Exhibit 77

REDACTED VERSION OF DOCUMENT PROPOSED TO BE FILED UNDER SEAL

UNITED STATES DISTRICT COURT
FOR THE CENTRAL DISTRICT OF CALIFORNIA
(SOUTHERN DIVISION)

ChromaDex, Inc.,
Plaintiff,

v.

Elysium Health, Inc. and Mark Morris,
Defendants.

Case No. 8:16-02277-CJC (DMF)

EXPERT REPORT OF DR. IAIN M. COCKBURN

(JUNE 21, 2019)

I. QUALIFICATIONS

1. I am the Richard C. Shipley Professor in Management and Chair of the Strategy and Innovation Department at Boston University's Questrom School of Business. In this capacity, I conduct research on the economics of innovation, with specific application to the pharmaceutical industry, and teach graduate classes on business strategy, competition, innovation, and intellectual property that focus primarily on the biopharmaceutical, software, and information technology industries. I also serve as a Research Associate at the National Bureau of Economic Research in Cambridge, Massachusetts. Prior to joining the faculty of Boston University, I held the VanDusen Professorship in Business Administration in the Faculty of Commerce at the University of British Columbia. In addition to these appointments, I have also been a Visiting Scholar in the Department of Economics at Harvard University, in the Economics, Finance, and Accounting Department at MIT's Sloan School of Management, and at Melbourne Business School.

2. I received my undergraduate degree from Queen Mary College, University of London in 1984, and my PhD in Economics from Harvard University in 1990.

3. I have served on the Steering Committee for Government Industry Partnerships for the Development of New Technologies of the National Research Council, and on the Scientific Committee of the European Union INNOVPROD Research Network. I have also been a co-editor or referee (an expert in the field that reviews submitted articles and recommends whether or not they should be published) for various academic journals in economics, management, and life sciences, including Science, Journal of Health Economics, Health Affairs, the British Medical Journal, Lancet, Management Science, Journal of Economics and Management Strategy, Journal of Political Economy, and American Economic Review.

4. My research focuses on the economics of innovation, intellectual property, productivity measurement, industrial organization, and applied econometrics. I have received major research funding from leading research institutions, including the National Science Foundation, the National Academy of Sciences, and the Alfred P. Sloan Foundation. I am an author on nearly four dozen refereed articles in leading academic journals in both economics and management including the American Economic Review, the RAND Journal of Economics, the Journal of Industrial Economics, and Management Science. In both 2017 and 2018, my publications ranked among the Top 10% of authors by all-time downloads by the Social Science Research Network (SSRN). Several of my most highly cited articles are based on research in the biopharmaceutical industry, including "Generics and New Goods in Pharmaceutical Price Indexes" in American Economic Review, "Scale, Scope, and Spillovers: Determinants of

Research Productivity in the Pharmaceutical Industry" in RAND Journal of Economics, "Absorptive Capacity, Coauthoring Behavior, and the Organization of Research in Drug Discovery" in Journal of Industrial Economics, "Is the Pharmaceutical Industry in a Productivity Crisis" in Innovation Policy and the Economy, "The Market for Follow-on Biologics: How Will It Evolve?" in Health Affairs, "Finding the Endless Frontier: Lessons from the Life Sciences Innovation System for Technology Policy" in Capitalism and Society, and "Patents and the Global Diffusion of New Drugs" in American Economic Review. A complete list of my publications and research grants is included in my curriculum vitae, attached as Appendix A to this report.

5. Outside academia, I have been a consultant on business strategy to a variety of life sciences and technology companies, and on public policy to government agencies in the U.S., the U.K., and Canada. I have provided expert testimony in litigation and arbitration matters on issues such as licensing and collaboration agreements, patent damages, antitrust, class certification, brand-generic competition, Medicaid and Medicare reimbursement, off-label marketing, transfer pricing, and misappropriation of trade secrets. A list of matters in which I have testified at trial or deposition in the past four years is attached as Appendix B.

6. For this matter, I am being compensated at my standard billing rate of $850 per hour. My compensation in this matter is not in any way contingent or based on the content of my opinions or the outcome of this or any other matter.

II. SCOPE OF ASSIGNMENT

7. I have been retained by Defendant and Counter-Claimant Elysium Health, Inc. ("Elysium") to opine as to:

   a. whether Plaintiff and Counter-Defendant ChromaDex, Inc. ("ChromaDex") possesses market power in a relevant market;

   b. the scope and nature of ChromaDex's alleged patent misuse;

   c. the anticompetitive effects, if any, resulting from the alleged patent misuse;

   d. whether ChromaDex's alleged patent misuse has been purged and its effects dissipated.

8. In addition, I have been asked to calculate the economic damages owed to Elysium in the event the trier-in-fact finds ChromaDex breached certain provisions of a supply agreement between ChromaDex and Elysium (the "NR Supply Agreement") including the "most favored nation" pricing provision

("MFN Provision"), the product exclusivity provision ("Exclusivity Provision"), and the current good manufacturing provision ("cGMP Provision").

III. DOCUMENTS CONSIDERED

9. I have been provided with documents produced in discovery by both Elysium and ChromaDex including, but not limited to, various ChromaDex Supply Agreements and Trademark License Agreements with various third party customers; data depicting ChromaDex's customer-level nicotinamide riboside ("NR") ingredient sales; patent license agreements for certain NR technology licensed by ChromaDex and royalty reports depicting ChromaDex's payments under these agreements; Amazon.com retail pricing data for certain dietary supplement products; deposition testimony of ChromaDex and Elysium corporate representatives; as well as various ChromaDex emails, investor presentations, and press releases. I have also reviewed publicly available documents from my own research regarding the facts and issues in this case including ChromaDex's quarterly and annual financial disclosures to the U.S. Securities and Exchange Commission ("SEC"), ChromaDex press releases, equity analyst research reports, and the relevant economic literature. A list of all the documents I have received and reviewed in forming my opinions on this matter is set forth in attached Appendix C and/or referenced throughout my report.

10. The opinions expressed herein are based on information currently available to me and I therefore reserve the right to update or amend my opinions in the event additional information or testimony becomes available.

IV. SUMMARY OF OPINIONS

11. The manufacture and supply of the NR ingredient constitutes a relevant product market in the United States. At the present time the relevant market consists exclusively of NR due primarily to the lack of available substitutes and the lack of reasonable interchangeability between NR and other potential nicotinamide adenine dinucleotide ("NAD+") precursors.

12. ChromaDex possesses market power in this market. Through exclusive licenses to certain patent rights, ChromaDex has established itself as the dominant (and until recently, the only) NR ingredient supplier in the U.S. market; controlling the manufacture and distribution of essentially all of the commercially available NR supply throughout the relevant time. Evidence of ChromaDex's market power includes, *inter alia*, ChromaDex's statements and related evidence regarding its control of the market; the absence of alternative suppliers during the relevant period; ChromaDex's ability to impose certain

commercial terms on NR customers; ChromaDex's ability to price discriminate among customers; and ChromaDex's ability to earn economic profits that would not otherwise prevail in a competitive market.

13. From an economic perspective, ChromaDex has committed patent misuse by tying customer purchases of its patented NR ingredient to mandatory licenses or mandatory use of its NIAGEN trademark.

14. ChromaDex's efforts to use its patent monopoly to establish NIAGEN as the founding trade name for NR has resulted in significant, ongoing anticompetitive effects in the market. These anticompetitive effects can be expected to persist even after the patent monopoly is lost.

15. ChromaDex's patent misuse has not been purged. ChromaDex's patent misuse has had, and will continue to have, anticompetitive effects. ChromaDex continues to use the NIAGEN mark and reap the benefits of its misuse. In addition, Elysium has not, to date, recovered monies it was coerced into paying ChromaDex under the terms of its mandatory trademark license, nor has it recovered the opportunity cost of those monies.

16. Elysium suffered economic damages of $4.39 million or $1.74 million – depending on which of two relevant NR sales spreadsheets produced by ChromaDex is complete and accurate – resulting from ChromaDex's breach of its contractual MFN Provision; calculated as the difference between the total dollar amount actually paid by Elysium and the amount paid Elysium would have paid had it been extended the lowest relevant price paid by a ChromaDex customer buying equal or lower volume.

17. Elysium has suffered lost profits damages of between $68,355 and $571,981 on lost sales it would have made but-for ChromaDex's breach of Elysium's product exclusivity. Elysium alleges ChromaDex breached certain provisions of the NR Supply Agreement by facilitating the third party sale of competing dietary supplements comprised of both NR and pterostilbene (or any ingredients that are substantially similar thereto); in combination, whether in the same delivery mechanism or packaging or in a separate form or packaging but marketed together; a "combination" exclusivity specifically granted to Elysium by ChromaDex.

18. Elysium has suffered economic damages of $221,000 resulting from ChromaDex's breach of its contractual cGMP provision, calculated as the difference between the total dollar amount Elysium actually paid, based on the price it bargained for under the belief that ChromaDex would supply cGMP-compliant material, and the amount it would have paid based on the average price bargained for by large volume Elysium customers to which ChromaDex did not make this commitment.

19. My opinions, and the bases for them, are set forth in more detail below.

Figure C (Source: CDXCA_00464084 at 464097.)

137. In short, by leveraging its patent and market power to require or cause its supply customers and licensees to use the mark in exchange for access to the patented product, ChromaDex broadened the scope of its patent rights by shifting its patent power into goodwill and trademarks. In my opinion, this constitutes misuse of the patents from economic perspective.

X. ANTICOMPETITIVE EFFECTS FROM CHROMADEX'S ALLEGED ACTS OF PATENT MISUSE

138. ChromaDex's conduct had readily apparent anticompetitive effects. As discussed above, anticompetitive effects can be shown by a "reasonable probability" of an effect in the market, and such effects can be "actual or prospective."[206] I conclude that a reasonable probability of anticompetitive effects existed here, and that those include both actual and prospective anticompetitive effects.

A. ChromaDex's Conduct Has Resulted in a Reduction in Competition and Consumer Choice

139. The first, and most obvious, anticompetitive effect of ChromaDex's alleged patent misuse was a decrease in competition in the market for end-user products that included NR. To start, there was a decrease in brand competition. ChromaDex, by forcing its customers to use the NIAGEN branding, prevented or made it more difficult for those customers to build equity in their own trademarks because they were required to invest in an existing brand that belonged to ChromaDex. This action focused customers on a primary brand and did not promote the development of competing brands by these licensees. This effect can be seen in Figure B above, which shows that of six primary ChromaDex

[206] *Princo Corp. v. ITC*, 616 F.3d 1318, 1338, 1340 (Fed. Cir. 2010).

DTC licensees five (MAAC10, Nectar7, Live Cell, HPN, and Thrive Now Health) used NIAGEN branding and only one (Elysium) did not.

140. In addition, ultimately there was a decrease in the actual choices available to customers seeking to buy products containing NR caused by ChromaDex taking steps to enter the DTC space and seize it for itself by launching TRU NIAGEN. As ChromaDex has recognized, its customers made a "substantial investment […] with respect to the use of the brand name NIAGEN."[207]

141. Without an end-user product of its own, ChromaDex, unlike these customers, was not in a position to build a strong consumer brand from the ground up. In fact, ChromaDex had previously attempted to itself launch a consumer product (for an ingredient other than NR) under the brand "BluScience."[208] It failed. ChromaDex was unable to "get the brand off the ground" and decided "not to continue the Blue Science brand."[209] ChromaDex then "transitioned back to an ingredient and technology company."[210]

142. By contrast, with NIAGEN, ChromaDex leveraged its patent to establish and develop the brand. Then, in late 2016, ChromaDex moved to take advantage of the strong brand recognition generated by its DTC licensees' mandatory use or licensing of the NIAGEN mark.[211] ChromaDex decided to terminate all of the DTC licensees' supply of NR as soon as it was able, and to replace those sales with the sales of its own DTC product through its acquisition of Healthspan and TRU NIAGEN.[212]

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[207] CDXCA_00289635 at 289639.

[208] Deposition of ChromaDex 30(b)(6) at 110:2-3 ("ChromaDex had launched a consumer product previously called Blue Science.").

[209] *Id.* at 184:25-85:3.

[210] *Id.* at 182:22-23.

[211] *See* Deposition of ChromaDex30(b)(6) at 56:22-57:13 (when asked what led ChromaDex to consider selling NIAGEN direct to consumer, Mr. Varvaro states: "[w]e were looking at a bunch of different analysis of where the brand Niagen was going, how it was performing […] there was a belief from a board-level standpoint, not across to everyone, but discussions came about how we can best achieve shareholder value going forward, and one of the considerations in that was launching or own finished product containing nicotinamide riboside." [sic,]); 60:12-22 ("I'm sure [the fact that there was a market for Niagen-branded products] was one of the facts that was taken into discussion," in deciding to pursue the direct to consumer market); 66:8-23 ("The company made a decision to phase out customers for many different reasons […] and there were ones that the belief was they were going to be phased out because they were potential competitors to the Tru Niagen brand.").

[212] CDXCA_00289635 - 289641.

143. The anticompetitive effect of ChromaDex's leveraging of the now-strengthened NIAGEN brand was recognized by ChromaDex in its SEC filings: it would result in fewer companies selling NR products to consumers. For example, as ChromaDex's 10-K for the 2017 fiscal year stated: "The acquisition in March 2017 of Healthspan Research LLC, a company that sold our TRU NIAGEN® product direct to consumers, marked our strategic shift from an ingredient and testing company to a global consumer focused nutraceutical company […]. In connection with our strategic decision to grow our global consumer brand, we have reduced the number of active NIAGEN® ingredient supply agreements."[213] As ChromaDex's Board Member, Stephen Block testified, "ChromaDex wanted to be the leading producer – seller to the DCT – the DTC channel."[214]

144. During the phase-out of its ingredient customers, ChromaDex decided that it would prohibit the use of the NIAGEN mark on the front packaging of its customers' products, essentially forcing its licensees to rebrand. This tactic occurred after ChromaDex used its patent rights to cause its licensees to invest in building the brand. ChromaDex recognized that its licensees had made significant investments in the NIAGEN brand and would soon be cut off entirely:

> CDX has had initial discussions with 4 of the 5 existing brands using NIAGEN® as their *primary* brand name. This practice was previously allowed by CDX, and in some cases substantial investment has been made by those companies with respect to the use of the brand name NIAGEN® and there are agreements in place that will either need to be terminated or permitted to expire.[215]

145. ChromaDex sent DTC licensees new TLAs which contained new clauses stating: "Licensee shall not use ChromaDex Marks on the front panel of the label or packaging. Specifically, Licensee is prohibited from using the ChromaDex marks on the principal display panel ("PDP")."[216] As ChromaDex told one licensee: "What this will mean for Live Cell, as we discussed, is changing your NR product brand name to something other than NIAGEN."[217]

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[213] ELY_0124076 at 124080 - 124081.

[214] Deposition of Stephen Block at 118:1-3.

[215] CDXCA_00289635 at 289639 (emphasis in original).

[216] CDXCA_00030358 at 30358.

[217] CDXCA_00030354 at 30354.

146. ChromaDex ultimately followed through on its plan to eliminate all of the DTC licensees from the market so that it could sell its TRU NIAGEN product direct to consumers free of competition. In its Form 10-Q for the quarterly period ending March 31, 2018, ChromaDex stated:

> By developing and selling TRU NIAGEN®, our own consumer standalone NIAGEN® supplement product, we are in direct competition with some of our current ingredients segment customers that use NIAGEN® in the products that are sold to consumers. In an effort to promote and better market our consumer product, we have made a strategic decision not to ship NIAGEN® to certain ingredients segment customers […].[218]

147. As a consequence of ChromaDex causing its licensees to invest in the NIAGEN brand to obtain a supply of NR, the number of companies offering consumer NR products has been reduced, as has competition and consumer choice. As ChromaDex's Rule 30(b)(6) designee testified, ChromaDex's only remaining NR customers are Nestle, Thorne, and Life Extension.[219] The TRU NIAGEN website identifies ChromaDex's current customers as only including Thorne, Life Extension, and HPN.[220] ChromaDex has stated that it does not believe that these customers really compete with TRU NIAGEN because they are marketed differently and in different channels.[221] In addition, in 2018 ChromaDex purchased the division of HPN responsible for its NIAGEN-branded product, and the product was discontinued.[222]

148. ChromaDex's ability to reduce competition in the direct-to-consumer channel would not have been possible without the substantial investments that ChromaDex previously caused its customers to make in the NIAGEN brand as a condition for obtaining supply of NR. Thus, the reduction in choices and competition in direct-to-consumer products is a consequence and anticompetitive effect of ChromaDex's conduct that persists to this day.

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[218] ELY_0108035 at ELY_108065.

[219] *See* Deposition of ChromaDex 30(b)(6) at 63:17 (the only remaining NR customers are Nestle, Thorne, and Life Extension).

[220] ELY_0122929 at 122930 (visited June 2019).

[221] Deposition of ChromaDex 30(b)(6) at 62:6-63:8. Thorne, as noted above, sells in the practitioner channel. In late 2018 Nestle obtained rights to sell TRU NIAGEN in the medical nutrition category with some rights (co-exclusive with ChromaDex) to sell certain products within the consumer health category. *See* ELY_0123394 - 123396.

[222] ELY_0123381 - 123384.

B. ChromaDex's Conduct has Resulted in Reduced Ability for Current and Future Competitors to Compete Against the NIAGEN Brand

149. ChromaDex's conduct also reduced the ability of current and future competitors to compete against ChromaDex and thus resulted in additional actual and prospective anticompetitive effects.

150. By requiring licensees to use NIAGEN trademark on their supplement products, ChromaDex obtained a significant benefit that made it easier for it to exclude other competitors. I discuss those advantages, and the related economic literature, extensively in Section IX above. As explained above, a brand or trademark represents goodwill, or a signal of product quality, and plays an important role in influencing consumer decisions. Once a consumer comes to like and trust products sold under a certain trademark, he or she will look for products bearing that trademark in the future and be less likely to purchase competing products sold under other marks. Such goodwill may even be carried over to new products, as a consumer is more likely to try something new if it is sold under the "umbrella" of a trademark that the consumer recognizes and trusts.[223] These benefits are long-lasting. Once the NIAGEN brand was established, both through its presence in the packaging and marketing materials of licensees, and through the efforts of licensees to educate consumers and win sales, new entrants were at a significant competitive disadvantage. ChromaDex recognized this when it noted that its "NIAGEN ingredient TM strategy" "[p]rovides differentiation for CDX if/when NR competition arrives," as shown in Figure C, above.[224]

151. In addition to this product differentiation, any supplement manufacturer seeking to introduce a NR product with a trademark other than NIAGEN would have to overcome a consumer's familiarity with (and trust in) the NIAGEN mark. Overcoming this obstacle would require substantial resources and business risk. ChromaDex also recognized this advantage – the establishment of a "trust mark" in ChromaDex's own words – from its NIAGEN strategy as shown in Figure C, above. [225]

152. This strengthening of the trademark NIAGEN resulting from ChromaDex's leveraging of its patent-based control of the supply of NR to impose mandatory trademark use/licensing was more pronounced

[223] *See* Wernerfelt, Birger "Umbrella branding as a signal of new product quality: an example of signaling by posting a bond." *RAND Journal of Economics*, 19(3) (1988), pp. 458-66.

[224] CDXCA_00464084 at 464097.

[225] CDXCA_00464084 at 464097.

because NIAGEN was a "pioneering brand."[226] By using its patent rights to strengthen the mark early, ChromaDex sought to establish itself as the "true" (or "TRU") version of NR. As ChromaDex has again noted, the NIAGEN trademark strategy allowed it to promote ChromaDex as the "driver behind NR." [227]

153. Consumers encountering products sold under the NIAGEN mark in the marketplace may consider NIAGEN, rather than NR, as the name of the authentic ingredient. In that sense, ChromaDex's mandatory trademark and licensing strategy resulted in NIAGEN becoming something of a "proprietary eponym"—a term used to refer to situations where a successful trademark is commonly used in a generic fashion but which is yet still a valid, enforceable trademark. (Familiar examples are Xerox and Kleenex.) This is the case here.[228] When a manufacturer has exclusive rights over such a "proprietary eponym," competitive problems can arise. The owner of the trademark has a clear advantage, and its products are often thought of as "the real thing" or the highest quality option regardless of the actual product attributes. Conversely, the sellers of competing products can experience difficulty establishing consumer recognition and goodwill in the face of competition by a super-brand.

154. In fact, ChromaDex has exploited this anticompetitive effect, and continues to do so. Indeed, the name TRU NIAGEN suggests that ChromaDex's brand of NR is the only genuine one, and thus, the only NR a consumer should want.[229] On the TRU NIAGEN website (www.truniagen.com), the menu at the bottom of the page contains a link entitled "Unauthorized NR."[230]:

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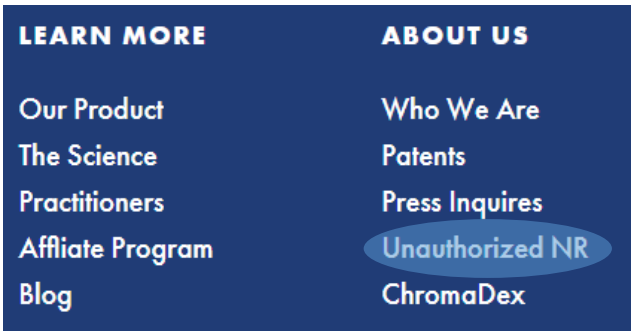
[226] *See* Schmalensee, Richard, "Product Differentiation Advantages of Pioneering Brands"; *American Economic Review*, 72 (February 1982). 349-65.

[227] CDXCA_00464084 at 464097.

[228] *See* Deposition of Amy Boileau at 36:25-37:2 (Q: "Did you use the term 'NR' and 'Niagen' interchangeably at ChromaDex?" A: "Pretty much, yes"); Deposition of Edward Price, at 98: 4-8 (Q: "Was it your understanding that Niagen was the name of the ingredient you'd be producing for Elysium?" Q: "Yes, I never had any idea that Niagen was – I actually thought that's what they called it."); Deposition of ChromaDex 30(b)(6) at 116:20 ("Nicotinamide riboside is Niagen.").

[229] This is representative of ChromaDex's marketing strategy. At his deposition, Rob Fried testified that ChromaDex's marketing of TRU NIAGEN sought to imply that the consumers were getting the "real thing." Deposition of Robert Fried at 143:10-25, Exhibit 8 (CDXCA_00276583); Deposition of ChromaDex 30(b)(6) at 116:17-21 (Q: "Is ChromaDex's marketing designed to get customers to associate the brand name Niagen with the substance nicotinamide riboside?" A: "Yeah. Nicotinamide riboside is Niagen. That's what the company would do, yes."). *See also* CDXCA_00276582 ("NR is NIAGEN®").

[230] ELY_0123385 at (visited June 2019).



(Source: ELY_0123385 (highlight added))

155. Clicking on that link takes the reader to a page with the words "counterfeit-nicotinamide-riboside" in the URL. The page prominently shows a bottle with ChromaDex's own TRU NIAGEN product. It also shows an unmarked container, but one which has a striking resemblance to the shape, size, and color as the container that Elysium uses for BASIS. The page asks: "Is your nicotinamide riboside authentic, safe, & effective?"[231]

(Source: ELY_0123390 at 123390)

[231] ELY_0123390 at 123390 (visited June 2019).

156. ChromaDex's response to this question is for its customers to look for the NIAGEN branding on the label. It also continues to draw a link between ChromaDex's patent rights and the NIAGEN branding.[232]

(Source: ELY_0123390 at 123390)

157. ChromaDex thus clearly continues to leverage the power it built up in the NIAGEN brand by misusing its patent rights to suggest that any competitors that do not use the NIAGEN brand are "counterfeit," not "authentic" NR, and even not "safe & effective." This is a clear anticompetitive effect from ChromaDex's conduct.

158. In addition, ChromaDex's conduct prevented or hampered its customers from building equity in their own trademarks because they were forced to use or license the NIAGEN branding. This, by itself, had anticompetitive effects, as it focused customers on a single brand and did not promote the healthy adoption of several competing brands. As ChromaDex recognized, many of its customers made a "substantial investment […] with respect to the use of the brand name NIAGEN."[233] They were then forced to rebrand by ChromaDex, with the daunting prospect of having to build a brand from scratch and then compete against the well-established NIAGEN brand that they themselves had been forced to help build.

159. The trademark license with Elysium had separate and distinct anticompetitive effects in addition to those outlined above. ChromaDex's conduct impacted the ability of Elysium, who was required to make royalty payments, to compete. As shown below in Figure D, Elysium was effectively required to pay substantially more to ChromaDex than other large volume licensees once the trademark licensing payments are factored in.

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[232] *Id.*

[233] CDXCA_00289635 at 289639.

(Source: CDXCA_00429638 - 429638, CDXCA_00422033 - 422033)

160. As shown, these trademark royalties effectively increased Elysium's price paid for NR by approximately $200 to an average of $1,247 per Kg over the Q1:2015 – Q1:2016 timeframe; higher than the NIAGEN prices paid by its high volume DTC competitors. Unless these costs could be passed through to consumers, the gross margins made by Elysium were necessarily reduced, negatively affecting its ability to compete. With higher costs, it would have less flexibility to lower prices to retail customers. Money used to make these royalty payments was also not available for building its business, developing new products, or expanding the end-user market for products containing NR. Elysium's CEO Eric Marcotulli testified that the money spent paying for trademarks Elysium did not want nor used could have been used "to further scale [Elysium's] business and invest in other products or clinical trials, et cetera."[234]

[234] Deposition of Eric Marcotulli at 108:9-14.

161. It is important to recognize that the impact of ChromaDex's conduct on Elysium had a broader anticompetitive effect on the market for NR products. Elysium was actively selling into the retail NR channel, and limits on its ability to compete necessarily had a negative impact on the pro-competitive effects of Elysium's presence in the market, such as greater consumer choice with respect to the variety of products and options for purchasing them (for example, single bottle vs. annual subscription), and sponsorship of research.

162. For the reasons discussed above, I conclude that ChromaDex's conduct in requiring its NR supply customers to use or license the NIAGEN trademark had profound, lasting, and continuing anticompetitive effects.

XI. CHROMADEX HAS NOT PURGED ITS ALLEGED PATENT MISUSE

163. Finally, ChromaDex has failed to purge and dissipate the long-term effect of its conduct. As discussed above, in May 2017 ChromaDex sent letters to some number of its licensees informing them that they were not required to use the ChromaDex trademarks. [235] In addition, within the same time frame it informed some licensees that their supply of NR had been terminated.[236] I understand ChromaDex has also asserted that it would refund royalty payments to some customers (but not to Elysium).[237] In my opinion, these actions are insufficient to purge the alleged misuse and dissipate its effects.

164. Far from dissipating the anticompetitive effects of ChromaDex's conduct, ChromaDex's strategic decision to terminate its prior licensees' supply in order to establish its own TRU NIAGEN branded supplement exacerbated them. For instance, the NIAGEN trademark has gained consumer recognition and goodwill as a result of the licensed use, and ChromaDex is now reaping those benefits in conjunction with its sale of TRU NIAGEN and excluding the companies that invested in that brand. As discussed above, by pushing out the NIAGEN name through multiple licensees, ChromaDex ensured that consumers came to know the product as NIAGEN. Therefore, the anticompetitive effects from this conduct continue to linger while ChromaDex continues to exploit the NIAGEN branding. In my opinion, the effects of ChromaDex's alleged misuse cannot be purged and dissipated while

[235] *See, e.g.*, CDXCA_00008603 - 8603, CDXCA_00008535 - 8535, CDXCA_00008664 - 8864, CDXCA_00008877 - 8877 (notifications regarding use of trademark).

[236] *See, e.g.*, CDXCA_00008507 - 8507, CDXCA_00262823 - 262823, CDXCA_00429813 at 429813, CDXCA_00008682 - 8282, CDXCA_00008787 - 8787, CDXCA_00008811 - 8811, CDXCA_00008936 - 8936 (notifications of termination of supply).

[237] ChromaDex's Answer to First Amended Counterclaim, Docket No. 46, at 11.

ChromaDex continues to use the NIAGEN branding. Otherwise, ChromaDex will continue to enjoy the benefits of its conduct and, as discussed above, the anticompetitive consequences of that misuse will continue to persist.

165. Moreover, because ChromaDex has already used the strength of the NIAGEN branding to exclude its prior DTC supply customers from the consumer market, the effects of the alleged misuse cannot effectively be dissipated because those customers are no longer present. There is now less competition because of ChromaDex's misuse. Like any market, competitive outcomes are path-dependent. Even if the currently excluded competitors were able to return to the market and use the NIAGEN brand, there is no guarantee that competitive outcomes would be the same as they would have been but for ChromaDex's conduct. Since the clock cannot be rewound, competitive advantages accruing to ChromaDex from its conduct cannot be expunged, and thus the effects of ChromaDex's alleged patent misuse cannot be fully dissipated.

166. A further example of the continuing effects of ChromaDex's conduct can be seen from ChromaDex's truniagen.com website where, as discussed in detail above, ChromaDex asserts that any products that do not contain the NIAGEN brand are "counterfeit," not "authentic," and not "safe & effective." This conduct shows that ChromaDex has not purged its alleged misuse and that its effects persist.

167. ChromaDex has also not returned the license fees paid by Elysium, nor has it compensated Elysium for the opportunity cost of such fees or for the legal fees that Elysium has incurred in connection with litigating its patent misuse counterclaim. While ChromaDex has stated that it will offset the amount of royalties against any amounts that ChromaDex recovers in this lawsuit,[238] it is uncertain whether judgment will enter in ChromaDex's favor.

168. Moreover, it is my opinion that these anticompetitive effects arising from the Elysium license will never be fully dissipated. Even if ChromaDex returns license fees paid by Elysium with interest, the clock cannot be turned back. The marketplace continues to evolve, and Elysium has been constrained to follow a particular path in developing its business. Lost opportunities that Elysium may have had, or gains that Elysium may have been able to realize if operating under looser financial constraints, are difficult to quantify but are nonetheless real economic losses that are irreparable.

[238] ChromaDex's Answer to Elysium's First Amended Counterclaim, ECF No. 46, at 11 (May 24, 2011).

169. As to the additional anticompetitive effects on the third party licensees who were forced to rebrand due to a change in the mandated trademark license, who ChromaDex acknowledged "in some cases [made] substantial investment […] with respect to the use of the brand name NIAGEN,"[239] those effects have likewise not been dissipated, as there is no evidence that they have recovered their investment or otherwise been made whole.

XII. ELYSIUM'S COUNTERCLAIM DAMAGES

170. I have been informed that Elysium filed counterclaims in this matter alleging, *inter alia*, that ChromaDex breached certain provisions of the February 2014 NR supply agreement and its February 2016 amendment.[240] As a result, I have been asked by counsel for Elysium to analyze and quantify the amount of economic damages suffered by and owed to Elysium in the event that the trier of fact finds ChromaDex liable for the breaches alleged by Elysium.

A. Breach of the MFN Provision

171. Section 3.1 of the NR supply agreement states that

> With respect to all Niagen provided by ChromaDex to Elysium Health under this agreement Elysium Health shall pay ChromaDex a maximum price of one thousand three hundred US dollars per kilogram ($1,300 per kg) ("Maximum Price"); If, at any time during the Term, ChromaDex supplies Niagen (or a substantially similar product) to a Third Party at a price that is lower than that at which Niagen is supplied to Elysium Health under this agreement, then the price of Niagen supplied under this Agreement shall be revised to such Third Party price with the effect from the date of the applicable sale to such Third Party and ChromaDex shall promptly provide Elysium Health with any refund or credits thereby created; provided Elysium Health purchases equal volumes or higher volumes than the Third Party. For the sake of clarity this Section does not apply to inter-Affiliate transfers.[241]

172. Elysium alleges ChromaDex breached Section 3.1's most favored nations pricing terms (*i.e.* the MFN Provision) by repeatedly supplying its NR ingredient to several customers at per-kilogram prices below those being paid by Elysium for equal or higher volumes and that ChromaDex neither "revised to such

[239] CDXCA_00289635 at 289639.

[240] Answer to Fifth Amended Complaint and Restated Counterclaims filed February 19, 2019 (ECF No. 192) (incorporating by reference the Third Amended Counterclaim, dated February 22, 2018 (ECF No. 103) and the Sixth Counterclaim for Relief, dated August 9, 2018 (ECF No. 118)); CDXCA_0061424 - 434, CDXCA_00061443 - 446.

[241] CDXCA_00061424 – 434 at 426.

packaging or in separate form or packaging but marketed together (collectively a "Combined Product").[245]

180. Data provided by ChromaDex indicates that it continued to ship NR to certain customers even after granting exclusivity to Elysium. I understand from counsel that resveratrol and pterostilbene are "substantially similar" ingredients and that Elysium alleges that ChromaDex's supply of NR to third parties that marketed those ingredients in combination for sale to consumers after February 2016 constitutes a breach of the agreement.

181. I have been provided with data identifying third party products containing both NR and resveratrol that were marketed and sold by ChromaDex customers between February 2016 and February 2017. During this period, four combination consumer products contained NR and resveratrol.

Company	Product	Channel	Retail ASP	NR (mg.)	Resveratrol (mg.)	Pterostilbene (mg.)	Pills/day	Pills/bottle
Thorne	ResveraCel	Practitioner & DTC	$48.00	300	150		2	60
Thorne	Extra Nutrients	Unknown	$60.00	25	25		4-8	240
LEF	Optimized Resveratrol with NR	DTC	$42.00	100	250		1	30
Vitaquest	Mitoboost	DTC	$42.95	100	30		1	30
Elysium	Basis	DTC	$60.00	250		50	2	60

182. To the extent that Elysium lost sales of BASIS to these four products as a result of ChromaDex's alleged breach, it incurred damages in the form of lost profits on these lost sales. It was also likely damaged by loss of the ability to position its product as the only product combining NR with a sirtuin activator. This would have conveyed some marketing advantage, which all else equal would have translated into some higher volume of sales over the relevant period, and out into the future. But while these are very real economic losses to Elysium, it is not possible to quantify them precisely using the available data.

183. To estimate lost profits, the first step is to assess the potential volume of sales of BASIS in the but-for world in which none of these combination products were available. The normal method used in economics to estimate but-for outcomes in these circumstances is to redistribute sales of the excluded

[245] CDXCA_00061443 - 446 at 445.

products to any remaining sellers. In this case, consumers who purchased one of the four at-issue products have shown that they prefer a combination product to alternatives such as purchasing ingredients separately, and their demand can therefore be allocated, after any necessary adjustments, to the only remaining combination product, BASIS.

184. In my opinion, the number of actual world retail purchasers of Thorne Extra Nutrients who could be expected to purchase BASIS in the but-for world is de minimis. This product does contain NR and resveratrol, but contains NR only in much smaller quantities than BASIS (25mg vs 250mg), and it also contains a large number of additional ingredients.[246] While some customers might have considered purchasing BASIS along with separately sold products containing the other ingredients, I am unable to determine what proportion would have found this to be equivalent to their actual world choice, or to reliably determine the cost of the other ingredients. To be conservative, I have therefore excluded Thorne Extra Nutrients from further consideration, and none of the actual world sales of this product are allocated to BASIS in the but-for world. For the other combination products, I take into account a number of factors in assessing how much of their sales could have been captured by BASIS in the but-for world.

185. None of the at-issue combination products combine NR with pterostilbene, instead they contain a substantially similar compound, resveratrol. In the absence of evidence to the contrary, I assume that consumers would regard these as equivalent in terms of therapeutic effect and thus that, for example, Vitaquest's Mitoboost (100mg NR plus 30mg resveratrol) is equivalent to 40% of a BASIS pill that contains 250mg of NR plus 50 mg of pterostilbene. LEF's "Optimized Resveratrol with NR" contains 100mg of NR per pill with 250mg/pill of resveratrol, and is not therefore not directly equivalent to BASIS, but for purposes of estimating but-for sales of BASIS, the LEF product can be assumed to be one pill containing 100mg NR with 30mg resveratrol (similar to Mitoboost), equivalent to 40% of a BASIS pill, plus an additional pill with 220mg of resveratrol.

186. At retail prices the cost of a month's supply (one 30-count bottle per month) of Mitoboost in the actual world was $42.95. [247] If BASIS were the only combination NR plus sirtuin activator product available,

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[246] Including Vitamin A, Vitamin C, Vitamin E, Vitamin D, Vitamin K, Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Biotin, Pantothenic Acid, Choline, Iodine, Magnesium, Zinc, Selenium, Copper, Manganese, Chromium, Molybdenum, Quercetin Phytosome, Bilberry, Mixed Carotenoids, Boron, and Vanadyl Sulfate.

[247] https://nordicclinical.com/product/mitoboost/.

a consumer could have obtained the same amount of NR in the form of BASIS pills at a cost of $12 per month ($60 for a 60-count bottle, equivalent to 5 months' supply of pills containing 100mg of NR.) It is reasonable therefore to assume that a large fraction of Mitoboost customers would have been Elysium customers in the but-for world, since BASIS would have been substantially less costly and a consumer who purchased Mitoboost in the actual world has shown that they prefer a combination product to purchasing ingredients separately. Insufficient data is available to determine precisely how many Mitoboost customers could have been BASIS customers in the but-for world. Not all Mitoboost customers can be assumed to purchase BASIS in the but-for world, since Mitobooost is not exactly equivalent to BASIS and some of the characteristics and features of Mitoboost that played a role in the purchase decision were not offered by BASIS. Elysium did not sell BASIS in a formulation containing 100mg NR per pill, and while "pill-splitting" is a common behavior, some customers preferring a 100mg per day dose might have not been willing to do this. BASIS was also sold primarily as a continuing subscription rather than single purchase, which some customers may not have been willing to sign up for, or to purchase single bottles from Elysium's website as opposed to their actual world method of purchase. Some number of actual Mitoboost customers might therefore choose not to purchase an NR combination product in the but-for world, switching to separately purchased NR-only and resveratrol-only or pterostilbene-only products, or exiting the market entirely. Based on my knowledge and experience in analyzing demand for pharmaceutical and OTC products, and allowing for the fact that the products are not identical in terms of dosage and formulation and that BASIS is sold primarily as an annual subscription rather than per bottle, in my opinion as much as 90%, but no less than 10%, of the volume of Mitoboost sales could have been captured in the but-for world by the equivalent amount of BASIS sales.

187. A similar logic holds for LEF's "Optimized Resveratrol with NR". Some customers may have purchased this product for other benefits of its resveratrol content beyond sirtuin activation, and for them the relevant price comparison is therefore the cost of one-tenth of a bottle of BASIS plus additional resveratrol. Even after including an additional $12.77 per month for costs of buying additional resveratrol, the $12 cost per month to buy the equivalent amount of NR in the form of BASIS, plus the cost of additional resveratrol,[248] is still substantially lower than the $42 per month cost of LEF's

[248] This is the cost of 30 days x 220mg of resveratrol, based on the average price per mg of three resveratrol products listed on Amazon.com: Jarrow Formulas Resveratrol 100mg 120 veggie caps; Life

product.[249] As with Mitoboost, there are differences between the LEF product and BASIS that would likely cause some number of actual world customers to decline to purchase BASIS in the but-for world. Apart from the question of single purchase versus subscription, the LEF product emphasized resveratrol over NR, and contained the two ingredients in quite different proportions than present in BASIS. Based on my knowledge and experience in analyzing demand for pharmaceutical and OTC products, and allowing for these product differences, in my opinion as much as 75%, but no less than 10%, of the volume of "Optimized Resveratrol with NR" sold by LEF could have been captured in the but-for world by the equivalent amount of BASIS sales.

188. Estimating but-for capture of sales of Thorne's ResveraCel product by BASIS requires the following factors be taken into account. Firstly, ResveraCel was sold both in the practitioner channel, from which Elysium was contractually excluded, and the DTC channel, where BASIS can be assumed to have been able to meet some demand in the but-for world. There is insufficient data disclosed in discovery to determine what fraction of ResveraCel was sold through the DTC channel. Here, I assume the sales of ResveraCel are split evenly (50%) between the practitioner and DTC channels. Secondly, ResveraCel contains 300mg of NR, and to acquire an equivalent amount of NR by purchasing BASIS, a ResveraCel customer would have to buy 20% more bottles on a monthly basis. This would make BASIS more costly, $72 per month versus $48.[250] By the Law of Demand, some number of ResveraCel consumers would have been deterred from buying BASIS in the but-for world. Again, insufficient data has been disclosed to allow direct estimation of the price elasticity of demand, but assuming a price elasticity of -1.5 to -2, which is consistent with Elysium's price-cost margins and my experience in estimating econometric models of demand for this type of product, the higher price of BASIS would have resulted in between 75% and 100% lower volume.

189. On the assumption that between 10% and as many as 90% of ResveraCel's DTC customers would have been likely purchasers of BASIS, then in my opinion as much as 11.25% (25% of 90% of the 50% of customers in the DTC) of the total volume of ResveraCel sold by Thorne could have been captured in the but-for world by the equivalent amount of BASIS.

Extension 100mg 60 vegetarian capsules; SOURCE NATURALS Resveratrol 100 Mg Vegetable Capsules, 120 Count.

[249] Exhibit 5, Schedule A.

[250] *Id.*

190. Exhibit 5 shows the upper and lower bounds on additional volume of but-for sales of BASIS that could have been made in place of each of the products at issue in each scenario, and Elysium's lost profits on the lost sales attributable to ChromaDex supplying NR and resveratrol to the sellers of these combination products. In total, Elysium's lost profits due to the alleged breach are between $68,355 and $571,981.

C. Breach of the cGMP Provision

191. The agreement under which ChromaDex supplied NR to Elysium specifically states that "THE NIAGEN SOLD HEREUNDER SHALL BE (i) MANUFACTURED IN ACCORDANCE WITH cGMP AND APPLICABLE LAWS AND REGULATIONS IN THE UNITED STATES …".[251] The agreement defined "cGMP" as "current good manufacturing practices (i) as described in parts 210 and 211 of Title 21 of the United States' Code of Federal Regulations and the latest FDA guidance documents pertaining to manufacturing and quality control practice, and (ii) as applicable in each other country in which Elysium Health advises ChromaDex in writing that Niagen products are intended to be sold [.]"[252] The expectation that the product received would meet the standards of pharmaceutical cGMP would have, all else equal, raised Elysium's willingness to pay, resulting in a higher per kg price in the agreement. I have been advised that the NR supplied to Elysium by ChromaDex was not manufactured in accordance with current good manufacturing practices as described in Parts 210 and 211 of Title 21 of the United States Code of Federal Regulations and the latest FDA guidance documents pertaining to manufacturing and quality control practice.[253] Had Elysium understood that it was in fact bargaining for supply of a product manufactured to a lower standard, and less expensively than a product manufactured to pharmaceutical cGMP, basic economic considerations suggest that it would only have agreed to a lower price.

192. Elysium has thus suffered economic harm. The appropriate measure of damages is the difference between the actual price paid and the lower price that Elysium can be assumed to have negotiated had it been aware that ChromaDex was not supplying cGMP-compliant NR, multiplied by the quantity purchased.

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[251] CDXCA_00061424 – 434 at 427.

[252] CDXCA_00061424.

[253] *See* https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm.