

In The Matter Of:
Paul Halderson, et al., v.
Star Blends, et al.

Lewis G. Sheffield, Ph.D.
May 30, 2014
Volume 3

Metropolitan Court Reporters, Inc.
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1 STATE OF WISCONSIN CIRCUIT COURT TREMPLEALEU COUNTY
 2
 3 Paul Halderson and Case No. 12-CV-74
 4 Lyn M. Halderson, Code Nos: 30303 & 30201
 5 N17388 County Road T
 6 Galesville, Wisconsin 54630
 7 and
 8 Arctic View Farms, LLC
 9 N17388 County Road T
 10 Galesville, Wisconsin 54630,
 11 Plaintiffs,
 12 vs.
 13 Star Blends LLC
 14 1919 Riley Rd.
 15 Sparta, Wisconsin 54656
 16 and
 17 ABC Insurance Company,
 18 a fictitious company,
 19 and
 20 Northern States Power Company
 21 d/b/a Xcel Energy Services Inc.
 22 1414 W. Hamlin Avenue
 23 Eau Claire, WI 54702,
 24 Defendants.
 25
 26 STATE OF MINNESOTA IN DISTRICT COURT
 27 COUNTY OF CASS NINTH JUDICIAL DISTRICT
 28 11-CV-12-1670
 29
 30 Randall and Peggy Norman, Plaintiffs,
 vs.
 Crow Wing Cooperative Power & Light Company,
 Defendant.
 VOLUME III
 Continuing Video Deposition of LEWIS G. SHEFFIELD, PhD,
 pursuant to Notice of Taking Deposition, and taken
 before John T. Kirby, a Notary Public in and for the
 County of Dakota, State of Minnesota, on the 30th day
 of May, 2014, at 1 South Pinckney Street, Madison,
 Wisconsin, commencing at approximately 8:59 a.m.

1 8:59 a.m. This is Volume III, Disk Number 1, of the
 2 Continuing video deposition of Dr. Lewis G. Sheffield,
 3 taken by Defendant Northern States Power Company in the
 4 matter of Paul Halderson, et al, versus Star Blends LLC,
 5 et al, State of Wisconsin, Circuit Court, Trempealeau
 6 County, Case Number 12-CV-74. And also noticed in the
 7 matter of Randall and Peggy Norman versus Crow Wing
 8 Cooperative Power and Light, State of Minnesota, County
 9 of Cass, Case File Number 11-CV-12-1670.
 10 The deposition is being taken at the Law
 11 Firm of Boardman and Clark, Madison, Wisconsin.
 12 My name is Todd Campbell. I am the video
 13 technician with Haskins Media Services, Apple Valley,
 14 Minnesota 55124.
 15 Will counsel please note their appearances
 16 after which the court reporter will swear in the witness.
 17
 18 MR. LAWRENCE: For the Plaintiff Halderson,
 19 et al, Attorney Scott Lawrence, and for the Plaintiff
 20 Norman, Scott Lawrence, and on the telephone listening is
 21 Charles Bird. Also appearing working for Haldersons is
 22 Dr. Theresa Peterson.
 23 MR. THORNTON: Do you want to tell him
 24 about Carlson?
 25 MR. LAWRENCE: Yeah. Thank you. I have an
 26 e-mail yesterday from Attorney Paul Carlson representing
 27 the Defendant in the Norman case that says, "Scott:
 28 Because we have motion hearings tomorrow, I will not be
 29 at the Sheffield deposition tomorrow." Just put that on
 30 the record.

1 APPEARANCES: Scott Lawrence, Esquire, of the LAWRENCE
 2 LAW OFFICE, S.C., 403 South Fourth Avenue, P.O. Box 117,
 3 Saint Nazianz, Wisconsin 54232-0117, 920-773-2811,
 4 ATTORNEYS@LDLAWSTN.COM, appeared representing the
 5 Plaintiffs, both captions.
 6
 7 Timothy R. Thornton, Esquire, of the firm
 8 of BRIGGS & MORGAN, 2400 IDS Center, Minneapolis,
 9 Minnesota 55402, 612-977-8400, tthornton@briggs.com,
 10 appeared representing Defendant NSP/Xcel Energy.
 11
 12 Charles A. Bird, Esquire, of the firm of BIRD,
 13 JACOBSEN & STEVENSON, PA, 305 Ironwood Square, 300
 14 Third Avenue SE, Rochester, Minnesota 55904, charles@-
 15 birdjacobsen.com, telephonically representing Plaintiff
 16 Norman.
 17 ALSO PRESENT:
 18 Theresa A. Peterson, DVM.
 19 VIDEOGRAPHER:
 20 Todd S. Campbell, CLVS VT, Campbell Legal
 21 Video Company, 417 Heather Lane, Fredonia, Wisconsin
 22 53021 262-447-2199, schedule@campbelllegalvideo.com.
 23 EXHIBITS
 24 298 140-3 299 140-16 300 142-11 301 143-19
 25 EXAMINATIONS
 26 By Mr. Thornton: 118, 160.
 27 By Mr. Lawrence: 137-162.
 28
 29 MR. CAMPBELL: We are on the record.
 30 Today is Friday, May 30, 2014. The time is approximately

1 MR. THORNTON: Tim Thornton representing
 2 Northern States Power Company.
 3
 4 LEWIS G. SHEFFIELD,
 5 a witness in the above matter,
 6 after having been first duly sworn,
 7 testified under oath as follows:
 8
 9 CONTINUING RE-DIRECT EXAMINATION
 10
 11 BY MR. THORNTON:
 12
 13 Q Dr. Sheffield, can you please explain the difference
 14 between the first Part III study that you did of proteins
 15 and the second study that you did by yourself with
 16 Messenger RNA?
 17 A There were quite a few differences. The biggest one was
 18 what the N point was. The first study we were looking at
 19 more functional, if I can describe it that way,
 20 functional assays, such as the lymphocyte blastogenesis
 21 assay or chemiluminescence assays, and actual protein
 22 levels in the blood.
 23 The second study was looking at Messenger
 24 RNA, which is a much earlier state of affairs in
 25 regulating gene expression.
 26 Q Is it fair to say that the Messenger RNA is what turns on
 27 the proteins that become the antibodies?
 28 A In a sense, that's correct. The Messenger RNA encodes
 29 the sequence of the proteins. There's actually several
 30 ways of increasing the level of protein in the blood.

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1 It's not just antibodies, it can be any protein that
2 you're detecting.
3 One of the methods - one method that the
4 cell uses would be to increase the Messenger RNA level.
5 It is not the only method, but it is a method.
6 Q And there's a relationship, but not a direct
7 relationship, between the Messenger RNA and the protein
8 in the blood?
9 A Often, yes. There are specific cases where regulation
10 occurs by other pathways, but usually there is some
11 relation.
12 Q And I asked you this last time, but in re-reading the
13 deposition transcript, I'm not still sure I understand
14 it. What's the difference between an activity change and
15 an expression change?
16 A I believe what you're referring to is this: Expression
17 is the level of a protein that is present. Activity is
18 its ability to carry out a particular function. For
19 example, some enzymes in the body are regulated not by
20 how much enzyme is there, but by how active the enzyme
21 is. For example, some of the enzymes called protein
22 kinases, these enzymes are present, but often turned off,
23 and some signal then turns them off. At least I believe
24 that's what you're referring to there as an activity,
25 whereas, the expression is the actual amount of it
26 present.
27 Q So, they might be present in the bloodstream, but not
28 turned on, so to speak, so not in an invading fighting
29 mode?
30 A That depends very much on the protein. Some proteins are

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1 regulated as to their activity and some are not.
2 Q And as I understand the second study, there was no within
3 animal samples taken or samples analyzed?
4 MR. LAWRENCE: Object to form.
5 A There was no repeated samples analyzed, if that's what
6 your asking.
7 Q Well, did you do a before and after on cow X, Y, Z?
8 A I believe we did collect the samples, but I don't think
9 we ever analyzed them.
10 Q And that's not the best way to analyze the data, is it?
11 A It's probably preferable to do a before and after study,
12 I would say, that's correct.
13 Q And on the first study, the Part III study, Mr. LeMire,
14 he was a statistician, is that correct?
15 A That's what he did on the study.
16 Q And you did the second study, the study you did on the
17 Messenger RNA, without a statistician?
18 A That's correct.
19 Q Now, take a look at 279, doctor.
20 A Okay.
21 Q And the pages aren't - well, the pages are numbered.
22 Page 37.
23 A Page 37. Okay.
24 Q And that's comparing a particular Messenger RNA - or, no,
25 that's comparing a protein between the two groups, the
26 control group and the test group?
27 A Let me orient myself here. Yes, that's correct.
28 Q And that's IgA serum?
29 A Correct.
30 Q And you do have a statistically significant difference

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1 between the treatment group and the control group of
2 .003?
3 MR. LAWRENCE: You left off a zero, Tim.
4 Q I'm sorry?
5 MR. LAWRENCE: Point triple zero 3.
6 Q Oh, excuse me. You're right.
7 A IgA serum. That is what this analysis shows, yes.
8 Q So that shows that, at least as related to IgA serum,
9 these cows were not random, but quite different?
10 MR. LAWRENCE: Objection. Form.
11 A It says they were different. Whether that implies not
12 random or not, I don't know.
13 Q Well, isn't the point in randomly selecting them is to
14 try to get two as similar groups as possible for
15 comparative purposes?
16 A Yes.
17 Q And at least as it relates to IgA serum, these groups are
18 not similar?
19 A In that respect, they were not.
20 Q And without having the before and after samples analyzed,
21 you can't make a covariant comparison with a group of
22 animals that you analyzed in the second test, can you?
23 A I wouldn't know how it could.
24 Q And one of the major factors that could influence the
25 comparison between the treated group and the control
26 group after is the starting point for those groups?
27 A That would seem correct.
28 Q And just so I'm clear, define for me what covariant
29 means.
30 A It's a statistical term. It means varying together.

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1 Q And block design is the statistical method that tends to
2 factor out differences between the sampling times, for
3 example?
4 A I think that's - I think what you're trying to get at is
5 correct.
6 Q Why don't you get at it so it is correct?
7 A If we have the - basically, the same thing repeated
8 several times, we have a group of, say, four cows we do
9 an experiment and we do the same experiment on another
10 four cows. A block design would allow removing any
11 difference between the two times.
12 Q So, if one was done during the summer and one done during
13 the winter, there would be some differences that were
14 associated with ambient temperature?
15 A Yes.
16 Q And where they were in the stage of the feed bins?
17 A Possibly.
18 Q And the whole point of the block design is to factor out
19 those differences?
20 A Yes.
21 Q And did you imply a block design in the Part III study?
22 A No.
23 Q Did you imply a block design in the study you did by
24 yourself?
25 A Oh, excuse me. I got those backwards. The Part III
26 study, meaning the one that these data came from?
27 Q The one you did with Dr. Reinemann.
28 A Dr. Reinemann. Okay. The answer to that question is,
29 yes. I'm sorry. And the answer to your second question
30 is no.

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1 Q Because that was done on one group of animals at one
2 time?
3 A Correct.
4 Q So the control group and the test group experienced the
5 same external factors?
6 A As close as we could manage it.
7 Q What is it, an array analysis?
8 A That's the method of detecting the Messenger RNAs.
9 Instead of looking at them one at a time, we looked at
10 them basically all at once, in the one assay.
11 Q And that was another difference between the original Dr.
12 Reinemann U study and the study you did alone, is that an
13 array analysis was only used on the second study, not the
14 first?
15 A That's correct.
16 Q And is that going to create some differences in the two
17 studies?
18 A Well, you're measuring very different things.
19 Q And in terms of the administration of electricity in the
20 second test, were you responsible for that?
21 A I did not design the method to do it, I implemented it,
22 if that's what you mean.
23 Q So you, physically - -
24 A I physically put the device on the animals.
25 Q And that was another difference between the first test
26 and the second test, is that you weren't involved in the
27 administration of the electricity in the first test?
28 A No, I was not.
29 Q Can you draw any conclusions to a reasonable degree of
30 scientific certainty from the Part III test, the first

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1 test that was done with Dr. Reinemann?
2 MR. LAWRENCE: Object to form.
3 A To a reasonable degree of scientific certainty, I would
4 be uncomfortable drawing any strong conclusions from
5 that. We saw some possible differences that were fairly,
6 in my opinion at least, modest in terms of what those
7 measures are.
8 Q Can you draw any conclusions to a reasonable degree of
9 scientific certainty from the second test, the test that
10 you did?
11 MR. LAWRENCE: Same objection. Form.
12 A I would make the same comment.
13 Q And in terms of milk production, were there any
14 differences in the Part III test in terms of comparing
15 the milk production of the control group and treatment
16 group?
17 A Not that I recall.
18 Q And in the second test, the test that you did?
19 A Not that I recall.
20 Q What about the behavioral responses, was there any
21 difference in behavioral responses between the control
22 group and the treatment group in the first test, Part
23 III?
24 A I don't recall ever seeing any actual data on that. I
25 don't recall any specific behavioral differences either.
26 Q What about in the second test, the test that you did?
27 A I didn't notice any.
28 Q And the Messenger RNA gene paper, that wasn't even
29 submitted for publication, was it?
30 A No. Not to my knowledge. I think I would remember

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1 submitting it.
2 Q And is there a difference between cow trainers and the
3 duration and the dose of electricity and the duration and
4 the dose of electricity that you and Dr. Reinemann were
5 administering in your two tests?
6 A Yes.
7 Q Can you explain that?
8 A Well, there's a lot of differences. Does everyone here
9 know what a cow trainer is? Do I need to explain that?
10 Q I'm sure the jury doesn't.
11 A Should I explain what a cow trainer is? Or will someone
12 else do that?
13 Q Please.
14 A Okay. In stanchion barns, a major goal is to keep the
15 cows clean. That's a goal at any dairy operation. The
16 cleaner the cows, the better the quality of milk, the
17 fewer cases of mastitis and so forth.
18 A cow trainer is designed to train cows to
19 avoid defecating in the stall and defecating in the
20 gutter behind the stall. When cows defecate, they often
21 hunch their back. The cow trainer prevents the cow - or
22 trains the cow to not do this by delivering an electrical
23 shock when she contacts a metal bar. So there's a metal
24 bar above the back of the cow, adjusted for each cow to a
25 certain height. And when the cow hunches to defecate,
26 she contacts the bar that delivers an electrical shock.
27 This is strong - not strong enough to
28 actually harm the cow, at least it's not thought to harm
29 the cow by most dairy producers, but it is strong enough
30 to cause an avoidance behavior so she will avoid making

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1 that contact.
2 Q Train the cow to crap in the alley rather than crap in
3 the stall?
4 A That's the idea. Now, what this is doing is delivering a
5 very short-term, very intermittent and avoidable
6 exposure. And it's a fairly high voltage; I don't know
7 just what the voltage on those things are. They're
8 often, I think, powered just by electric chargers.
9 I know - I've never contracted one. People
10 who have, tell me it's to humans fairly painful. On the
11 other hand, the exposures that we used were much, much
12 lower, and they were unavoidable exposures. The cow
13 could not modify her behavior to avoid them, but they
14 were a much lower level of exposure, but prolonged
15 exposure as opposed to intermittent exposure, which is
16 given by the trainers.
17 Q So, in terms of symptoms, behaviors, milk production of
18 cows that are subject to the trainers, you can't draw a
19 comparison to cows that are subject to low levels of
20 electric current, can you?
21 MR. LAWRENCE: Objection to form.
22 A I would be very hesitant to draw a correlation or an
23 inference there.
24 Q 278. On the first page there, there's typed in numbers
25 and handwritten numbers. Do you know what the difference
26 between the two are?
27 A I do not know.
28 Q And, for example, with the interleukin 1, pg/ml, the
29 picograms per microliter, I think. The typed number is
30 .071, which is not statistically significant, and the

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1 handwritten number is .0175, which is statistically
2 significant. What is the difference between the two, do
3 you know?
4 A I do not know where - what those numbers, those second
5 numbers, the handwritten numbers, are from, or what they
6 represent.
7 MR. LAWRENCE: Just for the record, I think
8 the unit is picograms per milliliter, not microliter.
9 Q You're right. Sorry. 282. Is that a document that you
10 recall ever seeing? On the first page it says, "Lewis
11 Sheffield requested these summary statistics."
12 A One moment, please. It appears to be something like I
13 might have requested. This was a long time ago, so I
14 don't specifically recall that, but I probably have seen
15 it before.
16 Q And this was an effort to just generally show that, as to
17 the parameters indicated on the second page, that these
18 cows are random enough?
19 A That's one of the reasons. Another reason is just - I
20 thought it was important to just have an idea of what the
21 basic characteristics were, such as their days in milk,
22 their milk production and such.
23 Q Was this at the beginning of the study or after the study
24 had been administered?
25 A (No response).
26 Q The note, there's a second - a third - I guess it's the
27 third page that has some different numbers.
28 A I don't recall.
29 Q And the one thing that struck me, if you look on the -
30 it's not numbered but it's the third page in the group,

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1 cow 4212, she has a somatic cell count of zero. That's
2 impossible, isn't it?
3 A What that would mean is, it is just below detection
4 levels. She would have had a very low somatic cell
5 count. Because that would be unusually low, especially
6 for this herd.
7 Q What's the difference between 286 and 251?
8 A Very little. It appears there might have been some
9 editorial wordy changes.
10 Q It appears to me like 286 is like an iteration of what
11 ultimately became 251.
12 A That's quite possible.
13 Q But to the best of your knowledge, 251 was your final
14 draft of your report, "Impact low AC currents on immune
15 function of dairy cattle"?
16 A I believe that is correct.
17 MR. LAWRENCE: For the record, sorry for
18 interrupting. Just so it's clear now, I believe 251 is
19 the copy Dr. Sheffield brought for the first deposition,
20 and 286 is one I printed off from the disk, I believe. I
21 think we're agreed on that.
22 Q I agree.
23 MR. LAWRENCE: Okay. Very good.
24 A They're different iterations of the same document, and I
25 can't say for certain which is the older or the newer of
26 the two, but they appear to be iterations of the same.
27 Q Well, for example, if you look at the second page of 286,
28 in the second paragraph under Animals, there's a wording
29 change, 'was' was changed to 'were.'
30 A Yes.

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1 Q And then it's 'were' in the later document, or in the
2 251 anyway.
3 A Yes.
4 Q All right. Focus on 251. The conclusion of your report
5 is that, "Four possible changes were noted: A slight
6 increase in interleukin Number 1, Messenger RNA 2, a
7 moderate decrease in interleukin 2 and 3, a moderate
8 increase in interleukin 2 and number 3, interleukin 10
9 Messenger RNA, and a decrease in IgA related to Messenger
10 RNA."
11 A Where exactly are we at?
12 Q I'm reading in the middle of the Abstract.
13 A The middle of the Abstract.
14 Q The third sentence begins, "However."?
15 A I think what I heard you say is not quite right.
16 Q What is quite right?
17 A I thought I heard you say an increase in interleukin 2.
18 It should be a decrease in interleukin 2.
19 Q Okay.
20 A But I could have misheard.
21 Q But anyway, that "However" sentence, that's the bottom
22 line of your findings?
23 A "However" sentence?
24 Q "However, four possible changes were noted."
25 A Yes. Okay. I see where you're at now. Yes.
26 Q And when the immune system is turned on by an invader to
27 the body of a cow, there's other things that happen, like
28 swelling, inflammation, temperature changes, things like
29 that?
30 A Oftentimes, yes.

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1 Q When a cow is responding to an infection, for example?
2 A One usually sees that, yes.
3 Q And did you see any evidence of these other immune
4 responses, symptoms, associated with the electrical
5 treatments that were being administered?
6 A I did not note any.
7 Q And when you say in the last sentence of the Abstract,
8 "These results suggest that electrical effects on disease
9 processes are likely to be modest," there's significance
10 to you using the word "suggest" in a scientific paper as
11 opposed "indicate" or "established," isn't it?
12 A I would say a word like "established," in my opinion,
13 would be a stronger word to use. That's what I would
14 suggest. But language is not always my best suit.
15 Q Well, based upon the data that you assembled as a result
16 of this test, you couldn't say anything was established,
17 could you?
18 A I would not use the word "established" in this context.
19 Q And then, on the second page of 251, - it's not numbered
20 - the last two paragraphs talk about the methodology that
21 was used to deliver the voltage, correct?
22 A Correct.
23 Q And you washed the patch of skin, shaved the hair, washed
24 it again and dried it and then attached the electrode?
25 A Yes.
26 Q That would be different than any exposure to electricity
27 in a barn that an animal receives, certainly in a
28 free-stall barn?
29 A Well, there was a reason we did that. But, yes, the
30 method of exposure would be different in the sense, for

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1 example, there's no layer of hair left. In order to
 2 deliver a really accurate current, we shave the hair and
 3 put an electrode directly on the skin rather than having
 4 it go through the hair, which would introduce a varying
 5 amount of resistance.
 6 Q Depending on the hair on the animals?
 7 A And how dirty it was and how wet it was and many other
 8 factors.
 9 Q Whereas, in a free-stall barn, if the cow wants to avoid
 10 the source of any electricity, it can just walk away?
 11 A Not always.
 12 Q When can't it?
 13 A For example, if it is coming through a water bowl, the
 14 cow still has to drink. But in terms of other places,
 15 like if it was on a railing or something that the cow
 16 would not need to contact to live, like a water bowl,
 17 yes, they could generally avoid that.
 18 Q And then, if you look on the third page, under Results
 19 and Discussion, you come to the conclusion that, "Milk
 20 production was unaffected by current exposure, ...and
 21 behavior of the cows was not noticeably affected?"
 22 A Yes.
 23 Q And the next paragraph - excuse me, the last paragraph on
 24 that page, you say, "Several major questions are raised
 25 by these results. Most measures were not affected,
 26 suggesting that those could be Type 1 errors, due to a
 27 large number of hypotheses tested." What are you saying
 28 there?
 29 A As in any experiment, no matter how big a difference is,
 30 you always have to acknowledge the possibility that you

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1 could be wrong, and the more things you test, the more
 2 likely you will be to find what's called a Type 1 error.
 3 I think I've explained what this is before.
 4 Q You have.
 5 A That is basically saying there's a difference when
 6 there's really not. There's some statistical ways that
 7 are sometimes used to account for that, and there's a lot
 8 of - at least it's my understanding, as a non--
 9 statistician, there's a lot of debate among statisti-
 10 cians as to how to do that, how to best control for that.
 11 Q Because you sampled almost a hundred different variables,
 12 the chances of an error is increased as opposed to if you
 13 were sampling one or two variables?
 14 A Yes.
 15 Q Each sample has a 5% chance of being wrong?
 16 A I'm not sure that's exactly the way that it's defined
 17 statistically, but that's the way it's often described.
 18 That's if you set your significance at 5%, which is
 19 typical in scientific literature, by the way.
 20 Q But if you're testing for one variable, the results from
 21 the test are going to be a lot more valid than if you're
 22 testing for almost a hundred?
 23 MR. LAWRENCE: Object to form.
 24 A You are stretching my knowledge as statistic here. But
 25 if you're testing for one variable and you set your P
 26 value at .05, there is a 5% chance of a Type 1 error. If
 27 you test for 10 variables and each one is at .05, there
 28 is something more than a 5% chance that at least one of
 29 them will be.
 30 Q Okay. You go on to say, "However, three variables were

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1 also identified in a previous study, suggesting the
 2 possibility that these could be real effects." Given the
 3 differences between the study you did by yourself and the
 4 study that you did with Dr. Reinemann, both what was
 5 looked at, how it was looked at, when it was looked at,
 6 how can you even make comparisons between the two?
 7 A That's why I would use a word like "suggest" rather than
 8 "show" or "define." They are measuring things that have
 9 a relationship, but they are not exactly the same thing.
 10 I'm trying to think of a good example.
 11 Q Apples and oranges are both fruits, but they're not the
 12 same fruit?
 13 A I'm trying to think of one a little better than that. In
 14 the first study we measured the protein, in the second
 15 study we're measuring a factor that - one of several
 16 factors that induces production in the protein.
 17 Q Well, not only are you looking at different things,
 18 you're looking at them in a different way, aren't you?
 19 In one, you're using an array analyzer and the other
 20 you're using assays?
 21 A You have to look at them in different ways, because one
 22 is a protein, one is a Messenger RNA. You can't use the
 23 same methods to detect them. They are different
 24 measures. And so there is also the possibility that
 25 you're not measuring the same thing.
 26 MR. LAWRENCE: Let the record reflect, we
 27 just lost the connection with Mr. Bird. He's up in
 28 northern Minnesota somewhere. Maybe I'll try him a
 29 little later.
 30 MR. THORNTON: Or maybe this deposition

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1 just put him to sleep.
 2 MR. LAWRENCE: Knowing Mr. Bird, I doubt
 3 that.
 4 Q The last sentence, carryover sentence, "However the
 5 possibility exists that such small changes in immune
 6 function over a long period of times could have important
 7 consequences for disease resistance, particularly when
 8 considered over long periods." That's speculation, isn't
 9 it?
 10 A Yes.
 11 MR. LAWRENCE: Object to form.
 12 Q Is it fair to say that the only conclusion that you
 13 really drew from this study is that more research is
 14 needed?
 15 A That would be the only one I would feel safe about
 16 saying.
 17 Q Take a look at 250.
 18 MR. LAWRENCE: Here you go.
 19 Q Which is the study that you and Dr. Reinemann did
 20 together. And this was submitted to the Minnesota Public
 21 Utilities Commission?
 22 A I believe so.
 23 Q Was it submitted to anybody else?
 24 A I do not know.
 25 Q And again, if you look at the last sentence of the
 26 Abstract, it says, "Collectively, these results suggest
 27 that exposure to 1 milliamp of current for two weeks had
 28 no significant - -
 29 MR. LAWRENCE: Mr. Bird's returned.
 30 MR. THORNTON: Mute your phone, Charlie,

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1 please.
 2 Q The last sentence of the Abstract says, "Collectively,
 3 these results suggest that exposure to 1 milliamp of
 4 current for two weeks had no significant effects on
 5 immune function of dairy cattle." Do you have any reason
 6 to take issue with that conclusion?
 7 A Based on all I know at the moment, no.
 8 Q And if you look at page 9 of the table, the - I can't
 9 pronounce it, con - -
 10 A Concanavalin A.
 11 Q And the next one underneath that?
 12 A Phytohemagglutinin.
 13 Q Those are in bold. Why is that?
 14 A I don't recall. I - -
 15 Q Go ahead. Go ahead.
 16 A As my - I said that, I'm thinking that they're bolded
 17 because there was some discussion about maybe there being
 18 two of the main measures to look at. But I could be
 19 wrong about that. I shouldn't speculate like that,
 20 because I really don't remember why those would be
 21 bolded.
 22 Q The bolding for the staph. aureas P value number of .038
 23 is because that is statistically significant?
 24 A Probably.
 25 Q And if we look at Page 11, - by the way, what's the
 26 difference between the Table 2 on page 9 and Table 3 on
 27 page 11? They appear to be the same response variables,
 28 but different numbers associated with it.
 29 A Yes. These were different experiments. Table 2 is the
 30 voltage exposure. The control group was given no volt-

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1 age, the treatment group was given 1 milliamp current.
 2 Table 3 reports what we refer to as the positive control
 3 experiment. I think I've described this already, but
 4 I'll do it again in case I haven't.
 5 Q You did describe it, but it may be a function of - I have
 6 a little difficulty reading it and understanding it. So
 7 give it another shot.
 8 A It's an - the idea is, if we were wanting to measure a
 9 change in immune function, could we even do it? If we
 10 gave something that we know is a stress to the animal,
 11 would that affect our immune function measures? That was
 12 the idea.
 13 Q Is that the dexamethasone?
 14 A Yes, the method we chose, I vaguely recall some
 15 discussions about this. And the method we chose is a
 16 fairly classic method of injecting the animals with a
 17 drug called dexamethasone. Dexamethasone is a synthetic
 18 glucocorticoid. This is a hormone produced by the
 19 adrenal gland in response to a number of signals, but
 20 among them, stress. Among its many properties is it
 21 strongly suppresses certain aspects of the immune
 22 function. It's the type of drug that's often, or used to
 23 be used to treat arthritis. Sometimes people with
 24 arthritis will have dexamethasone or glucocorticoid
 25 injections into joints. So, it's that kind of drug.
 26 So, what we did here was to inject the
 27 animals with dexamethasone, make our various measure-
 28 ments, and we see, for example, the concanavalin A,
 29 blastogenesis is affected, the IgG is affected, IL1 is
 30 affected, and as you'd expect cortisol is decreased.

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1 Q And that's the result of the injection and not the result
 2 of any electricity?
 3 A Yes. There was no electricity used in the results of
 4 Table 3.
 5 Q That's all I have.
 6
 7 **FURTHER RE-CROSS EXAMINATION**
 8
 9 **BY MR. LAWRENCE:**
 10
 11 Q Okay. That was short. Good. Dr. Sheffield, could you
 12 go back to exhibit 251, and I believe it's in front of
 13 you, the very last page of the exhibit.
 14 A I've got it, yes.
 15 Q This table (indicating). And do we have exhibit 254
 16 before you there, too? If not, I'll get one out of my
 17 set if you don't have one.
 18 **MR. THORNTON:** I'll get it.
 19 Q Thank you. Let's go to the second page of 254, that's
 20 that long spreadsheet of the measurements taken for the
 21 various variables for the treatment and control of cows.
 22 Do you recall that?
 23 A Okay. Yes.
 24 Q And in Table 1 on exhibit 251, that is that last page you
 25 have in front of you, you have the fold recorded for each
 26 gene, correct, or just about every gene anyway?
 27 A Yes.
 28 Q And then, referring to the second page of Table 254, I'd
 29 like to go through a few of those with you as they relate
 30 to some of those lower P values.

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1 **MR. THORNTON:** Just for the record, I'm
 2 going to object. This is way beyond the scope of
 3 re-direct.
 4 Q Okay. But anyway, on IgJ, for example, in Table 1 on
 5 251, you have loaded a fold of 0.43, correct?
 6 A That's what I see here, yes.
 7 Q And IgJ, the fold noted in those - those bottom four
 8 lines, which you weren't sure whether they were your work
 9 or not, the fold is also recorded as 0.43, at least to
 10 two digits, correct?
 11 A That looks right.
 12 Q With respect to IgA HC, or the heavy chain, the fold in
 13 Table 1, exhibit 211, which came out of your file of the
 14 first deposition, the fold is .49, correct?
 15 A That looks right.
 16 Q And on exhibit 254, at least to two digits, it's the same
 17 number, correct?
 18 A I think so.
 19 Q Interleukin 1 A, or alpha, it's A on the document, the
 20 fold on Table 1, exhibit 251, is 1.66, and again at least
 21 rounded to two decimal places, the same number appears on
 22 exhibit 254, is that correct?
 23 A I think so. Yeah.
 24 Q Next one, the next gene down in Table 1, exhibit 251
 25 notes the fold at 1.78. And again, in exhibit 254 for
 26 interleukin 1 B, we have to two decimal places, the same
 27 number, correct?
 28 A I think so.
 29 Q Following the next number on Table 1, exhibit 251, is IL1
 30 antagonist, and the fold reported is 1.19. And looking

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1 at exhibit 254, the fold is the same number to two
2 decimal points, correct?
3 A I think so.
4 Q One column over on 254, or one row down on 251, we have
5 the fold for IL2, reported both places as .48, correct?
6 A It looks right.
7 Q And then, the following column is IL2 receptor, and
8 that's 1.21, the same number both places to two decimal
9 points, correct, would you agree?
10 A Yes.
11 Q So, would it appear that the numbers that you have
12 reported in Table 1, exhibit 251, that came out of your
13 personal files are the same fold numbers, at least for
14 those variables that are reported in exhibit 254?
15 A It appears to be.
16 Q So, I think you told us before that, to your knowledge,
17 you were the only person that did any of that statistical
18 analysis on the outcome of the gene expression study,
19 correct?
20 A That's what I recall.
21 Q Now, it's fairly easy if one is - especially if one is
22 somewhat facile with the software, to run the P values on
23 these numbers on a two tailed independent T test,
24 correct?
25 A Yes. Should be.
26 Q And that can be done, for example, in standard Excel
27 software, as well as many others, correct?
28 A There's a lot of software, yes, to do that.
29 Q I'm having some difficulty establishing exactly when the
30 work was performed on the second study, but I would like

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1 to just discuss that with you a bit.
2 A Okay.
3 Q I'll show you what we've marked as exhibit 298, which is
4 a printout of one of the cover sheets from one of the
5 folders in the UW data which has attached to it a whole
6 bunch of milk production data on 20 cows, taken in
7 December of '03 and January of '04.
8 A Okay.
9 Q And the - I don't want to waste your time by sitting here
10 comparing them, but the cow numbers appear to be the same
11 as are recorded elsewhere in the data. Does that sound
12 like about the time this work was done on the gene
13 expression study?
14 A I can't be sure, but it seems reasonable. That appears
15 to be what this would be.
16 Q Exhibit 299 is just a - well, a shortened and somewhat
17 modified version of a portion of 254 in front of you,
18 where we have printed off the experimental data and the
19 Excel formulas for IgJ, IgA HC, IL1 A, IL1 B, IL2, IL10,
20 IgJ, IgA HC, - excuse me, I'm sorry, I'm on the second
21 sheet. The front sheet shows those variables with the
22 Excel notations for the formulas for the means, the fold
23 and the P value. Do you see that?
24 A Yes.
25 Q And this just comes off of any Excel software that you
26 plug the data into, will print you what those formulas
27 are, if you ask it, is that correct?
28 A I guess so.
29 Q And then the second sheet of the document, on the second
30 sheet of the document we simply run the analysis and

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1 printed the numbers in Excel, resulting in the P values
2 that are shown on the document, correct?
3 A That looks correct, yes.
4 Q And I believe those P values are identical to those shown
5 on exhibit 254. Or at least they'll do as many digits as
6 they're reported in here. If you can take a look and
7 verify that for us?
8 MR. THORNTON: I'll stipulate that they
9 are.
10 Q Okay.
11 A That appears the same, from what I can see here, yes.
12 Q And those P values are all - well, the largest of the
13 bunch is 0.0032 something for IgA HC, correct?
14 A That's right.
15 Q The rest of them are on the order of - well, a multiple
16 of a number times 10 to the minus 5th or 10 to the minus
17 6th, correct?
18 A That's correct, yes.
19 Q And do you have any information in your possession or do
20 you recall any information that would suggest that these
21 P values derived from that data are wrong?
22 A I can't think of any.
23 Q We talked briefly last time about the concept of cytokine
24 induced sickness behavior. I think you told me that you
25 didn't have much familiarity with that concept, correct?
26 A That's correct.
27 Q Do you know or know of Robert Dantzer and Keith Kelley,
28 K-e-l-l-y (sic), members of the Department of Animal
29 Sciences, in the case of Dr. Dantzer, the Department of
30 Medical Pathology, in the case of Dr. Kelley at the

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1 University of Illinois?
2 A Which Kelley was that now?
3 Q Keith Kelley.
4 A Keith Kelley.
5 Q Would you like me to restate that? I've got a document
6 for you.
7 A No. No. I'm not particularly familiar with those names.
8 No.
9 MR. THORNTON: I'm going to object. I'll
10 wait 'til you're done. Go ahead.
11 Q I'll show you exhibit 300, Dr. Sheffield, and that is a
12 copy of a paper from Elsevier publication called Brain,
13 Behavior and Immunity by Drs. Dantzer and Kelley,
14 entitled "Twenty years of research on cytokine-induced
15 sickness behavior." Have you ever seen that paper
16 before?
17 A No, I have not. At least not to my knowledge.
18 MR. THORNTON: Object as to any questions
19 on that paper based on foundation and hearsay.
20 Q In the Abstract of that paper, the third sentence, the
21 authors say, for example, quote, near the end of the
22 third line, "It was subsequently shown that physiological
23 concentrations of pro-inflammatory cytokines that occur
24 after infection act in the brain to induce common
25 symptoms of sickness, such as loss of appetite, sleepi-
26 ness, withdrawal from normal social activities, fever,
27 aching joints and fatigue."
28 MR. THORNTON: I'm also going to object
29 that this obviously relates to human beings and not
30 animals. When you're talking about normal social

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1 activities, I don't know of any normal social activities
2 that cows engage in.
3 Q Oh, I think the animals I have are full of those, Mr.
4 Thornton. We can save that for another day.
5 Anyway, this sort of thing is a concept
6 with which you were not familiar with when you performed
7 these studies, is that correct?
8 A If I understand what you're saying here correctly, I was
9 not familiar with that idea at the time I did these
10 studies, no.
11 MR. LAWRENCE: Charlie, you need to mute
12 your phone, please.
13 MR. BIRD: Oh, okay. Hold on a second.
14 I'll call you back.
15
16 (At this time a recess was taken - 9:58 to 10:08).
17
18 Q Thank you, Dr. Sheffield. Mr. Bird is back with us on
19 the telephone again. I'm showing you (exhibit 301) a
20 copy of a paper published by Cambridge University Press
21 2008, Animal Health Research Reviews, entitled "Sickness
22 behavior, its mechanisms and significance," by Dr. Ian
23 Tizard, T-i-z-a-r-d. I take it you have never seen that
24 paper before?
25 A This is the first time I've seen it, yes.
26 MR. THORNTON: Objection. Standing
27 objection to any questions about it?
28 Q Sure. And it has a similar discussion of the impact of
29 elevated inflammatory cytokines in its Abstract of
30 similar subject to the Dantzer and Kelley paper we looked

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1 at a moment ago, correct?
2 A I haven't had a chance to read it, just - -
3 MR. THORNTON: The document speaks for
4 itself.
5 A Skimming the Abstract, that appears correct.
6 Q Do you know who Dr. Tizard is?
7 A I seem to have seen that name before, but I don't recall
8 where. I'm assuming, since he is in veterinary medicine
9 at Texas A&M, it was in some connection there. But I
10 don't recall ever meeting him personally.
11 Q Are you familiar with his text, now in its 9th edition,
12 and I have a copy here - -
13 A That may be where I have seen the name before then.
14 Q And that's called Veterinary Immunology, 9th edition,
15 correct? (Indicating).
16 A I've seen that text before, yes.
17 Q And that is a standard - one of the standard texts in
18 Veterinary Immunology, correct?
19 A I don't teach veterinary immunology, but it's a text I
20 have seen before.
21 Q You have made no attempt, either by yourself or in
22 connection with others, to attempt to evaluate the
23 probability that these P values shown on the second page
24 of exhibit 299, which are also on exhibit 254, may have
25 occurred by random chance, have you?
26 A That I haven't.
27 Q Given the small numbers, would that be a useful project
28 to undertake in analyzing the significance of the results
29 of your gene expression study?
30 A I'm not sure, but I assume so.

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1 Q The gene expression study as well as the earlier Part III
2 study, were both funded by public entities, correct?
3 A I believe so, yes.
4 Q And yet, these very low P values on these several
5 variables that we talked about in exhibit 299 and 254,
6 those have never been made public, to your knowledge,
7 have they?
8 A I don't know.
9 Q You're aware that, for several decades now, dairymen have
10 - many dairymen have claimed that exposure to low levels
11 of electricity chronically have affected their herds
12 adversely. You have been aware of that for some time, -
13 -
14 MR. THORNTON: Objection. Hearsay. - -
15 Q Have you not?
16 A I have heard that, yes.
17 Q And you became aware, during the course of these studies,
18 at some point in time that Dr. Reinemann regularly
19 testifies for electric utilities in that regard, have you
20 not?
21 A I know that now. I don't know when I first heard that.
22 Q It may have been sometime after you did the work, is that
23 correct?
24 A I don't recall when I became aware of that.
25 Q Don't you think it was important that the public, and in
26 particular the dairy community, know about these very low
27 P values you found in your gene expression study?
28 A I don't have an opinion on that.
29 Q We talked a little bit about the equipment with which the
30 gene expression assay work was done?

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1 A Yes.
2 Q Can you tell me what department or departments at the
3 university or where that stuff ordinarily resides or
4 resided back at the time that you did this work? Is it
5 one of the Animal Science Departments or some other
6 department or how did that work?
7 A It was in the Animal Science Building. I don't recall
8 the ownership.
9 Q And I think you've described to us before that it was
10 typically shared between multiple researchers because
11 it's expensive stuff, correct?
12 A Yes.
13 Q And were the technicians who operated the machines, I
14 think you indicated before they were full-time employees
15 of the university, is that correct?
16 A I think that is correct.
17 MR. THORNTON: Objection. Move to strike.
18 Speculation.
19 Q They weren't graduate students, is that right?
20 A That's correct. They weren't graduate students.
21 Q So, what's your understanding, if you have one, about the
22 extent of the experience of these folks running that
23 equipment? Can you describe that a little bit?
24 A They had run the equipment. That's - I don't know what
25 else to say.
26 Q I think you told us in one of the earlier depositions
27 that basically you don't want the immune system active
28 all of the time because it can do damage if it is, is
29 that correct?
30 A Well, there are quite a few diseases which override the

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1 patient of the immune system does damage.
 2 Q And I apologize if this question has been asked, I do not
 3 think it has. But are you aware of any studies anywhere
 4 as to whether chronic elevation of the cytokines and the
 5 one immunoglobulin as shown on exhibit 299 will or will
 6 not damage cows? I'm referring to the second page of
 7 299.
 8 A Okay. So let me make sure I understand the question
 9 here. You're referring here to the things that are
 10 elevated, IL1 and 10. There's a good deal of work
 11 showing IL1 can be. I do not know how much of this might
 12 be in cows; there's certainly a lot more in rodents. I
 13 couldn't point you to any specific papers on that. I'm
 14 not saying they don't exist, I'm just saying I can't
 15 point you to them now.
 16 Q Are you aware of any studies of cows or of other animals
 17 where the depression of the variables as shown on 299
 18 which were lowered, and which is IgJ, IgA HC, IL2 and
 19 IL10, would be damaging to cows or other animals, for
 20 that matter?
 21 A I would have to go back in the literature and look to
 22 find specific studies. But the problem - my overall
 23 impression is that they probably would exist for at least
 24 some animals.
 25 MR. THORNTON: When you say they, you mean
 26 literature would exist for some animals?
 27 A Literature on things what IgA does and what changes in
 28 IgA. I recall seeing studies that certain problems were
 29 correlated with changes in IgA, but that was a long time
 30 ago that I've even looked at those studies, so I'm not

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1 really up to date on that.
 2 Q And in general, will a decrease in IgA tend to increase
 3 susceptibility for disease?
 4 MR. THORNTON: Objection. Foundation.
 5 Speculation.
 6 A Well, IgA is involved in what is called mucosal immunity.
 7 That is, I think I indicated this earlier, in these
 8 studies we're looking at, in the first study we were
 9 looking at serum levels of immunoglobulins. This one
 10 we're looking at the messenger immunoglobulins. And
 11 because IgA is more important in mucosal immunity on
 12 surfaces than it is in serum, that does raise the
 13 question of what the serum levels may actually be. But
 14 mucosal immunity is affected by IgA, so it's very
 15 important there.
 16 Q Dr. Sheffield, I assume in your time at the university,
 17 you probably had some responsibilities for managing
 18 various of the university dairy herds in one fashion or
 19 another, or am I wrong about that?
 20 A Not really.
 21 Q Go ahead. I'm sorry.
 22 A I was not involved in any day-to-day management. I
 23 occasionally served on committees that would make overall
 24 policy decisions on things, such as assigning cows to
 25 research projects and such. But I would not be involved
 26 in the day-to-day management.
 27 Q But have you ever been responsible for the day-to-day
 28 management of dairy herds?
 29 A No.
 30 Q So, you have no - well, what a veterinarian would call

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1 clinical experience in observing patterns of behavior,
 2 production and health in dairy herds over time, is that
 3 correct?
 4 A Only in context of research studies. But in terms of
 5 fields type work, no, I don't.
 6 Q And you would not be critical, I take it, of a
 7 veterinarian or a dairyman taking into account their
 8 field observations of their herd in making decisions on
 9 how to manage it, would you?
 10 A I'm not entirely sure exactly what you're getting at
 11 there. But unless it violated something that I would
 12 consider well recognized accepted standard practices,
 13 such as properly caring for animals, I can't see where I
 14 would object.
 15 Q You have certainly read some of the scientific and
 16 popular press literature that exists relating to the
 17 impact, or the alleged impact, as Mr. Thornton would say,
 18 of stray voltage on dairy herds, have you not?
 19 A Yes, I have read some.
 20 Q And various of that literature describes the course of
 21 health and production in herds as improving when steps
 22 are taken to reduce the electrical exposure of the herds;
 23 you're familiar with that, correct?
 24 MR. THORNTON: Objection. Hearsay.
 25 A I have seen those things they have stated, yes.
 26 Q Conversely, if the electrical exposure is increased, it's
 27 been reported that the health of various herds has
 28 diminished, correct?
 29 MR. THORNTON: Objection. Hearsay.
 30 A I don't know if I recall seeing that specific claim, but

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1 it might - it's been a long time since I've looked at
 2 some of that, so it's possible.
 3 Q There's certainly nothing inconsistent with your data on
 4 cytokines in IgJ, as reflected in the gene expression
 5 levels shown on exhibits 299 and 254, that would be
 6 inconsistent with the notion that exposure to electricity
 7 affects the health of dairy cattle, would it?
 8 A Off the top of my head, I would say I don't see anything
 9 that would be inconsistent with that. That, to me, if
 10 I'm understanding what you're asking, is a little bit
 11 like proving a negative; that, have we proved that it
 12 couldn't happen? Of course, not.
 13 Q And, in fact, we do see statistically significant changes
 14 in the levels of IgJ and the various - and IgA HC and the
 15 various cytokines listed on 299 associated with
 16 electrical exposure in your gene expression studies,
 17 correct?
 18 A In the messages, yes.
 19 Q Mr. Thornton talked to you about the behavioral changes
 20 or behavioral affects.
 21 Charlie, mute your phone, please.
 22 MR. BIRD: Pardon?
 23 Q Mute your phone.
 24 MR. BIRD: Okay. Sorry about that.
 25 Q Sorry about that, Dr. Sheffield, I'll start again.
 26 MR. BIRD: I'm going to have to get off
 27 because I can't fiddle with this while I'm driving. I'll
 28 just talk to you later.
 29 Q All right.
 30 MR. THORNTON: We'll miss you deeply,

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1 Charlie.
 2 MR. BIRD: I know. I know. All right.
 3 Q Dr. Sheffield, would it be a reasonable thing to do to
 4 analyze the barn notes from the first study, the Part III
 5 study that you and Dr. Reinemann and others performed, to
 6 see if there were any differences in behavior between the
 7 treatment and control animals?
 8 MR. THORNTON: Objection. Foundation. He
 9 testified last time he has never seen the barn notes.
 10 A I do not know if enough detail were recorded in there to
 11 make an appropriate analysis, so I really can't answer
 12 the question.
 13 Q Well, the Part III paper indicates that there were no
 14 changes in behavior noted, or words to that effect,
 15 correct?
 16 A Yes. Yes.
 17 Q That's got to be based on some kind of data, given that
 18 it was published, isn't that correct?
 19 A Yes. I've never seen the actual data, and don't recall
 20 discussing how that statement was determined. I wasn't
 21 involved in assessing behavior. I'm not a behavior
 22 assessor.
 23 Q Who was, with respect to that?
 24 A I don't recall. That might have been - I think the name
 25 was Rasmussen. But I could be mistaken on that.
 26 Q Well, if the statement is made in the paper and it is
 27 based upon data, that data should be preserved in the UW
 28 documentation of the study somewhere, should it not?
 29 A I would think so.
 30 Q Do you have any idea where that - what category of

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1 documents that might be in, other than the barn notes, if
 2 any?
 3 MR. THORNTON: Objection. foundation.
 4 Speculation.
 5 A I would not know.
 6 Q And if there is no data to back up that statement in the
 7 paper, then that statement would also be simply
 8 speculation, would it not?
 9 A I think that would be based on - well, without data, I
 10 would say, yes.
 11 Q Going back to exhibit 279 that counsel discussed with you
 12 earlier this morning a bit, page 37 in particular. I've
 13 got a copy over here to show you what it looks like.
 14 MR. THORNTON: Why don't you look at page
 15 37.
 16 Q Counsel asked you about the data with respect to
 17 differences between the treatment and control groups in
 18 IgA, I believe?
 19 A Yes.
 20 Q Was that data taken before, after or during the shock
 21 treatment?
 22 A I believe that this is data taken both before and during
 23 and analyzed to this data. Maybe I'm mistaken about
 24 that, but I believe that included - - maybe I can figure
 25 this out.
 26 Q Take your time, please.
 27 A I think that includes the before and after data.
 28 Q Was there part of a - in this particular case,
 29 demonstrated on or off the top of page 37, thereabouts,
 30 part of the covariant study or - covariant analysis or

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1 not?
 2 A I believe the idea behind this was, this would not have
 3 included a covariant in this analysis. I am struggling a
 4 bit here with the details of this particular model, but
 5 what we have here is a difference in the overall treat-
 6 ment effect. The next line, if we look on page 38, gives
 7 us the effect of the difference among the cows. Each
 8 cow, of course, is going to be different. So, you get a
 9 P value for that. A day effect, and that is whether
 10 there was a change over time, and then the final is a
 11 treatment by date interaction.
 12 What this shows is whether the two treat-
 13 ments responded differently to time. So, if, for
 14 example, you saw a change, and effect of treatment, you
 15 would see a treatment by time interaction, because they
 16 would start - if they start off at a certain level, and
 17 then say, just as an example, the treatment loads, you
 18 would see - and the control group did not rise in
 19 parallel, you would see a treatment by time interaction.
 20 I believe that was the idea behind this analysis.
 21 Q And did there appear to be an effect taking into account
 22 treatment and time, or could you tell?
 23 A From what I see here, it looks like, no. The treatments
 24 were - the groups were different, but they stayed
 25 different over time. That appears to be what's happening
 26 here.
 27 Q All right. Going to exhibit 282 that counsel discussed
 28 with you, it's that summary of individual cow data for
 29 the treatment and control cows in the Part III study.
 30 A I've got it here.

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1 Q Is one of these looking at data such as this to determine
 2 whether the randomization process was done reasonably.
 3 A I'm not quite sure how to answer that, because it gets
 4 into the question of what randomization means, and I
 5 think a statistician may be able to give a better answer
 6 for that.
 7 Q Okay. Fair enough. Let me just ask you the question
 8 from your point of view.
 9 A From my point of view, okay. First, if you're wanting
 10 random assignment, you would expect most of the things
 11 that you measure to not be different at the start of the
 12 experiment. On the other hand, if you do measure many
 13 things, even with random assignment, you expect a few of
 14 them to differ.
 15 So, if I took 20 people, for example, and
 16 randomly assigned them to two groups, it wouldn't do
 17 anything but just measure 20 different things. Some of
 18 those things may be different. Most of them would not
 19 be. And the same thing you would see with the cows. It
 20 would certainly be possible if you started with these -
 21 what is it 24 cows altogether - that as we're making more
 22 and more measurements, we would find an occasional one
 23 showing up where they look different.
 24 Q You probably answered this, but what is the reason that
 25 you randomize, to start with?
 26 A That is to avoid any bias in measuring your treatment
 27 effects.
 28 Q Let's just look at some of these various variables that
 29 are summarized on the second page of exhibit 282. It
 30 appears that the control cows for all three replicates

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1 are listed, and the numbers at the top of the page, the
 2 treatment cows are at the bottom, is that correct?
 3 A That seems to be the case, yes.
 4 Q And if I understand the numbers correctly, the days in
 5 milk for the control cows is 213, is that correct?
 6 A Right.
 7 Q Would that be at the beginning of the experiment?
 8 A I think so, but I'm not entirely sure.
 9 Q And for the treatment cows, it was 240, correct?
 10 A Correct.
 11 Q And part of the purpose of this study is to ascertain the
 12 effects, if any, of the electricity on stress on the
 13 cows, is that correct?
 14 A That's correct.
 15 Q Are cows later in lactation generally less subject to the
 16 effects of stressors than cows earlier in lactation?
 17 A I don't know.
 18 Q The next column is daily milk average amount, correct?
 19 A Correct.
 20 Q And looks like control cows were just over 90 pounds,
 21 correct?
 22 A They're averages, yes.
 23 Q And the treatment cows were just over 81 pounds, correct?
 24 A Correct.
 25 Q Generally speaking, are cows - are higher producing cows
 26 more subject to the effects of stress than lower
 27 producing cows?
 28 A More subject to or more stressed?
 29 Q Well, thank you. I'll ask a different question. Are
 30 higher producing cows generally more stressed than lower

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1 producing cows?
 2 A That's the general consensus, although I'm not sure how
 3 strongly the hard data are to support that. It depends a
 4 little on what you define as stress.
 5 Q And I think the definition of stress in the veterinary
 6 dictionary goes something like, anything that adversely
 7 affects the homeostasis of the organism. Does that sound
 8 about right?
 9 A That would sound like the kind of definition you would
 10 see in scientific literature.
 11 Q It's sort of like saying stress is stress, in a way, is
 12 that correct?
 13 A It's a little more precise than that.
 14 Q Okay. And, therefore, are higher producing cows
 15 generally more susceptible to additional incremental
 16 stress than lower producing cows?
 17 A I'm not sure how well that's supported, but I think many
 18 people would believe it.
 19 Q Then, at the means somatic cell count, the next column,
 20 for the control cows, it is 46.75, correct?
 21 A Correct.
 22 Q And that's in thousands, of course, correct?
 23 A That's in thousands per milliliter, yes.
 24 Q And for the control cows, it was 58.5, correct?
 25 A Right.
 26 Q Both very low numbers in the world of somatic cell
 27 counts?
 28 A Those are very low numbers, yes.
 29 Q You then have the days carrying calf, correct?
 30 A Yes.

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1 Q Just under 80 for the control cows and a little over 86
 2 for the treatment cows, correct?
 3 A Correct.
 4 Q The lactation number mean for the control cows was 2.75
 5 and for the treatment cows it was 2.83, correct?
 6 A Correct.
 7 Q The next column is just a trial number, which, of course,
 8 averages - -
 9 A Just two.
 10 Q And then we have the mean for the age of the cows in
 11 years, and for the control cows it is 4.65 and for the
 12 treatment cows, 4.94, correct?
 13 A Correct.
 14 Q Overall, at least based upon the parameters listed here,
 15 does it appear that the researchers' efforts to randomize
 16 the control and treatment cows was successful?
 17 A Looking at the standard deviations, those are very
 18 similar numbers. So, it appears that they were random.
 19 Q Counsel talked to you, or you talked to counsel about how
 20 cows can't always just walk away from electricity in
 21 their environment, for example, the example you used was
 22 a water bowl, correct?
 23 A Yes. It depends on where the source is as to whether
 24 they can, yes.
 25 Q And have you ever become familiar with the concept of
 26 measuring current in barn floors or step potentials to be
 27 different points on barn floors?
 28 A I've heard the terms, but I'm not familiar with the
 29 measurements and how those things are done.
 30 Q And if the cows are getting shocked from hoof to hoof in

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1 their environment at various points in their environment,
 2 that's something that they may not be able to get away
 3 from, depending on the specifics, would that be fair?
 4 MR. LAWRENCE: Objection. Foundation.
 5 A I wouldn't know for certain either way on that.
 6 Q Exhibit 250, the Part III paper, for just a moment.
 7 Pages 9 and 11, those two tables that Mr. Thornton talked
 8 with you about earlier. In Table 3, the positive
 9 control, the dexamethasone study that didn't involve
 10 electricity.
 11 A Yes.
 12 Q And again, this was one group, not a block design,
 13 correct?
 14 A I believe that's correct.
 15 Q And of the 13 variables studied, four showed a statistic-
 16 ally significant response at .05, indicating
 17 significance, correct?
 18 A That's correct.
 19 Q And what was your conclusion based upon that?
 20 A Well, to begin with, there weren't many cows in this, as
 21 you notice, so it was not a very powerful study to start
 22 with. But we concluded that we were, at least for some
 23 of the measures, able to detect differences induced by a
 24 known stress.
 25 Q And with respect to immune response, a particular stress
 26 may effect some responses and not others, isn't that
 27 correct?
 28 A That's true.
 29 Q And you have never taken the opportunity, I take it, or
 30 reviewed the results of the Part III study involving

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1 shock, which is summarized in Table 2, where the authors
 2 summarized it in Table 2, based upon a statistical
 3 analysis that accounted for the block design of the
 4 study, is that right?
 5 A I don't recall seeing that.
 6 Q I believe you told me in past sessions that the use of
 7 block statistics, or what some people call replication
 8 statistics, would be an inappropriate means of analyzing
 9 the data from the shock study in the Part III paper,
 10 correct?
 11 A From my understanding of the statistics, yes.
 12 Q And if the results of that analysis using the replication
 13 or block statistics showed that three of the 13 variables
 14 showed a statistically significant response and a fourth
 15 was closing to equal .06, the conclusions of the paper
 16 might have been different, might they not?
 17 MR. THORNTON: Objection. Speculation.
 18 Objection. No foundation. Objection. Hearsay.
 19 Objection. Relying upon an expert that hasn't been
 20 identified or made any disclosures in this case.
 21 A Without knowing more, I would say it would be possible.
 22 Not definitively yes or no though at this point.
 23 Q In your Messenger RNA study, the second study, you
 24 utilized a current level of 1 milliamperes, right?
 25 A I think that's right. Yes.
 26 Q And as I understand it, a wave form was used that was not
 27 a pure 60 cycle wave form, is that correct?
 28 A That's correct.
 29 Q That was based on studies that were, I believe, done up
 30 at the - I think it was an experimental study by Mr.

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1 Allen Bahr (ph) and others?
 2 A I don't remember where it was done.
 3 Q It was based on some - -
 4 A It was based on some measurements, and I don't know much
 5 about how those things were measured or any more than
 6 that.
 7 Q Have you made any review of the scientific literature
 8 about whether or not exposure to 1 milliamperes will
 9 elicit behavioral responses in some portion of the cow
 10 population?
 11 A I don't recall anything.
 12 Q Thank you. Off the record for a moment.
 13
 14 (Discussion held off the record - 10:49 to 10:54).
 15
 16 FURTHER RE-DIRECT EXAMINATION
 17
 18 BY MR. THORNTON:
 19
 20 Q Dr. Sheffield, can you say, to a reasonable degree of
 21 scientific certainty, that there's any biological
 22 significance to the P values on the second page of
 23 exhibit 299?
 24 MR. LAWRENCE: Object to form.
 25 A At this point, I would say I would be uncertain.
 26 Q And you were asked questions about the people that were
 27 collecting the samples and doing the analysis. Your
 28 report and your notes indicate that there were problems
 29 running the array analyzer, at the beginning of testing?
 30 A We did have some problems with that, yes.

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1 Q And that was the first time that that sort of testing
 2 device was ever used at the University of Wisconsin?
 3 A I'm not sure about that, but that could be.
 4 Q Certainly was the first time it was ever used - -
 5 A First time we had used it, yes.
 6 Q By we, you mean your research people?
 7 A Yes.
 8 Q And you said the significance of some of these proteins
 9 or Messenger RNAs were most significant for mucosal
 10 immunity rather than in the blood stream?
 11 A For the IgA, that's correct.
 12 Q And you didn't do any mucosal immunity testing?
 13 A No, we did not.
 14 Q So you can't say one way or the other whether the mucosal
 15 immunity was affected?
 16 MR. LAWRENCE: Object to form.
 17 A I would not say that I could make a conclusion about
 18 that. Let me rephrase that. I think that came out very
 19 strange.
 20 I would not make a conclusion about mucosal
 21 immunity in these studies.
 22 Q And then you were asked whether the numbers reflected in
 23 exhibit 299 were not inconsistent with adverse health
 24 effects in animals. And you said something to the effect
 25 that that's like proving a negative. My question is, can
 26 you conclude from the data in exhibit 299, to a reason-
 27 able degree of scientific certainties, that the gene
 28 levels reflected on 299 adversely affect animal health?
 29 MR. LAWRENCE: Object to form.
 30 A I would not conclude that.

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1 Q That's it.
 2
 3 FURTHER RE-CROSS EXAMINATION
 4
 5 BY MR. LAWRENCE:
 6
 7 Q One follow-up for the record. The gene expression study
 8 was conducted over a three week period of shocking
 9 activity, I think, is that correct?
 10 A It was two or three weeks. I would have to look, but
 11 it's in there as to how long it was.
 12 MR. THORNTON: First time, Scott, I've ever
 13 seen a lawyer say I've got one more question and only
 14 asked one more question.
 15 Q Well, I was known to violate that. So there is nothing
 16 in these studies that would give us any specific results
 17 that would relate to how a cow would be affected if she
 18 lived with electrical exposure all or most of her life,
 19 correct?
 20 A I don't think this would have any relevance to that, it's
 21 tissue exposure.
 22 Q Thank you. That's all I have.
 23 MR. THORNTON: Dr. Sheffield, neither one
 24 of us represent you, but you have a right to read and
 25 sign your deposition transcripts, in your case, plural
 26 transcripts. You have already indicated you think that's
 27 a good idea.
 28 A Yes.
 29 MR. THORNTON: I would recommend, given the
 30 scientific nature and the terms that you talked about

1 that you, if you don't mind, take the time to read it and
 2 send a copy to Mr. Kirby?
 3 A Yes, I intend to do that. I will do that when I get the
 4 final copy.
 5 MR. THORNTON: I think we both agreed that
 6 he can have 30 days from the time that he gets the last
 7 transcript to do that?
 8 MR. LAWRENCE: For all three transcripts,
 9 that correct.
 10 MR. THORNTON: All three transcripts.
 11 MR. LAWRENCE: That's correct. Any
 12 statutory provisions to the contrary notwithstanding.
 13 MR. THORNTON: Because we've got Minnesota
 14 rules and Wisconsin rules, and if we just come to an
 15 agreement, I think that solves it if you have a problem.
 16 MR. LAWRENCE: Yes, that's the intent.
 17 MR. THORNTON: And if you have a problem,
 18 get in touch with Mr. Kirby and we'll get you more time.
 19 MR. LAWRENCE: And, Mr. Kirby, do you want
 20 to send a copy direct to Dr. Sheffield?
 21 THE REPORTER: Right. Do you have a copy
 22 of the first two?
 23 A I have a copy of the first two.
 24 MR. LAWRENCE: Yes, I sent them before, and
 25 this one may just as well come from you.
 26
 27 (10:59 o'clock a.m.)
 28 * * * *
 29
 30

1 READING AND SIGNING CERTIFICATE
 2
 3 I, LEWIS G. SHEFFIELD, PhD, do hereby certify
 4 that I have read the foregoing transcript of my
 5 deposition, recorded by John T. Kirby, of 5-30-14, and
 6 believe the same to be true and correct, (or except as
 7 follows, noting the page and line number of the change or
 8 addition and the reason why):
 9 WRITING IN TRANSCRIPT WILL NOT BE ACCEPTED
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25
 26
 27
 28 _____ DATE _____ SIGNATURE
 29
 30

1 STATE OF MINNESOTA }
 2 COUNTY OF DAKOTA } ss.
 3
 4 Be it known that I took the video
 5 deposition of LEWIS G. SHEFFIELD, PhD, Volume III, on the
 6 30th day of May, 2014, at Madison, Wisconsin;
 7 That I was then and there a notary public
 8 in and for the County of Dakota, State of Minnesota, and
 9 that by virtue thereof, I was duly authorized to
 10 administer an oath;
 11 That the witness before testifying was by
 12 me first duly sworn to testify to the truth and nothing
 13 but the truth relative to said cause;
 14 That the testimony of said witness was
 15 recorded in computerized Stenotype and thereafter
 16 transcribed by myself, and that the testimony is a true
 17 record of the testimony given by the witness to the best
 18 of my ability;
 19 That I am not related to any of the parties
 20 hereto nor interested in the outcome of the matter;
 21 That the reading and the signing has been
 22 executed as evidenced by the preceding page.
 23
 24 WITNESS MY HAND AND SEAL THIS 2ND DAY OF JUNE, 2014.
 25
 26
 27
 28
 29 ☒
 30

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