally speaking, are there any

22 elements of the term "pharmaceutical composition"

23 that you think are universal across the definition

24 of that term?

25 MR. YOUNKIN: Objection. Form.

Page 20

1 Relevance. Foundation.

2 THE WITNESS: I think generally it would

3 be interpreted to always mean something that

4 doesn't harm the molecule being administered

5 and doesn't harm the subject receiving the

6 treatment.

7 BY MS. LUCIA:

8 Q The molecule being administered would be

9 the active agent of the pharmaceutical composition,

10 correct?

11 A Yes.

12 MR. YOUNKIN: Objection.

13 BY MS. LUCIA:

14 Q And in this case, that active agent would

15 be nicotinamide riboside, correct?

16 A Yes.

17 MR. YOUNKIN: Objection.

18 BY MS. LUCIA:

19 Q Continuing, again, to think about your

20 definition of a person of ordinary skill in the art,

21 do you think that person of ordinary skill in the

22 art would think that milk qualified as a

23 pharmaceutical composition?

24 MR. YOUNKIN: Objection. Form.

25 THE WITNESS: I think they would have the

Page 21

1 same question that I did, which was --

2 requiring clarification for whether or not

3 something like that would fit within the

4 definition, because it could depend on who

5 you're talking to and what day, and they would

6 look for support, as you may find in this

7 patent, for what definition was intended in a

8 given document.

9 BY MS. LUCIA:

10 Q But in your opinion, you think that food

11 is a pharmaceutical composition in the context of

12 the '086 patent, correct?

13 A Yes.

14 Q Does that cover all food?

15 MR. YOUNKIN: Objection. Form.

16 THE WITNESS: Yes, I believe so.

17 BY MS. LUCIA:

18 Q So there are no exceptions that you can

19 think of to food that would qualify as a

20 pharmaceutical composition of the '086 patent?

21 A If you'll give me a moment just to verify

22 my memory, but I believe --

23 The dependent claim actually recites

24 food, so I think that, yes, any food would qualify.

25 Q Thinking about milk specifically, in your

Page 22

1 opinion, milk is a food, correct?

2 A Yes.

3 Q So does all milk qualify as a

4 pharmaceutical composition under the '086 patent?

5 A Yes.

6 Q Are there any limitations to that at all?

7 A None that I can think of.

8 Q For example, does it matter what the fat

9 content of the milk is?

10 A No.

11 Q Does it matter how old the milk is?

12 A No, not for it to be defined as a food. I

13 mean, unless it has actually spoiled and would be

14 harmful to the person taking it.

15 Q So in that case, spoiled milk would not be

16 a pharmaceutical composition under the '086 patent?

17 MR. YOUNKIN: Objection. Form.

18 Relevance. Foundation.

19 THE WITNESS: Right. Based on it being so

20 spoiled that it caused harm, I think that would

21 be where it crossed the line, when it became

22 harmful to the subject.

23 BY MS. LUCIA:

24 Q And chewing gum, on its own, also

25 qualifies as a pharmaceutical composition, in your

Page 23

1 opinion?

2 A Yes. Again, for the same reason, based on

3 it being recited in the dependent claim.

4 Q If we could go to paragraph 30 of your

5 declaration, please. You'll find that on page 16.

6 Are you there?

7 A Yes.

8 Q This paragraph just provides your overview

9 of the '086 patent, correct?

10 A Yes.

11 Q And at the bottom of that page, you talk

12 specifically about claim 3 and that it depends [sic]

13 from claim 1, correct?

14 A Yes.

15 Q And you state that claim 3 identifies

16 different forms that the NR-containing formulation

17 can take, correct?

18 A Yes.

19 Q And the formulation that you're referring

20 to there, in paragraph 30, is the pharmaceutical

21 composition of claim 1, where nicotinamide riboside

22 is the active agent, correct?

23 A Yes.

24 Q What is your definition of a "carrier"?

25 A Again, I find that to be a term that's too

Page 24

1 vague to provide a definition without further

2 clarification.

3 Q Do you have an opinion on the definition

4 of "carrier" as it appears in the '086 patent?

5 A I guess just that it doesn't really

6 clarify much for me. I don't see how that

7 definition excludes very much.

8 Q What do you mean by "it doesn't exclude

9 very much"?

10 A Can you remind me where it is?

11 Q I can. You're looking for the discussion

12 of "carrier" in the '086 patent?

13 A Yes.

14 Q I believe you'll find that in column 28 of

15 the '086 patent.

16 A All right. So the patent recites that

17 examples of a pharmaceutically acceptable carrier

18 can be a liquid or solid filler, a diluent, an

19 excipient, or a solvent-encapsulating material.

20 So, to me, that covers almost any --

21 you know, between a liquid and a solid being

22 examples, it covers almost anything you could mix in

23 with a molecule. So I don't really find anything in

24 that definition to make me exclude any formulation

25 as a carrier.

Page 25

1 Q You said that you don't "find anything in

2 that definition to make me exclude any formulation

3 as a carrier"?

4 What do you mean by "any formulation

5 as a carrier"?

6 A I mean any other molecules present, mixed

7 with the nicotinamide riboside. It would be hard

8 for me to read this definition and say that any

9 other molecule mixed with it doesn't qualify as a

10 carrier.

11 Q You're referring to the nicotinamide

12 riboside because that's the active agent in the '086

13 patent, correct?

14 A That's correct.

15 Q I'm going to give you a few more documents

16 here. So I've given you Exhibit 1017, which we've

17 referred to as the Tummala reference, correct?

18 A Yes.

19 Q You're familiar with that reference?

20 A Yes.

21 Q And I've given you Exhibit 1018, which

22 we've referred to as the Canto reference, correct?

23 A Yes.

24 Q You're familiar with that reference?

25 A Yes.

Page 26

1 Q And I've given you Exhibit 1019, which
 2 we've referred to as the Gong reference, correct?
 3 A Yes.
 4 Q You're familiar with that reference?
 5 A Yes.
 6 Q So if we could turn to paragraph 13 of
 7 your declaration, please.
 8 In the first sentence of that
 9 paragraph, you state that nicotinamide riboside,
 10 taken orally, contributes to NAD+ synthesis.
 11 Did I read that correctly?
 12 A I'm sorry. Was that paragraph 13 or
 13 page -- I went to page 13.
 14 Q It's on page 8.
 15 A Yes.
 16 Q And your statement in that first sentence
 17 is based on the data presented in Tummala, Canto and
 18 Gong, correct?
 19 A And many other studies. Those are three
 20 examples.
 21 Q "Many other studies." Can you tell me
 22 what those are?
 23 A Not off the top of my head, but I recently
 24 wrote a review that covered, you know, maybe 30
 25 different papers that showed an increase in NAD

Page 27

1 biosynthesis from oral administration.
 2 Q I'm sorry. Did you say that you wrote a
 3 review or you read a review?
 4 A I wrote a review.
 5 Q Wrote a review.
 6 But you didn't rely on any of those
 7 other references described in that review for
 8 purposes of your declaration in front of you,
 9 correct?
 10 A Right. They were not necessary.
 11 Q So for purposes of your declaration, the
 12 only documents that you're relying on, specifically
 13 in paragraph 13, are the Tummala, Canto and Gong
 14 references, correct?
 15 A Yes.
 16 Q Looking at the Tummala reference,
 17 Exhibit 1017, this reference also published after
 18 the '086 patent issued, correct?
 19 MR. YOUNKIN: Objection. Relevance.
 20 THE WITNESS: Yes.
 21 BY MS. LUCIA:
 22 Q And in this Tummala reference, it reports
 23 the results of supplying mice with a nicotinamide
 24 riboside diet, correct?
 25 A Yes.

Page 28

1 Q And the nicotinamide riboside that was
 2 given to the mice in the Tummala reference, it was
 3 not fed to them as an ingredient in milk, correct?
 4 A That's correct.
 5 Q And there's no data in the Tummala
 6 reference regarding the activity of nicotinamide
 7 riboside in milk, correct?
 8 A Correct.
 9 Q Looking now at Exhibit 1018, the Canto
 10 reference, this reference published in 2012,
 11 correct?
 12 A Correct.
 13 Q This reference also provides some data
 14 regarding nicotinamide riboside, correct?
 15 A Yes.
 16 Q But it also was not -- the nicotinamide
 17 riboside used in the Canto reference was not used as
 18 part of milk, correct?
 19 A Correct.
 20 Q And there's no data in Canto regarding the
 21 activity of nicotinamide riboside in milk, correct?
 22 A Correct.
 23 Q Looking at Exhibit 1019, please, the Gong
 24 reference, the Gong reference published in 2013,
 25 correct?

Page 29

1 A Yes.
 2 Q The Gong reference also includes data
 3 regarding nicotinamide riboside fed to mice,
 4 correct?
 5 A I'm trying to remember the route of
 6 administration for this one. I might need a moment.
 7 Q That's fine.
 8 A Sorry. I found it. It's in the drinking
 9 water in this reference.
 10 Q So the nicotinamide riboside that they
 11 gave to the mice was not as an ingredient in milk,
 12 correct?
 13 A Correct.
 14 Q There were no other compounds added to
 15 the -- excuse me -- no other compounds that were
 16 added to the water, other than nicotinamide,
 17 correct?
 18 A Correct. Nicotinamide riboside.
 19 Q Excuse me. Yes. Thank you. Nicotinamide
 20 riboside.
 21 So there's no data in the Gong
 22 reference regarding the activity of nicotinamide
 23 riboside in milk, correct?
 24 A Correct.
 25 Q Looking at the last sentence of paragraph

Page 30

1 13 in your declaration -- it's on page 9 -- you
 2 state that -- you state: Moreover, several studies,
 3 including Trammell II, have taken the additional
 4 step of incorporating stable isotopes into NR before
 5 dosing, allowing a definitive demonstration that the
 6 orally administered NR is ultimately incorporated
 7 into NAD+ molecules rather than causing an increase
 8 indirectly.

9 Do you see that?

10 A Yes.

11 Q The sentence says "several studies," but
 12 you only cite to Trammell II, correct?

13 A Correct. Um, well, and figure 7, which
 14 may be derived from the same data.

15 Q But that's figure 7 of Trammell II,
 16 correct?

17 A Yes. You're correct. I'm sorry.

18 Q So when you say "several studies," are
 19 there any other studies that you are relying on for
 20 your conclusion that the orally administered NR is
 21 ultimately incorporated into NAD+ molecules rather
 22 than causing an increase indirectly?

23 A We've done several studies in my own lab
 24 that confirm this.

25 Q But those aren't cited here in your

Page 31

1 declaration, correct?

2 A Correct.

3 Q Were you relying on those for purposes of
 4 making that conclusion in the declaration?

5 A No, I don't think they were necessary. I
 6 think the Trammell reference covers it.

7 Q The information regarding NR being
 8 incorporated into NAD+ molecules, that information
 9 is not in the Tummala reference, correct?

10 A That's correct.

11 Q And it is not found in the Canto
 12 reference, correct?

13 A Correct.

14 Q And it is not found in the Gong reference,
 15 correct?

16 A Correct.

17 Q Looking at paragraph 14 of your
 18 declaration, please, the first sentence there says:
 19 The bioavailability of NR taken orally is as great
 20 or greater than that of nicotinic acid or
 21 nicotinamide.

22 Do you see that?

23 A Yes.

24 Q Does the -- in your opinion, does the
 25 bioavailability of NR depend on the form in which it

Page 32

1 is taken orally?

2 A It could, but I don't know. I don't have
 3 evidence to prove that.

4 Q If we could turn to paragraph 15 of your
 5 declaration, please, there's a sentence here in
 6 paragraph 15 that states: The primary forms of the
 7 disease are curable by provision of any precursor
 8 molecule that can be used to synthesize NAD+, i.e.,
 9 nicotinamide, nicotinic acid, tryptophan, or
 10 nicotinamide riboside (or nicotinic acid riboside).

11 Do you see that?

12 A Yes.

13 Q And the disease that you're referring to
 14 there is pellagra, correct?

15 A Yes.

16 Q So in your opinion, pellagra can be cured
 17 with any amount of any of those NAD+ precursor
 18 molecules?

19 MR. YOUNKIN: Objection.

20 THE WITNESS: No, not with any amount.

21 With -- meeting a certain minimum daily
 22 requirement.

23 BY MS. LUCIA:

24 Q Do you know what those daily requirements
 25 are?

Page 33

1 A Not off the top of my head, no.

2 Q Are there specific daily requirements for
 3 each of those precursor molecules?

4 A Yes. They would be different for
 5 nicotinamide and -- nicotinamide and nicotinic acid
 6 would be similar to each other, but different from
 7 tryptophan.

8 Q So if a given precursor molecule met the
 9 certain minimum daily requirement, pellagra could be
 10 cured regardless of what form they take?

11 A Yes.

12 Q Is that also regardless of whether or not
 13 that precursor molecule is bound to any other
 14 molecule?

15 A As long as it's not bound to another
 16 molecule that it can't be released from in the body.

17 Q Can you give me an example of that?

18 A For example, if it was covalently bonded
 19 to another chemical that the body didn't recognize
 20 or couldn't process, it might be inactivated.

21 Q Are there particular molecules that you
 22 can think of that nicotinamide riboside covalently
 23 binds to?

24 MR. YOUNKIN: Objection.

25 THE WITNESS: The obvious example I could

Page 34

1 give is phosphate. In the actual pathway to
 2 NAD biosynthesis, it gets covalently attached
 3 to a phosphate. But that is not an
 4 inactivating reaction. That actually helps it
 5 become NAD.
 6 BY MS. LUCIA:
 7 Q Do you know whether nicotinamide riboside
 8 binds to any other molecules that create an
 9 inactivating reaction?
 10 A I don't know of any examples.
 11 Q So you don't know whether or not it does
 12 bind to any molecules in that way to create an
 13 inactivating reaction?
 14 A I don't know. I presume such molecules
 15 exist, because, you know, these are chemicals and
 16 you can find molecules that will bind to just about
 17 anything. But I can't give you a good example.
 18 Q To the extent such a molecule existed,
 19 that would also exist in the body, for example?
 20 MR. YOUNKIN: Objection. Form.
 21 THE WITNESS: I don't have direct evidence
 22 that there is a molecule in the body that would
 23 inactivate nicotinamide riboside.
 24 BY MS. LUCIA:
 25 Q The last sentence of paragraph 15 of your

Page 35

1 declaration states: Although symptomatic cases
 2 today would be treated with purified precursors in
 3 addition to diet modification, a diet rich in milk
 4 and meat is sufficient to prevent and, in many
 5 cases, treat pellagra, and improvement in diet
 6 quality with particular attention to these
 7 components is the primary recommendation for at-risk
 8 populations.
 9 Do you see that?
 10 A Yes.
 11 Q When you say "purified precursors," that
 12 means an NAD+ precursor molecule without any other
 13 molecules, correct?
 14 A Yeah -- at least enriched. There could be
 15 other molecules in the mixture; for instance, to
 16 compound it into a pill.
 17 Q Do you know what the amount of
 18 nicotinamide riboside in meat is?
 19 A I don't know.
 20 Q Do you know whether nicotinamide riboside
 21 binds to any other molecules within meat?
 22 A I don't know.
 23 Q So you also wouldn't know whether or not
 24 the binding of nicotinamide riboside to some other
 25 molecule in meat would have an impact on

Page 36

1 nicotinamide riboside's effectiveness to treat
 2 pellagra?
 3 MR. YOUNKIN: Objection. Form.
 4 THE WITNESS: No, I don't know the answer
 5 to that.
 6 BY MS. LUCIA:
 7 Q Do you have an opinion on what kinds of
 8 meats are sufficient to prevent and treat pellagra?
 9 A No. Again, I can't think of any case
 10 where I've seen a distinction made on what kind of
 11 meat was used in these studies.
 12 Q For example, you don't know if it's only
 13 red meat?
 14 A That's correct. I don't know.
 15 Q When treating pellagra with diet
 16 modification, as you refer to in paragraph 15, is it
 17 important to include both milk and meat for that
 18 purpose?
 19 A I think, according to the studies of
 20 Goldberger, it probably is not, if you use a high
 21 enough quantity of either one in isolation. But the
 22 recommendation, as given, is to always include both.
 23 MS. LUCIA: Do you mind if we take a quick
 24 break, please?
 25 (Brief recess.)

Page 37

1 BY MS. LUCIA:
 2 Q So before the break, we were looking at
 3 paragraph 15. I'd like to stay there, if you still
 4 are.
 5 We talked about the meat that you
 6 reference in paragraph 15, and I asked you about
 7 whether or not the nicotinamide riboside present in
 8 meat binds to any other molecule, right?
 9 A Right.
 10 Q Do you recall that?
 11 A (Indicating.)
 12 Q I didn't ask you about milk. So do you
 13 know if the nicotinamide riboside in milk binds to
 14 any other molecule?
 15 A I know, from the Trammell reference in
 16 2016, that nicotinamide riboside does bind to
 17 components of milk, but not which components.
 18 Q Do you know whether the binding that
 19 occurs is a covalent bond, like you mentioned
 20 earlier?
 21 A I don't know that, but I presume not.
 22 Q Why do you presume not?
 23 A Because that's a rare thing to have
 24 happen. And in a case where you can measure free
 25 nicotinamide riboside and detect that it's present

Page 38

1 in the milk, if it was covalently binding to
 2 something, I think you would get other degradation
 3 products available in the mass spectrum, and you
 4 would probably see it.
 5 Q Do you know whether or not nicotinamide
 6 riboside binds to any molecule in milk to create an
 7 inactivating reaction?
 8 A I don't know that.
 9 Q I'm going to give you two more references.
 10 So I gave you Exhibit 1020, which you refer to in
 11 your declaration as the "Prevention of Pellagra"
 12 reference, correct?
 13 It's on page 6 of your declaration.
 14 It has the list, and Exhibit 1020 has that
 15 reference, but you can confirm that.
 16 A Yes.
 17 Q And you're familiar with Exhibit 1020?
 18 A Yes.
 19 Q And I also gave you Exhibit 1021, which
 20 has been referred to, quote, "Relation of Diet to
 21 Pellagra Incidence," end quote. Correct?
 22 A Yes.
 23 Q You're familiar with that reference?
 24 A Yes.
 25 Q If we can turn to paragraph 16 of your

Page 39

1 declaration, which is on page 10, and paragraph 16
 2 discusses both Exhibit 1020 and Exhibit 1021,
 3 correct?
 4 A Yes.
 5 Q Looking specifically at Exhibit 1020, that
 6 does not report any information about the amount of
 7 nicotinamide riboside in meat, correct?
 8 A Correct.
 9 Q And it also does not report any
 10 information about the amount of nicotinamide
 11 riboside in milk, correct?
 12 A Correct.
 13 Q In fact, Exhibit 1020 doesn't disclose
 14 nicotinamide riboside at all, correct?
 15 A Correct.
 16 Q On the top of page 11, the first full
 17 sentence there, you say: Meat and milk were
 18 suspected to be the active ingredients, but the
 19 design of the study did not conclusively test this
 20 hypothesis.
 21 Do you see that?
 22 A Yes.
 23 Q What -- "active ingredient" seems like a
 24 strange phrase there. What do you mean by that?
 25 MR. YOUNKIN: Objection to form.

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1 THE WITNESS: I mean -- I'm actually
 2 paraphrasing what was said by the authors in
 3 some of their later papers, where they reviewed
 4 this work, and it was their opinion that, based
 5 on the many dietary modifications they had made
 6 in people, that meat and milk were most likely
 7 the modifications that were correlating with
 8 pellagra prevention.
 9 But at that time, they were not able to
 10 conclusively state that.
 11 BY MS. LUCIA:
 12 Q So "active ingredients" in this context
 13 means an active ingredient of a diet, not an active
 14 ingredient of a pharmaceutical composition, right?
 15 A Yes.
 16 Q In the last sentence of paragraph 16, you
 17 talk about the study reported in Exhibit 1021,
 18 correct?
 19 A Yes.
 20 Q And as part of that Exhibit 1021, they
 21 revealed that households receiving a pint of milk or
 22 30 grams of fresh meat per adult were at
 23 substantially reduced risk of pellagra and that the
 24 risk further decreased with increased access to
 25 either of these foods.

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1 Do you see that?
 2 A Yes.
 3 Q Do you know how much nicotinamide riboside
 4 is present in a pint of milk?
 5 A I don't know.
 6 Q Earlier we talked a little bit about
 7 recommended daily amounts of some of the NAD
 8 precursor molecules, correct?
 9 A Yes.
 10 Q And you stated that you don't know what
 11 the actual recommended daily amounts of those
 12 precursors would be, correct?
 13 A Right.
 14 Q So do you know whether or not the amount
 15 of nicotinamide riboside in a pint of milk would be
 16 more or less than the recommended daily amount of
 17 nicotinamide riboside?
 18 MR. YOUNKIN: Objection.
 19 THE WITNESS: I couldn't say for sure
 20 without looking up the RDA and then actually
 21 reading the Trammell reference and calculating.
 22 BY MS. LUCIA:
 23 Q But that would be possible to do?
 24 A That would be possible to do, yes.
 25 Q Similarly, do you know how much

Page 42

1 nicotinamide riboside is present in 30 grams of
 2 fresh meat?
 3 A I don't know.
 4 Q And do you know whether the amount of
 5 nicotinamide riboside in 30 grams of fresh meat
 6 would be more or less than the recommended daily
 7 allowance of nicotinamide riboside?
 8 A I don't know. I don't know of a suitable
 9 reference to quantify the amount of nicotinamide
 10 riboside in the meat, so I'm not sure I could even
 11 calculate that.
 12 Q So different from with the milk, you
 13 wouldn't be able to calculate it for the meat?
 14 A That's right.
 15 Q Exhibit 1021 doesn't report any
 16 information about the amount of nicotinamide
 17 riboside in milk, correct?
 18 A Correct.
 19 Q It also doesn't report any information
 20 about the amount of nicotinamide riboside in meat,
 21 correct?
 22 A Correct.
 23 Q And, in fact, Exhibit 1021 doesn't contain
 24 any disclosure of nicotinamide riboside, correct?
 25 MR. YOUNKIN: Objection. Form.

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1 THE WITNESS: That's correct.
 2 BY MS. LUCIA:
 3 Q If we could turn to paragraph 21, which
 4 you'll find on page 13, spanning over to page 14 of
 5 your declaration. I'd like to focus specifically on
 6 the language that's on page 14 in that paragraph.
 7 And here you're talking about the
 8 results reported in the Goldberger reference,
 9 correct?
 10 A Correct.
 11 Q And that's Exhibit 1005, correct?
 12 A Yes.
 13 Q And you quote here: It may be concluded,
 14 therefore, that milk contains the black tongue
 15 preventive, but that somewhat more than 30 cc daily
 16 per kilogram of body weight, at least of skim milk,
 17 may be needed to secure complete protection when
 18 used to supplement such a basic diet as our No. 123,
 19 end quote.
 20 Do you see that?
 21 A Yes.
 22 Q Do you know how much nicotinamide riboside
 23 is present in 30 cc's of milk?
 24 A Again, no. Not without calculating it.
 25 Q But you would be able to calculate that?

Page 44

1 A Based on the Trammell reference, yeah, I
 2 could give an approximation.
 3 Q You would use the data reported in the
 4 Trammell reference against the reported recommended
 5 daily allowance of nicotinamide riboside?
 6 A Yeah.
 7 MR. YOUNKIN: Objection. Form.
 8 THE WITNESS: There is no recommended
 9 daily allowance for nicotinamide riboside, but
 10 there is for total niacin.
 11 BY MS. LUCIA:
 12 Q How would you calculate the total daily
 13 allowance for nicotinamide riboside?
 14 MR. YOUNKIN: Objection. Form.
 15 THE WITNESS: I would infer, based on what
 16 we know about its metabolism, that you could
 17 give the number of moles -- the same number of
 18 molecules of nicotinamide riboside as would be
 19 contained in the recommended daily allowance
 20 for niacin.
 21 BY MS. LUCIA:
 22 Q Do you know, then, whether the amount of
 23 nicotinamide riboside in 30 cc's of milk per
 24 kilogram is more or less than the recommended daily
 25 allowance of nicotinamide riboside?

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1 A I don't know.
 2 Q You don't know without calculating,
 3 correct?
 4 A Correct.
 5 Q Exhibit 1005, the Goldberger reference,
 6 does not contain any identification of nicotinamide
 7 riboside, correct?
 8 A Correct.
 9 Q And Exhibit 1005, the Goldberger
 10 reference, also does not contain any identification
 11 of NAD+, correct?
 12 MR. YOUNKIN: Objection. Form.
 13 THE WITNESS: That's correct.
 14 BY MS. LUCIA:
 15 Q The Goldberger reference discloses -- or
 16 discusses feeding milk to dogs, correct?
 17 A Yes.
 18 Q And in your view, that reference and its
 19 disclosures anticipate claim 1 of the '086 patent,
 20 correct?
 21 A Yes.
 22 Q If there were a prior art reference that
 23 described a child drinking a glass of milk, would
 24 that also anticipate claim 1 of the '086 patent?
 25 MR. YOUNKIN: Objection.

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1 THE WITNESS: No.

2 BY MS. LUCIA:

3 Q Why not?

4 A If I can refer back to the claim for a

5 second, just to make sure I say this correctly.

6 So I don't have a good answer to

7 that. I think I was going to say because it

8 required that there was NAD synthesis, which is not

9 true for claim 1. So as it's written for claim 1,

10 that might anticipate, yes.

11 Q I think, in your answer, you were going to

12 say something about claim 5?

13 MR. YOUNKIN: Objection. Form.

14 THE WITNESS: I was trying to --

15 MR. YOUNKIN: I just want to know what the

16 question is.

17 BY MS. LUCIA:

18 Q Sorry. I was confused, 'cause since we

19 had to get the rest of the language, I think that

20 the part where you talk about NAD synthesis didn't

21 come up.

22 So let me ask it this way: So I

23 understand your answer to be that, if there were a

24 prior art reference that described a child drinking

25 a glass of milk, that that would anticipate claim 1

Page 47

1 of the '086 patent, correct?

2 A Yes. Again, I'm not a lawyer, but my

3 understanding of how anticipation works is that that

4 would cause anticipation.

5 Q What about claim 5; would it anticipate

6 claim 5?

7 MR. YOUNKIN: Objection. Form.

8 THE WITNESS: No, it would not.

9 BY MS. LUCIA:

10 Q Why not?

11 A Because there's no proof that the milk

12 drunk by that child was used to synthesize NAD.

13 Q What if the book said that the child was

14 given the milk for insomnia?

15 MR. YOUNKIN: Objection. Form.

16 THE WITNESS: I don't think that would

17 change anything.

18 MS. LUCIA: I'm just going to take five

19 minutes off the record to see if we have

20 anything else.

21 MR. YOUNKIN: Okay.

22 (Brief recess.)

23 MS. LUCIA: I don't have any more

24 questions.

25 MR. YOUNKIN: I'm going to ask that we

Page 48

1 take another break so that I can think about my

2 redirect.

3 (Off the record.)

4 (Brief recess.)

5 - - -

6 EXAMINATION

7 - - -

8 BY MR. YOUNKIN:

9 Q Dr. Baur, if you could turn to page 8 of

10 your declaration, which I believe we've been calling

11 Exhibit 1002, you recall that there was some

12 questions about this paragraph during your

13 cross-examination?

14 MS. LUCIA: I'm sorry. My feed isn't

15 working. What page did you say?

16 MR. YOUNKIN: Page 8 of the report,

17 paragraph 13.

18 (Brief recess.)

19 MS. LUCIA: It's back.

20 BY MR. YOUNKIN:

21 Q Do you recall that there were some

22 questions earlier today regarding paragraph 13 of

23 your declaration?

24 A Yes.

25 Q And the first sentence of paragraph 13

Page 49

1 says that nicotinamide riboside taken orally

2 contributes to NAD+ synthesis, right?

3 A Yes.

4 Q And then you were asked some questions

5 about the studies that are referenced, in the next

6 sentence of that paragraph, right?

7 A That's correct.

8 Q Then in, I guess it's the third sentence

9 of paragraph 13, you refer to Trammell II, right?

10 A Yes.

11 Q So can you explain whether and to what

12 extent Trammell II documents that nicotinamide

13 riboside taken orally contributes to NAD+ synthesis?

14 A So the nicotinamide riboside given in

15 Trammell II contains stable isotopes. So heavier --

16 stable isotopes, so that in a mass spectrometer, you

17 can detect the difference, even though the molecule

18 is chemically identical.

19 And so what was done in Trammell II,

20 which was not done in those other references, was to

21 use this labeled form of nicotinamide riboside and

22 then detect those same labels appearing in the NAD.

23 So that proved that the actual molecule of

24 nicotinamide riboside that was administered ended up

25 in the NAD pool in the tissue.

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1 Q Administered orally?

2 A Yes.

3 Q So in addition to the articles mentioned

4 in the second sentence of paragraph 13, Trammell II

5 also documents that nicotinamide riboside taken

6 orally contributes to NAD+ synthesis?

7 A That's correct.

8 Q There was some questions earlier today

9 about molecules that bind to NR. Do you recall

10 that?

11 A Yes.

12 Q And I just want to make sure I understand

13 your testimony.

14 So you're not aware of any molecule

15 in milk that binds with NR to create an inactivating

16 reaction, right?

17 A That's correct.

18 Q You mentioned, I believe, that the

19 Trammell article that's Exhibit 1007 -- why don't we

20 pull that up -- this article mentions that there is

21 a molecule that binds to the NR in milk, is that --

22 or that binds to NR, rather?

23 A Yes.

24 Q And you said that you presume that that

25 bond is not a covalent bond. Can you explain why

Page 51

1 that is?

2 A Because that would be an unusual thing to

3 see in milk. Since you can detect free nicotinamide

4 riboside, there is probably not a molecule in there

5 that was covalently attaching to it or that would

6 have made a lot of the nicotinamide riboside

7 disappear from the signal in the mass spectrometer.

8 And typically, if either the

9 nicotinamide riboside was meant to be available as a

10 precursor vitamin, which is the hypothetical purpose

11 in the milk, you know, inactivating it, obviously,

12 would be detrimental. You'd be covalently modifying

13 it in a way that would make it no longer the same --

14 it would be detrimental to its activity as a

15 vitamin.

16 Q Even if there was a covalent bond, that

17 wouldn't necessarily inactivate the NR, right?

18 A That's correct.

19 Q There was some discussion of the --

20 discussion of carriers in the '086 patent, earlier

21 today. So I'd like to direct your attention to the

22 patent, which is Exhibit 1001.

23 And then you'll recall that, earlier

24 today, there was a discussion of the end of column

25 28 of this patent?

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1 A Yes.

2 Q So I'd like to direct your attention to

3 the next page, actually, column 29. And the first

4 sentence of this says: Examples of materials which

5 can serve as carriers include sugars, such as

6 lactose, glucose and sucrose.

7 Do you see that?

8 A Yes.

9 MS. LUCIA: Objection to the extent it

10 does not accurately reflect the language in the

11 patent. The sentence is much longer than what

12 is currently on the record.

13 MR. YOUNKIN: Okay. Shall I read the

14 whole sentence?

15 MS. LUCIA: Just stating the objection.

16 You can do however you'd like. It's --

17 MR. YOUNKIN: No, no, I understand.

18 BY MR. YOUNKIN:

19 Q All right. I'll give it a go.

20 All right. So the first sentence of

21 column 29 says: Examples of materials which can

22 serve as carriers include sugars, such as lactose,

23 glucose and sucrose; starches, such as corn starch

24 and potato starch; cellulose and its derivatives,

25 such as sodium carboxymethyl cellulose, ethyl

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1 cellulose and cellulose acetate; powdered

2 tragacanth; malt; gelatin; talc; excipients, such as

3 cocoa butter and suppository waxes; oils, such as

4 peanut oil and cottonseed oil, safflower oil, sesame

5 oil, olive oil, corn oil and soybean oil; glycols,

6 such as propylene glycol; polyols, such as glycerin,

7 sorbitol, mannitol, and polyethylene glycol; esters,

8 such as ethyl oleate and ethyl laurate; agar;

9 buffering agents, such as magnesium hydroxide and

10 aluminum hydroxide; alginic acid, pyrogen-free

11 water, isotonic saline; Ringer's solution; ethyl

12 alcohol; pH buffered solutions; polyesters;

13 polycarbonates and/or polyanhydrides; and other

14 non-toxic compatible substances employed in

15 formulations.

16 It goes on to say: Wetting agents,

17 emulsifiers and lubricants, such as sodium lauryl

18 sulfate and magnesium stearate, as well as coloring

19 agents, release agents, coating agents, sweetening

20 flavor and perfuming agents, preservatives and

21 antioxidants can also be present in the

22 compositions.

23 So returning to the beginning of

24 that, do you know whether or not there are sugars in

25 milk?

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1 A Yes, there are.

2 Q Can you give me an example?

3 A Lactose.

4 Q Is that sugar present in the milk that

5 Goldberger fed the dogs in the article we've been

6 discussing today?

7 A Yes.

8 Q I'd like to return to Trammell I, which is

9 our Exhibit 1007.

10 So earlier today, there were some

11 questions about the different concentrations of NR

12 that were found in the milk that was sampled in this

13 article. Do you recall those questions?

14 A Yes.

15 Q Was there any sample of milk tested in the

16 Trammell article where nicotinamide riboside was

17 absent?

18 A No.

19 Q So the NR was quantified in all samples

20 that were tested?

21 A Yes. To the degree I can find the data

22 presented. In many cases, it's an average, so I can

23 only presume that that's true.

24 Q Let me -- I'll direct your attention, for

25 example, to the second column of page 3 of this

Page 55

1 article, and you see that the paragraph, this

2 paragraph here, pointing to the top paragraph on the

3 right-hand column --

4 MS. LUCIA: The first full paragraph?

5 MR. YOUNKIN: Correct.

6 BY MR. YOUNKIN:

7 Q -- as shown in table 1, in all 19 samples,

8 nicotinamide and NR and no other NAD+ metabolite

9 were quantifiable. Do you see that?

10 A Yes.

11 Q So the NR was quantifiable in all of those

12 samples that were tested, correct?

13 A Yes, that's correct.

14 Q And that's true of the samples that were

15 also tested in the data shown in table 3 of the

16 article, right? Table 3. It's the next page.

17 A Yes.

18 Q In your declaration -- this is on

19 paragraph 11 -- you note, at the bottom of paragraph

20 11, that Trammell I states that the data presented

21 in the article show that approximately 40 percent of

22 niacin equivalents, excluding tryptophan, in cow's

23 milk are present as NR, with the remainder present

24 as nicotinamide.

25 Do you see that?

Page 56

1 A Yes.

2 Q Can you find the part of Trammell I that

3 says that?

4 A It is in the abstract, under Results, the

5 first sentence.

6 Q That was the authors' conclusion, based on

7 the data that they were analyzing, right?

8 A Yes.

9 MR. YOUNKIN: I'd like to just take two

10 minutes, and I'm done.

11 (Brief recess.)

12 MR. YOUNKIN: I have no further questions.

13 MS. LUCIA: No further questions.

14 (Witness excused.)

15 (Deposition concluded at 11:24 a.m.)

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1

2 C E R T I F I C A T E

3

4 COMMONWEALTH OF PENNSYLVANIA :

5 :

6 COUNTY OF PHILADELPHIA :

7

8

9 I, MAUREEN BRODERICK, Registered

10 Professional Reporter - Notary Public, within and

11 for the Commonwealth of Pennsylvania, do hereby

12 certify that the proceedings, evidence, and

13 objections noted are contained fully and accurately

14 in the notes taken by me of the preceding

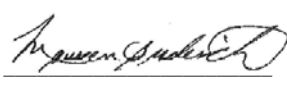
15 deposition, and that this copy is a correct

16 transcript of the same.

17

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21 MAUREEN BRODERICK

22 Registered Professional

23 Reporter - Notary Public

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<p style="text-align: right;">Page 58</p> <p>1</p> <p>2 ERRATA SHEET</p> <p>3 Attach to Deposition of: Joseph A. Baur, Ph.D.</p> <p>4 Taken on: April 26, 2018</p> <p>5 In the matter of: Elysium Health vs. Trustees of</p> <p>6 Dartmouth College</p> <p>7</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">PAGE</th> <th style="width: 15%;">LINE NO.</th> <th style="width: 20%;">CHANGE</th> <th style="width: 50%;">REASON</th> </tr> </thead> <tbody> <tr><td>8</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>9</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>10</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>11</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>12</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>13</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>14</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>15</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>16</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>17</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>18</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>19</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>20</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>21</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>22</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>23</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>24</td><td>_____</td><td>_____</td><td>_____</td></tr> <tr><td>25</td><td>_____</td><td>_____</td><td>_____</td></tr> </tbody> </table>	PAGE	LINE NO.	CHANGE	REASON	8	_____	_____	_____	9	_____	_____	_____	10	_____	_____	_____	11	_____	_____	_____	12	_____	_____	_____	13	_____	_____	_____	14	_____	_____	_____	15	_____	_____	_____	16	_____	_____	_____	17	_____	_____	_____	18	_____	_____	_____	19	_____	_____	_____	20	_____	_____	_____	21	_____	_____	_____	22	_____	_____	_____	23	_____	_____	_____	24	_____	_____	_____	25	_____	_____	_____	
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<p style="text-align: right;">Page 59</p> <p>1</p> <p>2 SIGNATURE PAGE</p> <p>3</p> <p>4 - - -</p> <p>5</p> <p>6 I hereby acknowledge that I have</p> <p>7 read the foregoing transcript, dated April 26,</p> <p>8 2018, and the same is a true and correct</p> <p>9 transcription of the answers given by me to the</p> <p>10 questions propounded, except for the changes, if</p> <p>11 any, noted on the Errata Sheet.</p> <p>12</p> <p>13 - - -</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18 SIGNATURE: _____</p> <p>19 JOSEPH A. BAUR, Ph.D.</p> <p>20 DATE: _____</p> <p>21 WITNESSED BY: _____</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p>																																																																													

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