UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

TEVA PHARMACEUTICALS INTERNATIONAL GMBH and TEVA PHARMACEUTICALS USA, INC.,	*	
Plaintiffs,	*	
v.	*	Civil Action No. 18-cv-12029-ADB
ELI LILLY AND COMPANY,	*	
Defendant.	*	

MEMORANDUM AND ORDER

BURROUGHS, D.J.

Plaintiffs Teva Pharmaceuticals International GmbH and Teva Pharmaceuticals USA, Inc. (collectively, "Teva" or "Plaintiff") and Defendant Eli Lilly and Company ("Lilly" or "Defendant"), competing pharmaceutical companies, have both developed antibodies capable of treating headache disorders associated with calcitonin gene-related peptide ("CGRP"). In the instant case, Teva alleged that Lilly induced infringement and contributorily and willfully infringed three of its patents (the "Patents-in-Suit" or "Patents"). [ECF No. 593 (Verdict) at 2–4]. Lilly, in turn, alleged that the Patents-in-Suit are invalid under 35 U.S.C. § 112 for lack of written description and enablement. [Id. at 5–6]. From October 18, 2022 through November 9, 2022, the parties presented their cases to a jury, which returned a verdict in favor of Teva and awarded $90,000,000 in lost profits damages, $36,740,000 (or 5%) in reasonable royalty damages, and $49,800,000 in future lost profits damages. [Id. at 7–9]. Now pending before the Court is Lilly's motion for judgement as a matter of law under Federal Rule of Civil Procedure 50(b) and/or for a new trial under Rule 59. [ECF No. 649]. For the reasons set forth below, Lilly's motion is GRANTED in part and DENIED in part.

I. STANDARD OF REVIEW

Defendant's Rule 50 motion for judgment as a matter of law is based on the contention that the evidence was not sufficient to support the jury's verdict. [ECF No. 650 at 8–9]. "A party seeking to overturn a jury verdict faces an uphill battle." Marcano Rivera v. Turabo Med. Ctr. P'ship, 415 F.3d 162, 167 (1st Cir. 2005). "Courts may only grant a judgment contravening a jury's determination when the evidence points so strongly and overwhelmingly in favor of the moving party that no reasonable jury could have returned a verdict adverse to that party." Id. (quoting Rivera Castillo v. Autokirey, Inc., 379 F.3d 4, 9 (1st Cir. 2004)). In evaluating a motion for judgment as a matter of law, the Court must consider "the evidence presented to the jury, and all reasonable inferences that may be drawn from such evidence, in the light most favorable to the jury verdict." Osorio v. One World Techs. Inc., 659 F.3d 81, 84 (1st Cir. 2011) (quoting Granfield v. CSX Transp., Inc., 597 F.3d 474, 482 (1st Cir. 2010)).

In contrast, the Court's power to grant a Rule 59 motion for a new trial "is much broader than its power to grant a [motion for judgment as a matter of law]." Jennings v. Jones, 587 F.3d 430, 436 (1st Cir. 2009). The Court may grant a motion for a new trial "if the verdict is against the demonstrable weight of the credible evidence," or if it "results in a blatant miscarriage of justice." Foisy v. Royal Maccabees Life Ins. Co., 356 F.3d 141, 146 (1st Cir. 2004) (quoting Sanchez v. P.R. Oil Co., 37 F.3d 712, 717 (1st Cir. 1994)). "The district court may 'independently weigh the evidence' in deciding whether to grant a new trial," Cham v. Station Operators, Inc., 685 F.3d 87, 97 (1st Cir. 2012) (quoting Jennings, 587 F.3d at 435), and "wields 'broad legal authority' when considering a motion for a new trial . . . ." Jennings, 587 F.3d at 436 (quoting de Pérez v. Hosp. del Maestro, 910 F.2d 1004, 1006 (1st Cir.1990)). At the same time, a "district judge cannot displace a jury's verdict merely because [she] disagrees with it' or

because 'a contrary verdict may have been equally . . . supportable.'" Id. (quoting Ahern v. Scholz, 85 F.3d 774, 780 (1st Cir. 1996)). "[W]hen an argument that the evidence was insufficient forms the basis of a motion for new trial, the district court is generally well within the bounds of its discretion in denying the motion using the same reasoning as in its denial of a motion for judgment as a matter of law." Lama v. Borras, 16 F.3d 473, 477 (1st Cir. 1994).

II. EVIDENCE AT TRIAL[1]

In reaching its verdict, the jury could have found the following facts, based on the evidence presented at trial. These facts are construed in the light most favorable to the jury verdict.

A. Overview

CGRP is a protein found in humans. See [Trial Tr. 2-93:5, 2-104:8–12, 4-22:15–18, 14-183:7–15].[2] When CGRP "binds," or attaches, to certain cells, the cells expand, causing increased blood flow through blood vessels, which is associated with headache. [Id. at 4-23:24–24:17].

The Patents-in-Suit, U.S. Patent Nos. 8,586,045 (the "'045 Patent"), 9,884,907 (the "'907 Patent"), and 9,884,908 (the "'908 Patent"), relate to a method for treating headache by blocking the binding function of the CGRP protein. [Trial Tr. 2-104:8–12]. More specifically, and as described in more detail below, the Patents-in-Suit relate to a method for using humanized anti-CGRP antibodies to bind to CGRP, and block the CGRP protein from itself binding to cells in a

[1] The Court summarizes the facts relevant to the science at issue and validity here, and separately addresses facts related to future profits below.

[2] The trial transcript in this case is docketed at ECF Nos. 600 (Day 1) and 602–617 (Days 2–17). For consistency, the Court cites the trial transcript as follows: Trial Tr. Day-Page:Line.

way that causes headache. [Id. at 14-183:7–15, 15-16:22–24; ECF No. 650 at 6; ECF No. 667 at 1].

1. Humanized Anti-CGRP Antibodies and How They Function

Antibodies and antigens are both proteins. [Trial Tr. 2-36:4]. Antibodies are proteins produced by the immune system to fight disease and infection by identifying and binding to antigens. [Id. at 2-147:4–10, 4-18:22–19:13]. CGRP is an example of an antigen. [Id. at 4-22:15–18].

A humanized antibody is an antibody engineered in a laboratory. [Trial Tr. 3-191:10–16]. Humanizing an antibody means taking an antibody from a non-human species, like a mouse or rat, and converting it to an antibody that the human immune system will not reject. [Id. at 3-191:21–192:15].

The makeup and shape of an antibody (a protein) is relevant to how the antibody functions. See [Trial Tr. 4-19:7–20:2]. Proteins are made up of amino acids. [Id. at 4-18:22–19:13]. There are approximately 20 amino acids found in the human body. [Id.]. These individual amino acids combine together in "chains[,] . . . linked together in a head-to-tail fashion," to form a protein. [Id.]. When amino acids combine in a chain to make a protein, they form a shape, and the shape of the protein determines the protein's function. [Id. at 4-19:7–20:2]. The relevant antibodies here are generally depicted with a Y-shape. [Id. at 2-123:4–13, 11-117:9–119:24].

Typical full-length antibodies are made up of four chains—two light chains and two heavy chains—and each of the four chains has two regions, a constant region and a variable region. [Trial Tr. 11-28:12–29:7]. The constant regions are largely the same across all antibodies, and the variable regions are different in different antibodies. [Id. at 4-23:3–20, 11-52:25–53:22].

The variable regions, or variable domains, can be categorized into V-gene families. [Trial Tr. 11-92:11–25]. Different V-gene families are defined by their "sequence," or makeup, of amino acids. [Id. at 4-23:3–20, 11-47:23–48:20, 11-52:25–53:22, 11-92:11–25]. A V-gene family's sequence of amino acids determines the variable region of the antibody's structure, or shape. [Id.].[3]

Inside the variable regions are complimentary determining regions ("CDRs"), which are structures with a "distinct sequence of amino acids." [Trial Tr. 4-23:3–20, 8-225:15–18, 11-55:9–17]. The CDRs are the parts of an antibody that bind to an antigen. [Id. at 4-23:3–20]. The CDRs have a particular shape based on their amino acid sequence, and when a CDR's shape matches the shape of a binding site on an antigen (called the epitope region of the antigen), the antibody can bind to the antigen. [Id. at 4-23:3–20, 11-28:16–22, 11-55:13–56:12].[4]

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[3] "Sequence identity" refers to a comparison of the makeup of the amino acids in two proteins. [Trial Tr. 11-49:14–51:7]. Sequence identity is often expressed as a percentage identifying how many amino acids are the same in two proteins, and is a way to determine whether two proteins are similar or dissimilar. [Id.].

[4] Put another way, the parties agreed at trial that

> CGRP consists of a single polypeptide chain that, in humans, is 37 amino acids in length. An antibody or immunoglobulin is a specialized protein molecule that recognizes and binds to a target molecule known as an antigen. The portion of an antigen bound by an antibody is called an epitope. Antibodies are made up of amino acids connected end to end in linear chains called polypeptide. Typical full length antibodies are composed of four peptide chains chemically bound, two identical heavy chains and two identical light chains. Each full length antibody contains constant and variable regions. Each heavy chain has a variable domain, VH, and each light chain has a variable domain, VL. So that's like V heavy/V light. The variable domain in each heavy or light chain has three complementarity determining regions, CDRs, and four framework regions. The variable regions of an antibody's heavy chains and light chains are the portion of the antibody that bind to the antigen.

[Trial Tr. 11-28:12–29:7].

In sum, the method at issue involves administering humanized antibodies to a person. [TX-0001 ("'045 Patent") at claim 30; TX-0002 ("'907 Patent") at claims 1, 5–6; TX-0003 ("'908 Patent") at claims 1, 5–6]. Those antibodies are called humanized anti-CGRP antagonist antibodies because when they bind to the protein CGRP (when the CDR of the antibody binds with the epitope of CGRP), they "antagonize," or "block," CGRP from functioning in a way that causes headache. [Trial Tr. 3-69:4–9]

2. The State of the Science Prior to the Patents-in-Suit (The Prior Art) and the Development of the Patents-in-Suit

Dr. Jorg Zeller ("Zeller") and his team are the inventors of the Patents-in-Suit, the first of which was filed in July 2011. [Trial Tr. 3-21:20–23:15; '045 Patent at (22)]. The Patents claim priority, however, to an application filed in November 2006. [Trial Tr. 3-21:20–23:15, 11-40:18–21; '045 Patent at (60); '907 Patent at (60); '908 Patent at (60)].

Teva argues that evidence at trial confirmed that before Zeller and his team developed the Patents-in-Suit, "a connection between CGRP and headache had been established, and both clinically-effective small molecule drugs targeting the CGRP pathway and anti-CGRP antagonist antibodies had been described in the scientific literature, but a [person of ordinary skill in that art (a "POSA")] did not yet know whether the antibodies could be used to prevent headache." [ECF No. 667 at 1].

For example, Teva cites to an inventor of the Patents-in-Suit's testimony that as early as 2001, he and others "knew that if you inject CGRP into human, you elicit pain. People actually did this experiment, they injected CGRP into human that elicited an acute migraine." [Trial Tr. 2-93:15–94:6]. That inventor further testified that in 2003, an executive at his company made a public presentation "show[ing] that blocking the CGRP receptor leads to partial reversal of

migraine pain," [id. at 2-94:15–19], and that research on this same topic was published "just under a year after 2004," [id. at 2-97:9–17].

Also in 2003, Zeller received a CGRP-blocking antibody from an academic lab at UCLA. [Trial Tr. 2-154:1–15]. Zeller and his team injected this antibody into mice so the mice would generate their own CGRP-blocking antibodies. [Id. at 2-154:24–155:8]. The team then studied whether the antibodies could prevent migraines in rats, [id. at 2-103:7–104:7],[5] and found that "anti-CGRP blocking antibodies could really treat migraine," [id. at 2-104:8–12].

Having found an anti-CGRB antibody, called "antibody 79," that could prevent migraine in rats, [Trial Tr. 3-97:11–98:8], Zeller and his team undertook the process of humanizing antibody 79, [id. at 3-102:15–110:10]. By 2005, the team had developed a humanized anti-CGRP antibody called "G1." [Id. at 3-110:10, 3-111:2–8]. Based on this work and the G1 humanized antibody, the Zeller team filed a provisional patent application in November 2005, and a patent application in November 2006. [Id. at 3-112:3–18; '045 Patent at (60); '907 Patent at (60); '908 Patent at (60)].

By the time the application was filed, the jury could have found that (1) a POSA would have known methods for making murine (mouse) anti-CGRP antibodies, [Trial Tr. 2-154:24–155:8, 15-103:15–104:15, 15-109:13–20; PTX-474 at 3], (2) a POSA could generate anti-CGRP antagonist antibodies, [id. at 15-106:14–109:20, 15-158:19–159:4], (3) a mouse immunized with CGRP would generate anti-CGRP antibodies, [id. at 12-57:5–11], (4) antibodies that antagonize CGRP could be identified using tests that could analyze millions of potentially relevant

[5] Using "animal models" is a way to "attempt to simulate, to reproduce the disease in organisms that are not human, primarily in mice or rats, before you take the risk of going to human. You want to make sure that your drug is effective in a mouse or in a rat." [Trial Tr. 2-102:20–24].

antibodies in days, [id. at 2-157:21–158:12, 15-57:20–60:8, 15-105:1–106:13], and (5) a POSA could confirm an antibody's ability to antagonize CGRP in animals, [id. at 2-161:2–182:3, 15-63:23–64:5]. In addition, a jury could have concluded that a POSA would have known that humanization of the antibodies was routine. [Id. at 12-52:3–59:5, 15-109:21–119:9, 15-152:20–156:25]; see also ['045 Patent at 28:43–29:28; PTX-865].

That said, prior to filing the application, no humanized anti-CGRP antagonist antibodies were known in the art. [Trial Tr. at 3-28:6–9, 11-137:4–6, 12-148:23–149:2, 15-67:25–68:6, 15-144:17–24]. The Patent Trial and Appeal Board (PTAB), however, had found Teva's patents covering humanized anti-CGRP antagonist antibodies themselves, i.e., the underlying antibody and not the method for using it,[6] invalid because it determined that as of November 2005, it would have been obvious how to make a humanized anti-CGRP antagonist antibody. See, e.g., [PTX-923 at 41, 94–100, 165].

3. The Patents-in-Suit

a. The Asserted Claims

The asserted claims before the jury were claim 30 of the '045 Patent; claims 5, and 6 of the '907 Patent; and claims 5, and 6 of the '908 Patent (collectively, the "Asserted Claims"), which provide the following:[7]

[6] As Teva concedes, the Inter Partes Reviews ("IPRs") discussed in the record and in its brief did not relate to a "method of treatment," but instead "cover[ed] the underlying antibodies." [ECF No. 667 at 2].

[7] See [TX-0001–0003; ECF No. 593].

Patent-in-Suit	Claims
The '045 Patent **Claim 30**, which depends on claim 17.	**17**. A method for reducing incidence of or treating headache in a human, comprising administering to the human an effective amount of an anti-CGRP antagonist antibody, wherein said anti-CGRP antagonist antibody is a human monoclonal antibody or a humanized monoclonal antibody. **30**. The method of claim **17**, wherein said anti-CGRP antagonist antibody is a humanized monoclonal antibody.
The '907 Patent **Claims 5 and 6**, which depend on Claim 1.	**1**. A method for treating headache in an individual, comprising: administering to the individual an effective amount of a humanized monoclonal anti-Calcitonin Gene-Related Peptide (CGRP) antagonist antibody, comprising: two human IgG heavy chains, each heavy chain comprising three complementarity determining regions (CDRs) and four framework regions, wherein portions of the two heavy chains together form an Fc region; and two light chains, each light chain comprising three CDRs and four framework regions; wherein the CDRs impart to the antibody specific binding to a CGRP consisting of amino acid residues 1 to 37 of SEQ ID NO:15 or SEQ ID NO:43. **5**. The method of claim **1**, wherein the headache is a migraine with or without aura, hemiplegic migraine, cluster headache, migrainous neuralgia, chronic headache, or tension headache. **6**. The method of claim **1**, wherein the headache is a migraine.

The '908 Patent **Claims 5 and 6**, which depend on Claim 1.	**1**. A method for treating headache in an individual, comprising: administering to the individual an effective amount of a humanized monoclonal anti-Calcitonin Gene-Related Peptide (CGRP) antagonist antibody, comprising: two human IgG heavy chains, each heavy chain comprising three complementarity determining regions (CDRs) and four framework regions, wherein portions of the two heavy chains together form an Fc region; and two light chains, each light chain comprising three CDRs and four framework regions; wherein the CDRs impart to the antibody specific binding to a CGRP consisting of amino acid residues 1 to 37 of SEQ ID NO:15 or SEQ ID NO: 43, and wherein the antibody binds to the CGRP with a binding affinity (K_D) of about 10 nM or less as measured by surface plasmon resonance at 37° C. **5**. The method of claim **1**, wherein the headache is a migraine with or without aura, hemiplegic migraine, cluster headache, migrainous neuralgia, chronic headache, or tension headache. **6**. The method of claim **1**, wherein the headache is a migraine.

All of the Asserted Claims require the use of a *humanized* anti-CGRP antagonist antibody. For example, claim 30 of the '045 Patent requires that the "anti-CGRP antagonist antibody is a humanized monoclonal anybody." ['045 Patent at claim 30]. Similarly, claim 1 of the '907 and '908 Patents, upon which the Asserted Claims 5 and 6 depend, requires "administering to [an] individual an effective amount of a humanized monoclonal anti-[CGRP] antagonist antibody." ['907 Patent at claims 1, 5–6; '908 Patent at claims 1, 5–6].

In addition, the Asserted Claims cover a method for treating headache by administering the humanized anti-CGRP antagonist antibodies. See ['045 Patent at claims 17, 30; '907 Patent at claims 1, 5–6; '908 Patent at claims 1, 5–6].

The '907 and '908 Patent claims appear to include additional requirements for the humanized monoclonal anti-[CGRP] antibodies. See ['907 Patent at claim 1; '908 Patent at claim 1]. Specifically, claim 1 of both Patents requires

> two human IgG heavy chains, each heavy chain comprising three complementarity determining regions (CDRs) and four framework regions, wherein portions of the two heavy chains together form an Fc region; and
>
> two light chains, each light chain comprising three CDRs and four framework regions;
>
> wherein the CDRs impart to the antibody specific binding to a CGRP consisting of amino acid residues 1 to 37 of SEQ ID NO:15 or SEQ ID NO:43.

['907 Patent at claim 1; '908 Patent at claim 1], and claim 1 of the '908 patent further requires "and wherein the antibody binds to the CGRP with a binding affinity (K_D) of about 10 nM or less as measured by surface plasmon resonance at 37° C." ['908 Patent at claim 1].[8] Testimony at trial, however, established that, with the exception of the "IgG type" chains, which refers to a specific antibody type that "relates to allergic disorders," [Trial Tr. 11-37:4–14, 11-78:22–79:1], "these are all generic features of all full-length antibodies," simply reflect "how antibodies work," and do not help distinguish between different types of antibodies. [Id. at 11-76:21–78:16].[9] Notably, the claims do not identify any amino acid sequence or unique structure of

[8] "Binding affinity" refers to the strength of the binding between and antibody and antigen. See [Trial Tr. 3-94:10–19, 8-195:21–196:6].

[9] In Teva Pharmaceuticals International GmbH v. Eli Lilly & Co., the Federal Circuit similarly found that in a claim that required

> A humanized monoclonal anti-Calcitonin Gene-Related Peptide (CGRP) antagonist antibody, comprising:
>
> two human IgG heavy chains, each heavy chain comprising three complementarity determining regions (CDRs) and four framework regions, wherein portions of the two heavy chains together form an Fc region; and
>
> two light chains, each light chain comprising three CDRs and four framework regions;

antibodies possessing the claimed function. [Id. at 11-76:4–82:21, 11-136:16–137:6, 11-138:7–10, 12-167:4–169:5, 12-180:15–20].

b. The Specifications

The Specifications of the Patents-in-Suit are substantively identical and generally "describe a humanized anti-CGRP antagonist antibody referred to as antibody G1 and later named fremanezumab." [Trial Tr. 11-29:8–12]. The parties' framing of the rest of the disclosure in the specifications differs.

Lilly contends that "Teva's specification discloses just a ***single*** humanized anti-CGRP antagonist antibody within the scope of the asserted claims—G1." [ECF No. 650 at 8 (citing Trial Tr. 11-84:3–5) (emphasis in brief)]. Although the specifications disclose 84 "variants" of the humanized anti-CGRP antagonist antibody G1, [Trial Tr. 15-163:15–17; '045 Patent at 60:55–65:59 (Table 6); '907 Patent at 62:28–67:31 (Table 6); '908 Patent at 62:13–67:14 (Table 6)], Lilly contends that the 84 variants are not within the scope of claims 5 and 6 of the '907 and '908 Patents because they are "antibody fragments," not "full-length antibodies." [ECF No. 650 at 8 n.3 (citing Trial Tr. 11-83:20–84:14, 15-163:25–164:8)]. Lilly further argues that the 84 variants of G1 are very similar to G1 itself—sharing "more than 95% sequence identity." [Id. at 8 (citing Trial Tr. 11-86:21–88:16, 15-163:20–23)]. Moreover, Lilly avers that the 84 variants are not proven to be antagonist antibodies, as required by the Asserted Claims. [Id. (citing ECF No. 101 at 11–12; Trial Tr. 11-83:21–84:14, 15-164:17–19)].

> wherein the CDRs impart to the antibody specific binding to a CGRP consisting of amino acid residues 1 to 37 of SEQ ID NO:15 or SEQ ID NO: 43,

U.S. Patent No. 9,890,210, "the recited heavy and light chains are generic to IgG antibodies and the recited sequence IDs correspond to CGRP." 8 F.4th 1349, 1356, 1362–63 (Fed. Cir. 2021).

In contrast, Teva argues that the specifications "disclos[e] experimental data for 97 different humanized and murine [mouse] anti-CGRP antibodies, including antibody G1." [EFC No. 667 at 2 (citing '045 Patent at 50:6–69:67)]. Teva does not point to trial testimony in support of the 97 antibodies it identifies, but a review of the patents confirms that 12 of the identified antibodies are murine, ['045 Patent at 52:1–30 (Table 3); '907 Patent at 52:43–66 (Table 3); '908 Patent at 53:1–21 (Table 3)], and that the remaining 85 are the same antibody and antibody fragments identified by Lilly, namely G1 and its 84 variants, ['045 Patent at 60:55–65:59 (Table 6); '907 Patent at 62:28–67:31 (Table 6); '908 Patent at 62:13–67:14 (Table 6)].

Moreover, Teva states that the specifications disclose "a detailed study of CGRP antagonism using numerous [mouse] antibodies" that "showed a strong correlation between [in lab] antagonism of CGRP and efficacy in animal models" that "[a] POSA would understand [] to prove that anti-CGRP antagonist antibodies could treat headache in humans." [ECF No. 667 at 2 (citing '045 Patent at 53:35–57:12, 67:53–69:67; PTX-2027 at 6; Trial Tr. 15-40:1–19, 15-42:17–24, 15-62:14–64:23, 15-125:7–20, 15-158:2–162:21)]. Teva further avers that evidence at trial showed that "a POSA would understand the data in the specification for antibody G1 to be representative of anti-CGRP antagonist antibodies generally," such that "once the inventors showed G1 would treat headache, a POSA would understand that *any* humanized anti-CGRP antagonist antibody would." [Id. (citing Trial Tr. 15-64:6–23, 15-161:18–162:21) (emphasis in brief)].

B. Teva and Lilly's Competing Products

Teva's anti-CGRP product is called Ajovy®. [Trial Tr. 2-104:13–17]. The active ingredient in Ajovy® is the G1 antibody disclosed in the Patents-in-Suit, which is also called fremanezumab ("fmab"). [Id. at 3-162:16–22, 4-162:21–163:12]. Lilly's infringing product is

Emgality®, and the active ingredient in Emgality® is the anti-CGRP antagonist antibody galcanezumab ("gmab"). [Id. at 3-156:20–157:7, 4-162:21–163:12]. There are several differences between G1 and gmab.

First, the CGRP antigen has three different epitopes, or binding sites. See [Trial Tr. 8-198:25–7, 11-122:1–123:8]. There is a C-terminal epitope on one end, an N-terminal on the opposite end, and a "mid-region" epitope between them. [Id.]. G1 binds to the C-terminal end epitope of CGRP, whereas gmab binds to the mid-region of CGRP. [Id. 11-96:11–97:11, 11-105:18–107:8, 15-101:15–20].

Second, Lilly's expert testified, and Teva's expert did not dispute, that the sequence identity between gmab and G1 is 50.8% to 64.5%. [Trial Tr. 11-88:17–89:23, 15-145:8–15]. In contrast, as to the 84 G1 variants disclosed in Table 6 of the Patents-in-Suit, ['045 Patent at 60:55–65:59 (Table 6); '907 Patent at 62:28–67:31 (Table 6); '908 Patent at 62:13–67:14 (Table 6)], the variable regions of G1 and the variants have more than 95% sequence identity with its variants. [Trial Tr. 11-86:21–88:16, 15-163:20–23].

Third, gmab and G1 come from different V gene families, and have CDRs of different sequences and lengths. [Trial Tr. 11-88:17–90:10, 11-91:9–92:10, 11-93:4–94:8, 15-146:5–8]. In contrast, G1 and its variants come from the same V gene families, their CDRs have the same length, and three of the six CDRs are identical in G1 and its 84 variants. [Id. at 11-90:15–91:8, 11-93:14–22].

Fourth, Lilly's expert testified that gmab is more "potent" than G1 for treating migraines, [Trial Tr. 11-107:9–108:20, 12-207:15–207:21], and thus, for example, has different dosing and response rates, [id. at 12-206:12–210:16]; see also [id. at 12-138:15–19 (Teva doctor confirming different dosage)]. A former Teva doctor also testified that there are potency and affinity

differences between gmab and G1. [Id. at 12-137:24–138:19]. Moreover, while gmab could succeed in treating one type of headache, cluster headache, [id. at 12-206:25–207:5], Teva's G1 product was not marketed for that purpose, [id.], and a former Teva doctor testified that Teva was not pursuing approval to treat cluster headache with its G1 product, [id. at 12-97:25–98:8].

C. Identifying and Making Additional Antibodies Beyond G1

Regarding antibodies beyond the 97 identified in the specifications and the later discovered gmab, testimony at trial established that there are a "mind-bogglingly large" number of antibodies that could *potentially* fit within the scope of the Asserted Claims, though the *actual* number is not "knowable." [Trial Tr. 11-79:2–82:21].

To identify additional antibodies that might antagonize CGRP, Teva's expert testified that one could not predict whether an antibody will antagonize CGRP based on its amino acid sequence. [Trial Tr. 15-146:23–147:11]. Instead, antibodies need to be made and tested for antagonism. See [id.]. Similarly, the named inventor of the Patents-in-Suit testified that "you would have to evaluate each anti-CGRP antibody empirically to determine whether or not it [could] inhibit CGRP." [Id. at 3-35:10–15].

Thus, to get a humanized anti-CRGP antagonist antibody within the scope of the Asserted Claims generally requires four steps. First, a lab test (an "in vitro assay") could identify millions of potential antibody candidates in days. [Trial Tr. 15-105:1–106:13].

Second, "as of November 2006," a POSA could "take the best of those compounds" identified in the in vitro test and assess whether they are strong candidates in animal tests or models ("in vivo" tests). [Trial Tr. 15-63:6–14]. In vivo tests have "a higher degree of complexity" than in vitro tests, and are necessary because, to work in human bodies, drugs need to work in an animal model that "reflects a specific aspect that is similar or the same as through

human condition." [Id. at 2-161:2–10]. These in vivo animal tests, an inventor testified, "take time" because "animal [treatment] protocols . . . have to be submitted for approval." [Id. at 2-161:11–15].

Third, one would need to get the actual animal anti-CGRP antagonist antibodies identified as strong candidates. [Trial Tr. 15-152:11–19]. It took 111 days (nearly four months) for the inventors here to get the rodent anti-CGRP antagonist antibodies that they used for developing the Patents-in-Suit. [Id.].

Fourth, the animal anti-CGRP antagonist antibodies would have to be humanized. Lilly's expert testified that humanizing an antibody can take "many months' worth of effort," cost "maybe half a million dollars," and require "two or three researchers working full time." [Trial Tr. 11-150:25–151:12]. Teva's expert testified that "in the context of somebody wanting to develop a drug for treating a terrible disease like migraine," the time and cost did not seem prohibitive, but he agreed that around 2006 it "might" have taken "several months" to generate a humanized antibody. [Id. at 15-116:18–117:20, 15-156:19–22]. He further testified that in present day, humanizing an antibody can cost up to $70,000 and can take eight to nine weeks. [Id. at 15-117:11–118:2].

D. Procedural History

From October 18, 2022 through November 9, 2022, the parties presented their cases to a jury, which returned a verdict in favor of Teva. [ECF Nos. 593, 600, 601–617]. Lilly filed the instant motion for judgment as a matter of law ("JMOL") and/or a new trial on January 27, 2023. [ECF No. 649].[10] Teva opposed the motion on February 24, 2023, [ECF No. 667], and Lilly

[10] Lilly also moved for judgment as a matter of law at the close of evidence on November 8, 2023. [ECF No. 588]. That motion is DENIED as moot.

filed a reply on March 10, 2023, [ECF No. 683]. Lilly also submitted notices of supplemental authority regarding enablement on May 19, 2023, [ECF No. 687], and September 22, 2023, [ECF No. 693]. Teva responded on May 22, 2023, [ECF No. 689], and September 25, 2023, [ECF No. 694]. Lilly further filed a reply in support of its first notice of supplemental authority on May 24, 2023. [ECF No. 690].

III. DISCUSSION

Lilly argues that it is entitled to JMOL and/or a new trial because the Asserted Claims are invalid for two reasons: (1) lack of written description and (2) lack of enablement. [ECF No. 650 at 4, 23]. Lilly also avers that it is entitled JMOL and/or a new trial on the issue of future lost profits. [Id. at 26]. The Court addresses each issue in turn.

A. Written Description

Section 112 states that a patent specification "shall contain a written description of the invention." 35 U.S.C. § 112. "[T]he hallmark of written description is disclosure," and the test is "an objective inquiry into the four corners of the specification from the perspective of a [POSA]." Ariad Pharms., Inc. v. Eli Lilly & Co., 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). "A specification adequately describes an invention when it 'reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.'" Juno Therapeutics, Inc. v. Kite Pharma, Inc., 10 F.4th 1330, 1335 (Fed. Cir. 2021) (quoting Ariad, 598 F.3d at 1351). Context matters, however, and "[w]hat is required to meet the written description requirement 'varies with the nature and scope of the invention at issue, and with the scientific and technologic knowledge already in existence.'" Juno, 10 F.4th at 1335 (quoting Capon v. Eshhar, 418 F.3d 1349, 1357 (Fed. Cir. 2005)). "Whether a patent claim is supported by an adequate written description is a question of fact," and courts "review a . . .

factual determination relating to compliance with the written description requirement for substantial evidence." AbbVie Deutschland GmbH & Co., KG v. Janssen Biotech, Inc., 759 F.3d 1285, 1297 (Fed. Cir. 2014). "[P]atents are presumed to be valid, and overcoming this presumption requires clear and convincing evidence." Id.

The Federal Circuit has set forth a number of factors to consider when evaluating the adequacy of disclosure for generic claims, i.e. claims that cover multiple different ways or "species" to accomplish the invention, including "the existing knowledge in the particular field, the extent and content of the prior art, the maturity of the science or technology, and the predictability of the aspect at issue." AbbVie, 759 F.3d at 1299 (internal quotation marks and citation omitted).

> For genus claims using functional language, . . . the written description "must demonstrate that the applicant has made a generic invention that achieves the claimed result and do so by showing that the applicant has invented species sufficient to support a claim to the functionally-defined genus."[11]

Juno, 10 F.4th at 1335 (quoting Ariad, 598 F.3d at 1349). "An adequate written description of a claimed genus requires more than a generic statement of an invention's boundaries." Ariad, 598 F.3d at 1349 (citing Regents of the Univ. of Cal. v. Eli Lilly & Co., 119 F.3d 1559, 1568 (Fed. Cir. 1997)). Moreover, the Federal Circuit has held that a "sufficient description of a genus . . . requires the disclosure of either a representative number of species falling within the scope of the genus or structural features common to the members of the genus so that one of skill in the art can 'visualize or recognize' the members of the genus." AbbVie, 759 F.3d at 1299. In deciding these issues, the Court looks to the specification as it would be viewed by a POSA, which, in

[11] "A genus claim is a claim to a general category of invention[,] . . . [whereas] a species claim is a more specific iteration of or improvement on the 'genus' invention." Max-Planck-Gasellchaft Zur Foerderung Der Wissenschaften E.V. v. Whitehead Inst. for Biomed. Research, 850 F. Supp. 2d 317, 323 (D. Mass. 2011).

effect, incorporates the knowledge in the prior art and, as it must, draws all inferences in the light most favorable to the jury verdict.

Lilly's main arguments that the Asserted Claims are invalid for lack of adequate written description are that (1) the claimed genus of humanized anti-CGRP antagonist antibodies in the Patents-in-Suit is extremely broad, (2) the Patents-in-Suit do not disclose a representative number of antibodies, (3) the Patents-in-Suit fail to disclose a common antibody structure correlated to the claimed functions, and (4) the inventors failed to make humanized anti-CGRP antagonist antibodies as broadly as claimed. [ECF No. 650 at 4–15]. The Court addresses each argument below.

1. The Breadth of the Asserted Claims

Lilly first argues that the Patents-in-Suit are invalid because they are too broad. [ECF No. 650 at 5–7]. In particular, Lilly avers that the Asserted Claims all require administration of humanized anti-CGRP antagonist antibodies, and that the claims define humanized anti-CGRP antagonist antibodies "only by their desired function—antagonizing CGRP (i.e., binding to CGRP and inhibiting its biological activity) and effectiveness in treating migraine or other headache disorders—rather than by identifying any amino acid sequence or structure of antibodies possessing those functions." [Id. at 6]. Thus, according to Lilly, the Asserted Claims cover *all* humanized anti-CGRP antagonist antibodies that could be discovered for treating headache, which is improper when the specification only discloses one humanized anti-CGRP antagonist antibody (G1). [Id. at 6–7].

Teva responds that

> the asserted claims do not claim "everything that works"—they exclude anti-CGRP antagonist antibodies created through a method other than humanization (for example, random amino acid substitutions or mutagenesis in fully human antibodies), and they exclude antibodies that work by binding to other targets like the CGRP receptor, rather than CGRP itself.

[ECF No. 667 at 11]. As described above, however, Lilly agrees that the Asserted Claims are limited to *humanized* anti-CGRP antagonist antibodies, but nonetheless argues that they are too broad. [ECF No. 650 at 5–7]. Apparently recognizing this, Teva points to expert testimony at trial, which it characterizes as stating that the category of humanized anti-CGRP antagonist antibodies could be "small," and that Lilly's expert did not actually know how many antibodies are covered by the Asserted Claims. [ECF No. 667 at 11–12 (quoting Trial Tr. 11-81:18–82:18, 11-137:21–138:6)].[12] Teva next avers that the limitation to humanized anti-CGRP antagonist antibodies narrows the scope of the claims to what the jury heard was a genus of antibodies that can be obtained in a predicable way using established procedures: "An animal immunized with CGRP using known methods, including that described in the [Patents-in-Suit], will reliably generate antibodies antagonistic to CGRP and not to other antigens; those antibodies then can be reliably humanized using established techniques." [Id. at 12].

Here, even viewing the evidence in the light most favorable to the verdict, the Asserted Claims are broad. The jury heard evidence that the Asserted Claims cover a method of treating headache using anti-CGRP antagonist antibodies ('045 Patent) or IgG type humanized anti-CGRP antagonist antibodies ('907 and '908 Patents). See supra. The jury also heard evidence that all such antibodies would be covered under Teva's Asserted Claims. See [Trial Tr. 3-52:5–23, 3-150:13–22, 15-157:1–4]. Further, the Asserted Claims do not identify any narrower "amino acid sequence or structure of antibodies possessing those functions." [ECF No. 650 at 6

[12] The same expert also testified based on a "thought experiment" that there is a "very, very large number" of antibodies that "could potentially fall within the scope" of the asserted claims. [ECF No. 667 at 12 (quoting Trial Tr. 11-79:8–82:3)].

(citing ECF No. 101 at 11–12; Trial Tr. 11-76:4–82:21, 11-136:16–137:6, 11-138:7–10, 12-167:4–169:5, 12-180:15–20].

The Asserted Claims are therefore generic genus claims directed to a particular function. See Eli Lilly & Co. v. Teva Pharms. Int'l GmbH, 8 F.4th 1349, 1354, 1362 (Fed. Cir. 2021) (claim for a "A humanized monoclonal anti-Calcitonin Gene-Related Peptide (CGRP) antagonist antibody" with "CDRs [that] impart to the antibody specific binding to a CGRP consisting of amino acid residues 1 to 37 of SEQ ID NO:15 or SEQ ID NO:43" was "described, not in terms of [its] structure, but rather in terms of [its] function."). Moreover, the Asserted Claims "have a broad scope due to their lack of structural limitations." See id. at 1362. Broad claims, however, are not necessarily invalid for lack of written description. See Ariad, 598 F.3d at 1341, 1349 (finding that where claims "encompass[ed] the use of all substances that achieve[d] the desired result of reducing the binding of the [protein]," "a generic claim may define the boundaries of a vast genus of chemical compounds, . . . [but] the question may still remain whether the specification, including original claim language, demonstrates that the applicant has invented species sufficient to support a claim to a genus."). For example, although

> [f]unctionally defined genus claims can be inherently vulnerable to invalidity challenge for lack of written description support, especially in technology fields that are highly unpredictable, where it is difficult to establish a correlation between structure and function for the whole genus or to predict what would be covered by the functionally claimed genus[,] . . . functionally defined claims can meet the written description requirement if a reasonable structure-function correlation is established, whether by the inventor as described in the specification or known in the art at the time of the filing date.

AbbVie, 759 F.3d at 1301 (citing Ariad, 598 F.3d at 1351; Centocor Ortho Biotech, Inc. v. Abbott Labs., 636 F.3d 1341, 1352 (Fed.Cir.2011); Enzo Biochem, Inc. v. Gen–Probe Inc., 323 F.3d 956, 964 (Fed. Cir. 2002)). Thus, the Court will consider whether the specification shows

that the inventors disclosed sufficient representative species to support the broadly claimed genus of humanized anti-CGRP antagonist antibodies for the purpose of treating headache.

2. Representative Species

To satisfy the representative species test, the patent must show that "the applicant has invented species sufficient to support a claim to the functionally-defined genus." Ariad, 598 F.3d 1349; see also AbbVie, 759 F.3d at 1299 ("The question . . . is whether the patents sufficiently . . . describe representative species to support the entire genus"). The Federal Circuit explained in AbbVie that

> [o]ne factor in considering the question is how large a genus is involved and what species of the genus are described in the patent. If the genus is not large or, even if it is, the specification discloses species representing the genus throughout its scope, the requirement may be met. On the other hand, analogizing the genus to a plot of land, if the disclosed species only abide in a corner of the genus, one has not described the genus sufficiently to show that the inventor invented, or had possession of, the genus. He only described a portion of it.

759 F.3d at 1299–1300. Put another way, "[m]erely drawing a fence around a perceived genus is not a description of the genus," instead, the patent needs to show that the applicant "conceived and described sufficient representative species encompassing the breadth of the genus." Id. at 1300 (citing Ariad, 598 F.3d at 1353). If it does not, "one has only a research plan, leaving it to others to explore the unknown contours of the claimed genus." Id. (citing Ariad, 598 F.3d at 1353).

"Where representative [species] are necessary to satisfy the written description requirement, the number of such [species] that must be disclosed depends on the context, including the knowledge already available in the art." Erfindergemeinschaft UroPep GbR v. Eli Lilly & Co., 276 F. Supp. 3d 629, 650 (E.D. Tex. 2017), aff'd 739 Fed. App'x 643 (Fed. Cir. 2018); see also Ariad, 598 F.3d at 1351 ("[No] bright-line rules govern[] . . . the number of species that must be disclosed to describe a genus claim, as this number necessarily changes with

each invention, and it changes with progress in a field."). That said, "[i]t is often the case that a patent claiming the invention of a new genus, or the use of a new genus, must provide more detail regarding that genus, such as disclosing a number of representative species or a structural feature by which to recognize the new genus." UroPep, 276 F. Supp. 3d at 648 ("As in Ariad, when one purports to have 'invented a genus,' the written description should 'disclose a variety of species that accomplish the result,' because '[t]he description requirement of the patent statute requires a description of the invention, not an indication of a result that one might achieve if one made the invention.'" (quoting Ariad, 598 F.3d at 1350)). Moreover, evidence that "a claimed genus does not disclose a representative number of species may include evidence of species that fall within the claimed genus but are not disclosed by the patent." Amgen Inc. v. Sanofi, 872 F.3d 1367, 1374 (Fed. Cir. 2017).

The Court addresses these issues—the size of the genus, the novelty of the genus, the number of representative species disclosed, and evidence of other species that fall within the scope of the claims—in turn.

Size of the Genus: The jury heard testimony that, based on a "thought experiment," there is a "very, very large number" of antibodies that "could potentially fall within the scope" of the Asserted Claims. [Trial Tr. 11-79:8–82:18]. Though Teva cites testimony from the same expert and argues that he "admitted" that "the number of antibodies covered by the claims could be 'actually small,'" [ECF No. 667 at 12], the cited testimony was, accurately recounted, the following:

> Q. What if the number of antibodies covered by the claims is actually small, does that cure the enablement problem?
>
> A. So, just to clarify, in this particular metaphor, the antibodies that do fall within the scope of the claim would be needles within that haystack. You have to find -- you have to search for them and find them. And I'm not sure I agree that the number of antibodies that actually do this would be small. But even if they were small, that

> doesn't solve the problem, you still have to search this infinitely large haystack of antibodies in order to find those that actually do bind to antagonized CGRP.

[Trial Tr. 11-137:21–138:6]. Thus, even characterizing the evidence in the light most favorable to the verdict, the jury could only have found that (1) there are a very large number of antibodies that would need to be screened in order to identify those that could antagonize CGRP, see e.g., [id. at 11-79:8–82:18, 11-137:21–138:6, 15-105:1–106:13], and (2) the size of the genus, i.e., the number of anti-CGRP antagonist antibodies that could be humanized and treat headache, was "unknowable," and thus not necessarily very large or small. See [id. at 11-82:9–18].

Novelty of the Genus: The jury heard uncontroverted evidence that no humanized anti-CGRP antagonist antibodies were known in the prior art. [Trial Tr. 3-28:6–9, 11-137:4–6, 12-148:23–149:2, 15-67:25–68:6, 15-144:17–24]. It therefore follows that the jury only could have found that the Patents-in-Suit were the first to claim the functionally-defined genus of humanized anti-CGRP antagonist antibodies for the purpose of alleviating certain types of headache. See, e.g., ['045 Patent at claim 30; '907 Patent at claims 5, 6; '908 Patent at claims 5, 6; Trial Tr. 3-52:5–12, 3-150:13–22, 15-157:1–4].

Number of Disclosed Species: A reasonable jury could not have found that the Patents-in-Suit disclosed more than one humanized anti-CGRP antagonist antibody within the scope of the Asserted Claims. [Trial Tr. 11-84:3–8]. Evidence showed that the 84 variants of G1 did not fall within the scope of the asserted claims because they were "fragments," not "full length-antibodies," [id. at 11-83:20–84:14, 15-163:25–164:8], and/or because they were not shown to be antagonist antibodies, [id. at 11-83:20–84:14, 15-164:17–21]. Moreover, a reasonable jury could only have found that the 84 variants of G1 were highly similar to G1, with 95% sequence identity in the variable regions, [id. at 11-86:21–88:16, 15-163:20–23], and the same V gene

families and length of CDRs, [id. at 11-90:15–91:8, 11-93:14–22]. Those variants therefore do little to broaden the scope of the disclosure of G1.

The murine antibodies that Teva points to also could not fall within the scope of the Asserted Claims because they were not humanized. ['045 Patent at claim 30 (requiring humanized antibodies); '907 Patent at claims 5, 6 (same); '908 Patent at claims 5, 6 (same)]. That said, the jury could have credited testimony that a POSA would understand how to humanize the disclosed murine antibodies, that anti-CGRP antagonist antibodies that could bind to different epitopes of CGRP were known in the art, and that all humanized anti-CGRP antagonist antibodies would treat headache. [Trial Tr. 12-52:3–59:5, 12-80:5–82:7, 15:9:16–16:10, 15-64:6–23, 15-109:21–119:9, 15:156:19–25, 15-161:18–162:21].[13]

Though the specification only describes one humanized anti-CGRP antagonist antibody that falls within the scope of the claims, Teva argues that the disclosure of murine antibodies is relevant and sufficient to satisfy the written description requirement. [ECF No. 667 at 16, 18–21]; see also [ECF No. 650 at 18]. Specifically, Teva argues that "Lilly did not show by clear and convincing evidence that those other [murine] antibodies are not representative of the genus of antibodies that can be used in performing the claimed methods." [ECF No. 667 at 16].

As explained above, the evidence at trial confirmed that only humanized antibodies fall within the scope of the Asserted Claims. ['045 Patent at claim 30 (requiring humanized

[13] Teva cites to the PTAB's IPR decision invalidating Teva's antibody patents for the proposition that "'anti-CGRP antagonist antibodies were well-known in the art,' and that a POSA could humanize them without disrupting their essential properties." [ECF No. 667 at 14]. But unlike the Patents-in-Suit, the patents at issue there did not "recite an intended therapeutic use," [PTX-924 at 106], and as Teva concedes, the IPRs discussed in the record and in its brief did not relate to a "method of treatment," but instead "cover[ed] the underlying antibodies" themselves. [ECF No. 667 at 2].

antibodies); '907 Patent at claims 5, 6 (same); '908 Patent at claims 5, 6 (same)]. Murine antibodies are not humanized antibodies, and although the fact that they were disclosed in the specification may be generally relevant to the overall written description analysis, see [ECF No. 667 at 19], they are not themselves representative species. See Eli Lilly, 119 F.3d at 1566 (patent invalid for lack of written description "because the specification, although it provided an adequate written description of rat cDNA, did not provide an adequate written description of the [human] cDNA required by the asserted claims."); id. at 1568 ("a description of rat insulin cDNA is not a description of the broad classes of vertebrate or mammalian insulin cDNA.").

Teva's attempt to distinguish Eli Lilly on this point is unavailing. See [EFC No. 667 at 18–19]. Teva argues that "the question there was whether claims directed to all 'vertebrate' and 'mammalian' cDNA were supported by the disclosure of just rat cDNA," [id.], and that

> [t]he case had nothing to do with humanization, or a genus whose members could be envisioned and derived from known compounds by following established steps, as with humanization of murine antibodies. And the Federal Circuit noted a decade ago that "[i]t is routine to raise a spectrum of antibodies to a known protein simply by injecting that protein into a host animal that is a different species."

[Id. at 19 (citing Centocor, 636 F.3d at 1351 n.4)].

The Federal Circuit in Eli Lilly held that

> [a]n adequate written description . . . "requires a precise definition, such as by structure, formula, chemical name, or physical properties,' not a mere wish or plan for obtaining the claimed invention, and that "an adequate written description of a DNA requires more than a mere statement that it is part of the invention and reference to a potential method for isolating it; what is required is a description of the DNA itself."

119 F.3d at 1566–67 (quoting Fiers v. Revel, 984 F.2d 1164, 1170–71 (Fed. Cir. 1993)). The court there rejected the argument that the specification, which described rat cDNA for a claim limitation that required human cDNA, "describe[d] in sufficient detail how to prepare the claimed organism," finding that the specification's "general method for obtaining the human

cDNA . . . [, w]hether or not it provides an enabling disclosure, it does not provide a written description of the cDNA encoding human insulin, which is necessary to provide a written description." Id. at 1567. The court further held that although the specification "provides a process for obtaining human insulin-encoding cDNA, there is no further information in the patent pertaining to that cDNA's relevant structural or physical characteristics; in other words, it thus does not describe human insulin cDNA," and that "a description which renders obvious a claimed invention is not sufficient to satisfy the written description requirement of that invention." Id. Similarly, here, that murine anti-CGRP antagonist antibodies were listed in the patents, and that humanization of them may have been obvious,[14] does not make them representative species, and is not enough on its own to adequately describe the claimed invention. The jury in fact heard testimony from Teva's expert confirming that none of the rodent antibodies referenced in his report disclosed an amino acid sequence, and not all rodent

[14] Teva argues that "the PTAB's IPR decisions confirm what the jury could reasonably find from the evidence at trial: that the genus of humanized anti-CGRP antagonist antibodies was well understood in the art, based on the extensive prior-art disclosure of murine antibodies and the established knowledge of humanization," and that "neither Lilly nor the PTAB identified any particular anti-CGRP antagonist antibody as obvious, and the PTAB adopted Lilly's arguments and found that the prior art disclosed anti-CGRP antagonist antibodies without limitation to any particular antibody." [ECF No. 667 at 20–21 (emphasis omitted)]. That the PTAB found it would be obvious to humanize anti-CGRP antagonist antibodies and that they would have a reasonable expectation of success in doing so, regardless of whether it was just one antibody or multiple antibodies, does not necessarily establish on its own that, for example, as Teva itself argued in the IPRs, "such humanized anti-CGRP antibodies would necessarily be safe and effective" for use "in treating various diseases." See [PTX-924 at 102–06]; see also [Trial Tr. 3-35:10–15 (inventor of Patents-in-Suit testifying as follows: "Q. . . . you would have to evaluate each anti-CGRP antibody empirically to determine whether or not it can inhibit CGRP, correct? A. Yes. We determined binding and blocking. Q. You'd have to measure it empirically, correct? A. Yes.")].

antibodies identified in his report were shown to antagonize CGRP. See [Trial Tr. 15-67:16–24].[15]

In further support of its argument that disclosing just one humanized anti-CGRP antagonist antibody is not enough, Lilly argues that the Asserted Claims' specifications identify only one representative species because the inventors had not succeeded in making any more humanized anti-CGRP antagonist antibodies. [ECF No. 650 at 13]. Lilly points to trial testimony, for example, that "[a]s of November 2006, it was still an unrealized plan to develop anti-CGRP antagonist antibodies that bound to the mid-region of CGRP," [Trial Tr. 15-148:11–21], and that during that same time, the named inventor was "looking also to other attachment points on the other end or in the middle portion of CGRP," [id. at 3-16:24–17:4]. Moreover, Lilly argues that the inventors had failed to invent rodent anti-CGRP antagonist antibodies that could bind to the same region of CGRP as G1. [ECF No. 650 at 13 (citing Trial Tr. 3-27:21–24; PTX-2055 at 1; PTX-115 at 1, 3; TX-3439; TX-3447; TX-3446)]. Lilly contends that this evidence supports a finding that the inventors were not in possession of the full genus, and that the specifications therefore amounted to an impermissible "research plan." [ECF No. 650 at 13–14 (citing Ariad 598 F.3d at 1352–53; Amgen, 872 F.3d at 1378; Boston Sci. Corp. v. Johnson & Johnson Inc., 679 F. Supp. 2d 539, 555 (D. Del. 2010), aff'd, 647 F.3d 1353 (Fed. Cir. 2011))].

Teva apparently concedes that, at the very least, the inventors were not in possession of additional species that satisfied the claims of the Patents-in-Suit. [ECF No. 667 at 22].

[15] Teva's reliance on BASF Plant Sci., LP v. Comm. Sci. & Indust. Research Org., 28 F.4th 1247 (Fed. Cir. 2022) is similarly unhelpful. [ECF No. 667 at 19]. The language Teva cites regarding a predictive model was used to support affirming the validity of a *species* claim. BASF, 28 F.4th at 1265. The Court in BASF, however, reversed the finding of validity for related *genus* claims in part due to a lack of evidence regarding "a representative number of species, of the sort [the Federal Circuit's] precedents have flagged as important to determining adequate written-description support for broad genus claims with functional properties." Id. at 1268–69.

Specifically, they argue that the inventors did not "fail," but instead created antibodies that could bind to other regions and "set them aside to focus on G1."[16] Teva further responds that "an actual reduction to practice is not required for written description," [ECF No. 667 at 22 (citing BASF, 28 F.4th at 1267; Immunex Corp. v. Sandoz Inc., 964 F.3d 1049, 1063 (Fed. Cir. 2020))], and that in any event, the jury could have found that a POSA would have been aware of anti-CGRP antagonist antibodies that could bind to different regions of CGRP, and that the binding epitope "'is not critically important' in the context of CGRP,"[17] [id.]. Ultimately, Teva argues that what matters is that ample evidence showed that the inventors "understood and disclosed that all humanized anti-CGRP antagonist antibodies would work in the claimed method." [Id.].

[16] Of Teva's cited testimony for this proposition, [ECF No 667 at 22 n.68], only Trial Tr. 2-121:24–122:22 and 15-136:8–139:7 provide insight into whether the inventors had developed an anti-CGRP antagonist antibody that bound to different regions of CGRP than G1. This testimony, however, was uncertain as to whether the inventors developed those antibodies prior to filing the Patents-in-Suit. See [Trial Tr. 2-121:24–122:22 ("Q. . . . You found an antibody that bound to something other than the epitope that G1 binds to, correct? A. Yes. Q. And that was after you filed your patent application, correct? A. I don't recall the exact timing, but our mode of operation is to continue to develop second generation antibody drugs until the drug is approved. So we continued the work."); id. at 15-136:8–139:7 (Dr. Hale testifying: "Q. So does the fact that Dr. Zeller would still need to do affinity maturation suggest to you that he believed it would be impossible to make anti-CGRP antagonist antibodies that bound to the N-terminal or mid-region of CGRP? A. I think on the contrary. ***I think he was pretty sure it was possible.***") (emphasis added))]; see also [id. at 148:11–21 (Dr. Hale testifying that as of November 2006, it was "it was still an unrealized plan to develop anti-CGRP antagonist antibodies that bound to the mid-region of CGRP.")].

[17] All but one of the documents and testimony relied on by Teva for the proposition that the epitope site is not important post-date November 2006, and thus have no relevance to what a POSA would have known at the time of the invention. See [ECF No. 667 at 17 n.25 (citing TX-5163 (2011); PTX-1368 (2009); PTX-332 (2014); Trial Tr. 9-176:9–177:7 (testifying at 9-173:3–177:7 about a 2011 study))]. TX-5162, which is also cited by Teva, is dated September 2006 and it says binding to C-term and N-Term epitopes were "efficacious in vivo," but does not mention the efficacy of mid-region epitope binding in vivo, and instead notes that "mid-region" inhibits CGRP in vitro." [TX-5162 at 6].

The Court finds that the jury could not have found that the inventors were in possession of anti-CGRP antagonist antibodies that could bind to all three regions of CGRP. The jury could have credited testimony, however, that a POSA would know that anti-CGRP antagonist antibodies could bind to different regions of CGRP and still accomplish the claimed function of treating headache.

Finally, Lilly argues that Teva is advancing an impermissible "make and use" argument. [ECF No. 650 at 20 (citing Amgen, 872 F.3d at 1377; In re Ruschig, 379 F.2d 990, 995 (C.C.P.A. 1967))]. More specifically, Lilly avers that Teva cannot disclose just one covered antibody and then rely on the fact that a POSA would have known how to "raise" more anti-CGRP antagonist antibodies, "could" humanize them, and that they all would work to treat headache as required by the claims. [Id. (emphasis omitted) (quoting Trial Tr. 15-161:18–162:21)].

Teva does not directly respond to this argument, but does generally argue that the Patents-in-Suit disclose more than one representative species, which as explained above, they do not, and that, in any event, the disclosure is sufficient in light of the "the well-established and predictable humanization technology at issue." See [ECF No. 667 at 14–15].

Here, the jury could have credited testimony that, even if not in possession of additional antibodies other than G1, the disclosed murine anti-CGRP antagonist antibodies could be routinely humanized and a POSA would know they could treat headache. See [Trial Tr. 12-52:3–59:5, 12-80:5–82:7, 15-9:16–16:10, 15-40:1–19, 15-42:17–24, 15-62:14–64:23, 15-109:21–119:9, 15-125:7–126:12, 15:156:19–25, 15-158:2–162:21]. Beyond the disclosed murine antibodies, however, the jury could only have found that "you would have to evaluate

each [additional] anti-CGRP antibody empirically to determine whether or not it can inhibit CGRP." [Id. at 3-35:10–15].

Other Species Within the Scope of the Asserted Claims: The jury heard uncontroverted testimony that the active anti-CGRP antagonist antibody in Lilly's Emgality® (gmab), the accused product, is different from G1 in several ways. For example, gmab and G1 bind to different epitopes, [Trial Tr. 11-96:11–97:11, 11-105:18–107:8, 15-101:15–20], the sequence identity between gmab and G1 is 50.8% to 64.5%, [id. at 11-88:17–89:23, 15-145:8–15], and gmab and G1 come from different V gene families and have CDRs of different sequences and lengths, [id. at 11-88:17–90:10, 11-91:9–92:10, 11-93:4–94:8, 15-146:5–8]. See also [id. at 11-111:14–112:15 (comparing disclosure in Patents-in-Suit to gmab)].

There was also evidence that these differences effect function, including that gmab and G1 have different potency, doses, and can treat different types of headache. See [Trial Tr. 11-107:9–108:20, 12-206:12–210:16, 12-97:25–98:8, 12-137:24–138:19]. For example, evidence showed that gmab is effective in treating cluster headache, one of the types of headache that was specifically claimed in the '907 and '908 patents, ['907 Patent at claim 5; '908 Patent at claim 5; Trial Tr. 12-206:25–207:5], whereas G1 was not marketed for that purpose and Teva was not pursuing approval to treat cluster headaches with its G1 product, [Trial Tr. 12-97:25–98:8, 12-206:25–207:5].

Teva contends, however, that the jury could have disregarded or found that these differences are not important. [ECF No. 667 at 16–18]. Specifically, Teva argues that (1) the trial record showed that G1 and gmab behave the same way when tested in vivo and a POSA would not have considered differences between the two to be significant in their use for treating headache, [id. at 17]; (2) Lilly did not show that any identified differences between G1 and gmab

relate to the Asserted Claim limitations, [id.]; and (3) the jury could have rejected the importance of the differences between G1 and gmab identified by Lilly at trial, [id. at 18].[18]

Lilly claims in response that Teva's argument that the identified differences could be disregarded or do not matter has already been rejected by the Federal Circuit. [ECF No. 683 at 3–5 (citing AbbVie, 759 F.3d at 1301 (finding patent invalid in part because there was "no evidence to show any described antibody to be structurally similar to, and thus representative of, [the accused product]."); Juno, 10 F. 4th at 1337 (testimony that antibodies in the claimed species "all do the same thing" was "too general" because it did not "explain[] which [antibody] will bind to which target" or the "characteristics of the exemplary [antibodies] that allow them to bind to particular targets . . . , the mere fact that [the antibodies] in general bind does not demonstrate that the inventors were in possession of the claimed invention")].

The Court agrees that the jury could have discredited the importance of some, if not many, of the differences between Emgality® and Ajovy®. It disagrees, however, that a reasonable jury could have found that there were no relevant differences between the two,[19] or

[18] Teva also avers that G1 is not the only antibody for use in the claimed method that is disclosed in the specifications or that would have been known to a POSA because the specifications disclosed "murine anti-CGRP antagonist antibodies that could have been routinely humanized, and a POSA would have had background knowledge of several more." [ECF No. 667 at 16]. As previously explained, the Court disagrees that these disclosures fall within the scope of the Asserted Claims.

[19] As one example, Teva's expert testified that CDRs, which are different in gmab and G1, [Trial Tr. 11-88:17–90:10, 11-91:9–92:10, 11-93:4–94:8, 15-146:5–8], "are actually loops of amino acids that actually make contact with the antigen. And that determines how the antibody will interact with the antigen and bind to the antigen, and that's the first step in how antibodies are going to carry out their biological function," [id. at 4-20:3–23:20]. See also Teva, 8 F.4th at 1363 (the PTAB "found that, although the claims [of Teva's patents claiming the underlying antibodies] do not recite amino acid sequences, AJOVY® and Emgality® have specific sequences that critically affect binding affinity and inhibit the ability of the antibodies to kill cells[, and] that, although the claims did not recite limitations regarding picomolar binding

that the specifications of the Patents-in-Suit disclosed an antibody that was "structurally similar to, and thus representative of" Emgality®. See, e.g., [Trial Tr. 11-96:11–97:11, 11-105:18–107:8, 15-101:15–20 (different epitopes); id. at 11-88:17–89:23, 15-145:8–15 (different sequence identity); id. at 11-88:17–90:10, 11-91:9–92:10, 11-93:4–94:8, 15-146:5–8 (different V gene families, CDR sequences and lengths); id. at 11-107:9–108:20, 12-206:12–210:16, 12-97:25–98:8, 12-137:24–138:19 (different potency, doses, and can treat different types of headache)]; see also AbbVie, 759 F.3d at 1293–94, 1300–02 (patent invalid in part because the accused antibody differed in structure (approximately 50% sequence similarity with the asserted antibodies, different CDR length, different epitopes, and different V gene families), and "the patents must at least describe some species representative of antibodies that are structurally similar [the accused antibody]").

Analysis: The Court finds that, even viewing the evidence in the light most favorable to the verdict, clear and convincing evidence supports a finding that the disclosure of the single species G1 was insufficient to claim the entire genus of humanized anti-CGRP antagonist antibodies for the treatment of headache. The Court does not reach this decision nor overturn a jury verdict lightly. Succinctly put, although the Federal Circuit has found at least once that disclosing one representative species can be enough, see Invitrogen Corp. v. Clontech Lab'ys, Inc., 429 F.3d 1052, 1073–74 (Fed. Cir. 2005), under the facts of this case and considering what the Federal Circuit and other courts have said about representative species, the Court cannot

affinity, full-length antibodies versus fragments, or IgG antibody classes, all of those features are critical to the ability of the AJOVY® and Emgality® antibodies to function as humanized anti-CGRP antagonist antibodies.") (internal citation omitted).

conclude that the disclosure of a single species is enough to support the very broad scope of these asserted claims.[20]

In AbbVie, the Federal Circuit affirmed a verdict of invalidity for lack of written description because the patent disclosed only one very limited subgenus within a diverse claimed genus. 759 F.3d at 1300–02. There, the patent claimed a genus of antibodies having a neutralizing function with respect to a particular antigen. Id. at 1299. The patent disclosed several antibodies that served the claimed function and shared a particular structure, and that included a 90% or more amino acid sequence similarity in the variable regions. Id. at 1291, 1300. The defendant, however, created an antibody (the accused antibody) that shared the function but differed greatly in structure (approximately 50% sequence similarity with the asserted antibodies, different CDR length, different epitopes, and different V gene families). Id. at 1293–94, 1300–01. The patentee's experts also "conceded that the [asserted patents] d[id] not disclose structural features common to the members of the claimed genus[,]" id. at 1299, and "d[id] not describe any example, or even the possibility, of [the antibodies] having heavy and

[20] The Federal Circuit in Invitrogen found sufficient disclosure where the specification (1) "recite[d] both the DNA and amino acid sequences of a representative embodiment of the claimed [] enzyme," (2) "disclose[d] test data that the enzyme produced by the listed sequence ha[d] the claimed [function]," (3) taught "that the invention c[ould] be applied to [the relevant] genes of other retroviruses," (4) "cite[d] references providing the known nucleotide sequences of these [additional] genes," and (5) "the sequences for these and other representative [] genes were known in the art." 429 F.3d at 1073. Moreover, the court below in Invitrogen, which the Federal Circuit affirmed on the issue of written description, found that the evidence "established a sufficiently known correlation between . . . []function[] and . . . []structure[] to satisfy the PTO test for written description." Id. at 1072. In contrast, here, amino acid sequences of, for example, the rodent antibodies that Teva relies on were not disclosed, see [Trial Tr. 15-67:16–24 (Teva's expert confirming that none of the rodent antibodies referenced in his report disclosed an amino acid sequence, and not all rodent antibodies identified in his report were shown to antagonize CGRP)], and the evidence does not support a sufficiently known correlation between the structure of anti-CGRP antagonist antibodies and their ability to accomplish the claimed function, see infra.

light chains other than the [disclosed] types." Id. at 1300. The Federal Circuit concluded that "the claimed genus covers structurally diverse antibodies," id., and that the written description requirement was not met because the patent disclosed no species representative of the structural breadth demonstrated by the accused antibody, id. at 1300–01. More specifically, "the patents must [have] at least describe[d] some species representative of antibodies that are structurally similar to [the accused antibody]," and the court found "no evidence to show any described antibody to be structurally similar to, and thus representative of, [the accused antibody]." Id. at 1301. The court further found that there was "no evidence to show whether one of skill in the art could make predictable changes to the described antibodies to arrive at other types of antibodies such as [the accused antibody]." Id.

Just like AbbVie, the Patents-in-Suit fail to "describe[] some species representative of antibodies that are structurally similar to [the accused antibody gmab]," see 759 F.3d at 1301, and the evidence at trial did not establish any correlation between the specific structure of humanized anti-CGRP antagonist antibodies and their function, see id. ("functionally defined claims can meet the written description requirement if a reasonable structure-function correlation is established"). Moreover, clear and convincing evidence supported that gmab is different from G1 in several ways that are similar to the differences between the antibodies in AbbVie, id. at 1293–94, 1300–01 (approximately 50% sequence similarity with the asserted antibodies, different CDR length, different epitopes, and different V gene families), and further supported that gmab and G1 have different potency, different doses to achieve a desired result, and can treat different types of headache, see [Trial Tr. 11-107:9–108:20, 12-206:12–210:16, 12-97:25–98:8, 12-137:24–138:19].

Similarly, in Juno, the Federal Circuit reversed a denial of JMOL and found claims invalid for lack of adequate written description in part because the patent failed to disclose sufficient species to claim the genus. 10 F.4th at 1332, 1338, 1342. There, the patent claimed a genus of antibodies having a neutralizing function with respect to any antigen for which binding caused the desired response. Id. at 1333, 1336–37. The patent disclosed two exemplary antibodies, but "d[id] not provide information sufficient to establish that a skilled artisan would understand how to identify the species of [the antibody] capable of binding to the limitless number of targets as the claims require." Id. at 1337. The Federal Circuit found that although it was "not fatal that the amino acid sequences of these [antibodies] were not disclosed," the patent needed to "provide[] other means of identifying which [antibodies] would bind to which targets, such as common structural characteristics or shared traits." Id. The court further found that "testimony that [the antibodies] were generally known in the field," and that "they were known to bind," was insufficient to overcome the fact that "the specification provide[d] no means of distinguishing which [antibodies] will bind to which targets." Id. at 1338.

Although this case is different from Juno in that the Patents-in-Suit do not claim all antigens to which G1 binds, see 10 F.4th at 1333, 1336–37, it is similar to Juno in that testimony established that the underlying antibodies "were generally known in the field" and "were known to bind," which was insufficient to support a finding of validity, see id. at 1338.

In contrast, in UroPep, the Eastern District of Texas denied JMOL and a new trial because the patent described sufficient species of a large genus. 276 F. Supp. 3d at 638, 648. The patent there related to medication to alleviate difficulty urinating due to an enlarged prostate. Id. at 638–39. An enlarged prostate was known to constrict the urethra, and it was also known that inhibiting certain enzymes could promote muscle relaxation, and in turn mitigate the side

effects of an enlarged prostate. Id. at 638–39. The patent disclosed three specific enzyme types that could be inhibited and "10 discrete chemical compounds and two classes of chemical compounds" that functioned as inhibitors of those enzymes, described "known methods to determine whether any particular compound is a selective inhibitor of a specific [enzyme] type," and stated that "[i]f a compound is a selective inhibitor of one of the identified [enzyme] types . . . , then that compound is suitable for the purpose according to the invention." Id. at 639–40 (internal quotations and citations omitted). There, the argument centered around whether there was a sufficient disclosure of one of the three enzyme types, and the court found that, based on expert testimony, the patent described four compounds that were known inhibitors of that enzyme. Id. at 645–46. The Court further found that the disclosure of four specific compounds and two compound classes known to be inhibitors of the enzyme was sufficient even if the genus was very large, with tens of thousands of inhibitors developed since the filing of the patent. See id. at 646.

As the Court explained in UroPep, "when one purports to have 'invented a genus,' the "written description should 'disclose a variety of species that accomplish the result.'" See 276 F. Supp. 3d at 648 (quoting Ariad, 598 F.3d at 1350 (quoting Eli Lilly & Co., 119 F.3d at 1568)); see also In re Alosnso, 545 F.3d 1015, 1018 (Fed. Cir. 2008) (affirming the PTAB's finding that a "single antibody described in the [s]pecification [wa]s insufficiently representative to provide adequate written descriptive support for the genus of antibodies required to practice the claimed invention.").[21] Humanized anti-CGRP antagonistic antibodies were a new genus, and the

[21] Teva attempts to distinguish In re Alonso, 545 F.3d 1015 (Fed. Cir. 2008) as addressing unpredictable science, whereas the science here was "well-established and predictable." See [ECF No. 667 at 15]. The unpredictability in Alonso, though, stemmed at least in part from the fact that the specification did not even "characterize the antigens to which the monoclonal antibodies must bind; it disclose[d] only the molecular weight of the one antigen." Id. at 1021.

Patents-in-Suit were the first to disclose a method of treating headache utilizing a new genus of antibodies. But unlike UroPep, where the patent at issue disclosed three specific enzyme types that could be inhibited and "10 discrete chemical compounds and two classes of chemical compounds," see 276 F. Supp. 3d at 639, the Patents-in-Suit here disclose only G1.

Finally, as explained above, evidence here showed that any additional antibodies beyond G1 would have to be identified and tested to determine whether they could inhibit CGRP. [Trial Tr. 3-35:10–15]. As the Delaware District Court found in Pernix Ireland Pain DAC v. Alvogen Malta Operations Ltd., without "such testing data, the inventors cannot be said to have possessed the full scope of the claimed invention." 323 F. Supp. 3d 566, 628 (D. Del. 2018) (also finding that "[a]ll that the specification discloses is that one such formulation will work for that purpose. Whether any others will work, and which they are, would depend entirely on testing, and thus cannot be said to have been within the scope of what the patentees invented");[22] see also AbbVie, 759 F.3d at 1300 ("One needs to show that one has truly invented the genus, i.e., that one has conceived and described sufficient representative species encompassing the breadth of the genus. Otherwise, one has only a research plan, leaving it to others to explore the unknown contours of the claimed genus."); Amgen, 872 F.3d at 1377–78 (finding jury instruction improper because "to satisfy the statutory requirement of a description of the invention, it is not

[22] Teva attempts to distinguish Pernix as addressing unpredictable science, whereas the science here was "well-established and predictable" and addressed a class of antibodies known to inhibit CGRP. See [ECF No. 667 at 15]. Though the jury could have credited testimony that the disclosed murine anti-CGRP antagonist antibodies could be routinely humanized and that a POSA would know they could treat headache, see [Trial Tr. 12-52:3–59:5, 12-80:5–82:7, 15-9:16–16:10, 15-40:1–19, 15-42:17–24, 15-62:14–64:23, 15-109:21–119:9, 15-125:7–20, 15:156:19–25, 15-158:2–162:21], the inventor of the Patents-in-Suit and Teva's own experts confirmed that for antibodies not yet disclosed or known, like Pernix, one would have to evaluate (e.g., make and test) each anti-CGRP antibody empirically to determine whether or not it can inhibit CGRP, see [id. at 3-35:10–15, 15-146:23–147:11].

enough for the specification to show how to make and use the invention, i.e., to enable it," and the instruction did "not even require any particular antibody to be easily made; all it require[d] [wa]s that 'production of antibodies'—some, not all—'against [a newly characterized] antigen' be conventional or routine" (emphasis omitted)).

In sum, a reasonable jury could only have found that (1) the Patents-in-Suit claimed a new genus of antibodies for a functional purpose, (2) G1 was the only covered species of the genus identified in the Patents-in-Suit, (3) the number of additional candidate antibodies (e.g., the genus size) was unknowable, (4) there is a very large number of potential candidate antibodies that would have to be identified and tested to determine whether they could inhibit CGRP, (5) the inventors of the Patents-in-Suit at the very least did not possess species that bound to all three epitopes of CGRP, and (6) the accused antibody gmab was different from G1 in multiple respects. In light of this evidence, in totality, a reasonable jury could only have found that clear and convincing evidence at trial confirms that the disclosure of just on representative species, G1, results in an impermissible "research plan, leaving it to others to explore the unknown contours of the claimed genus." AbbVie, 759 F.3d at 1300 (citing Ariad, 598 F.3d at 1353).[23]

[23] The parties also dispute whether the failure to address skepticism established in IPRs that headaches could be treated without an antibody crossing the blood brain barrier (BBB), and whether anti-CGRP antagonist antibodies could cross the BBB barrier, renders the Asserted Claims invalid. [ECF No. 650 at 21–23; ECF No. 667 at 24–25; ECF No. 683 at 12–13]. Though the Court need not decide this issue, it notes that the PTAB and Federal Circuit's decisions addressed whether the Asserted Patents were obvious in view of the state of the prior art. See Teva, 8 F.4th at 1348–50; [PTX-925 at 86, 138–40]. In contrast, here, the jury received evidence and heard testimony that a POSA could have believed the anti-CGRP antagonist antibodies would treat headache based on "knowledge about anti-CGRP antagonist antibodies that w[ere] known as of November 2006," *in addition to* "the data from the animal test in the Zeller specification." [Trial Tr. 15-64:6–18].

3. Common Structural Features

The fact that the Patents-in-Suit do not disclosure a sufficient representative number of species does not end the inquiry. Instead, the Patents-in-Suit may have an adequate written description if they disclose "'structural features common to the members of the genus so that one of skill in the art can "visualize or recognize" the members of the genus.'" See Amgen, 872 F.3d at 1374 ("a patent claiming a genus must disclose 'a representative number of species falling within the scope of the genus ***or*** structural features common to the members of the genus so that one of skill in the art can "visualize or recognize" the members of the genus'" (quoting Ariad, 598 F.3d at 1355) (emphasis added)).

Teva briefly argues that the Patents-in-Suit disclosed common structural features including "(1) a Y-shaped structure; (2) structural complementarity with CGRP (paratope); (3) humanization; and (4) all of the particular structural features recited in the claims of the '907 and '908 patents." [ECF No. 667 at 23 (citing Tr. 4-20:3–20; 11-56:7–57:5, 11-132:6–10, 15-98:21–99:11, 15-162:6–12)].

As explained above, see infra, the Y-shaped structure and structural features recited in the Asserted Claims of the '907 and '908 Patents are generic to full-length antibodies and, for the '907 and '908 Patents, IgG antibodies. [Trial Tr. 2-123:4–13, 11-37:4–14, 11-76:4–82:21, 11-117:9–119:24, 11-132:6–10, 11-136:16–137:6, 11-138:7–10, 12-167:4–169:5, 12-180:15–20]. Moreover, that there may be "structural complementarity with CGRP" does not describe what structure, for example an amino acid sequence, in an antibody allows for such structural complementarity. See [id. at 3-35:1–18, 4-20:3–20, 11-115:1–17, 11-117:20–120:4, 15-147:8–11]. For example, Teva's expert explained that the "loops of amino acids," CDRs, "that actually make contact with the antigen . . . determine[] how the antibody will interact with the antigen and bind to the antigen, and that's the first step in how antibodies are going to carry out their

biological function." [Id. at 4-20:3–20]. Finally, humanization is a process that is not specific to anti-CGRP antagonist antibodies, it is not a structure that determines whether or not an antibody will fall within the scope of the Asserted Claims. See [id. at 15-88:23–89:16]. Thus, the Patents-in-Suit do not adequately describe any common structure of anti-CGRP antagonist antibodies. See Juno, 10 F.4th at 1338–39 ("general assertion" that antibodies "consist[] of a variable region derived from the light chain of an antibody and a variable region derived from the heavy chain of an antibody, where these two portions are connected," and that "all [of the relevant antibodies] have a common structure, regardless of whether they bind," was "insufficient" to satisfy the common structure test); see id. at 1339 (finding the general description of the relevant antibody meant the patent improperly "claim[ed] a 'problem to be solved while claiming all solutions to it . . . cover[ing] any compound later actually invented and determined to fall within the claim's functional boundaries,' . . . which fails to satisfy the written description requirement" (quoting Ariad, 598 F.3d at 1353)).

B. Enablement[24]

"The requirement of enablement, stated in 35 U.S.C. § 112, enforces the essential '*quid pro quo* of the patent bargain' by requiring a patentee to teach the public how 'to practice the full scope of the claimed invention.'" McRO, Inc. v. Bandai Namco Games Am., Inc., 959 F.3d 1091, 1099–100 (Fed. Cir. 2020) (quoting AK Steel Corp. v. Sollac, 344 F.3d 1234, 1244 (Fed. Cir. 2003)).

[24] Because the Court finds that the Patents-in-Suit are invalid due to a lack of written description, it does not need to reach the issues of enablement or future lost profits. Nonetheless, given that this decision will doubtless be reviewed, for the sake of completeness, the Court will undertake the analysis.

"To prove that a claim is invalid for lack of enablement, a challenger must show by clear and convincing evidence that a person of ordinary skill in the art would not be able to practice the claimed invention without 'undue experimentation.'" Amgen Inc. v. Sanofi, Aventisub LLC, 987 F.3d 1080, 1084 (Fed. Cir. 2021) (quoting Alcon Rsch. Ltd. v. Barr Lab'ys, Inc., 745 F.3d 1180, 1188 (Fed. Cir. 2014)). "Whether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations." In re Wands, 858 F.2d 731, 737 (Fed. Cir. 1988). The factual considerations, known as the "Wands factors," are:

> (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims.

Id.

The Supreme Court recently added that a specification must not always "describe with particularity how to make and use every single embodiment within a claimed class." Amgen v. Sanofi, 598 U.S. 594, 610–11 (2023). Instead, the specification may disclose "some general quality . . . running through the class that gives it a peculiar fitness for the particular purpose," because "disclosing that general quality may reliably enable a person skilled in the art to make and use all of what is claimed, not merely a subset." Id. at 611 (internal quotations and citations omitted). A specification may also "call for a reasonable amount of experimentation to make and use a patent invention," but "[w]hat is reasonable in any case will depend on the nature of the invention and the underlying art." Id. at 612; see also Bexalta Inc. v. Genentech, Inc., No. 2022-1461, slip. op. at 5 (Fed. Cir. Sept. 20, 2023) ("As the Supreme Court recently reaffirmed in Amgen Inc. v. Sanofi, 'the specification must enable the full scope of the invention as defined

by its claims,' allowing for 'a reasonable amount of experimentation.'" (quoting Amgen, 598 U.S. at 610–12)).

Here, Lilly argues that the trial record confirmed that a POSA would have to make and screen a "vast" number of antibodies "by trial-and-error experimentation" to identify humanized anti-CGRP antagonistic antibodies that satisfied the claims of the Asserted Patents. [ECF No. 650 at 23]. Specifically, Lilly argues that (1) it was unpredictable whether an antibody would antagonize CGRP based on its amino acid sequence, and the only way to know whether it would antagonize CGRP would be to make and test it from scratch, which could take several months and significant effort, [id. at 24 (citing Trial Tr. 15-147:8–11); ECF No. 683 at 12–13 (citing Trial Tr. 11-148:25–150:5, 11-150:25–151:12, 15-152:11–19, 15-156:4–22)]; (2) the specifications themselves require making a rodent antibody, humanizing it, testing it in vitro, and testing it in vivo, and using different doses and for different types of headache, [id. (citing Trial Tr. 12-168:9–185:13, 14-262:6–263:18, 15-63:6–14, 15-63:23–64:5, 15-152:11–19, 15-161:18–25)]; see also [ECF No. 683 at 13 (arguing that Lilly presented evidence that G1 failed to treat certain types of headache) (citing Trial Tr. 12-187:16–22, 12-189:6–190:6)]; (3) experimentation for even one antibody is substantial, [ECF No. 650 at 24 (citing Trial Tr. 11-140:11–143:5, 15-152:11–19, 15-156:4–22)]; (4) because the genus of antibodies is "exceedingly broad," there are a large number of antibodies to test, [id. (citing Trial Tr. 11-79:8–81:25, 11-137:8–138:13; TX-3178 at 14)]; and (5) even with their first-hand knowledge, the inventors did not manage to make antibodies similar to G1, [id. (citing Trial Tr. 11-149:18–150:5)]. Lilly further argues that identifying, making, and using humanized anti-CGRP antagonist antibodies is not sufficiently "routine" to satisfy the enablement requirement. [ECF No. 683 at 12].

Teva responds that the humanized anti-CGRP antagonistic antibodies were not "new and unpredictable," but were instead "a well-known class of compounds that could be routinely made, tested, and humanized," [ECF No. 667 at 26], and that the prior art taught a POSA to make humanized anti-CGRP antagonist antibodies, [id. (citing Trial Tr. 15-57:17–63:14, 15-104:24–106:13, 15-116:10–119:3, 15-139:18–140:11)]. More specifically, Teva argues that large numbers of anti-CGRP antagonist antibody candidates could be generated and screened quickly, that it would be routine to humanize them, and that in the context of drug development, this effort to practice the invention would be routine, not undue. [Id. at 27 (citing Trial Tr. 13-166:9–167:6, 15-57:17–63:14, 15-104:24–106:13, 15-116:10–119:3, 15-139:18–140:11]. Thus, Teva argues that the specification was not merely a starting point for future research and that, in any event, a considerable amount of experimentation is permissible so long as it is routine. [Id. at 26–27].

The Supreme Court's recent decision in Amgen is instructive. There, the Court invalidated for lack of enablement patents claiming "all antibodies that (1) bind to specific amino acids on [a] naturally occurring protein [described in the patents] . . . and (2) block [that protein] from impairing the body's mechanism for removing [certain bad] cholesterol from the bloodstream." 598 U.S. at 599. The specifications identified amino acid sequences for 26 antibodies that performed the binding and blocking function, and depicted the three-dimensional structures of two of the twenty-six antibodies. Id. at 602–03. In addition, the specifications provided two different "roadmap[s]" to make additional antibodies that satisfied the claims. Id. at 603. The first, relevant here,

> direct[ed] scientists to: (1) generate a range of antibodies in the lab; (2) test those antibodies to determine whether any bind to [the protein]; (3) test those antibodies that bind to [the protein] to determine whether any bind to the sweet spot [(epitope)] as described in the claims; and (4) test those antibodies that bind to the sweet spot

> as described in the claims to determine whether any block [the protein and thus accomplish the claimed function].

Id.

The Court found that although the specifications enabled the 26 exemplary antibodies, "the claims . . . swe[pt] much broader," and instead tried to claim "an entire class of things defined by their function—every antibody that both binds to particular areas of the sweet spot of [the protein] and blocks [the protein] from binding to LDL receptors," Amgen, 598 U.S. at 612–13, and that the record established that the claims covered a "'vast' number of additional antibodies" beyond the 26 identified in the patents, id. at 613. The Court further said that "the more a party claims, the broader the monopoly it demands, the more it must enable," id., and that the roadmaps "amount[ed] to little more than two research assignments," id. at 614, or called on POSAs to engage in "trial and error," id. at 615. Specifically, the Court held that the patents failed the enablement requirement because the specification's relevant roadmap called on scientists to "create a wide range of candidate antibodies and then screen each to see which happen to bind to [the protein] in the right place and block it from binding to LDL receptors." Id. at 614.

Similarly, in Bexalta, the Federal Circuit recently held that a patent claiming antibodies that bound to a protein and increased certain biological activity, and disclosed the amino acid sequences of eleven such antibodies in the specification, was invalid for lack of enablement. Slip op. at 7–8. There, in order to obtain "undisclosed but claimed antibodies," the patent directed a POSA to do the following:

> (1) immunize mice with [the protein]; (2) form hybridomas from the antibody-secreting spleen cells of those mice; (3) test those antibodies to determine whether they bind to [the protein]; and (4) test those antibodies that bind to [the protein] to determine whether [there was] any increase [the relevant] activity.

Id. at 8. The patent did not disclose any "common structural (or other) feature delineating which antibodies" will bind to the protein and increase the relevant activity, nor did it describe "why the eleven disclosed antibodies perform[ed] the claimed functions, or why [] other screened antibodies d[id] not." Id. at 9. The Federal Circuit found that even if the disclosed process "predictably and reliably generat[ed] new claimed antibodies every time it [was] performed," it still called for an impermissible "trial-and-error approach[]" because a POSA would have to "make candidate antibodies and screen them to determine which ones perform[ed] the claimed function[]." Id. at 9–10.

Here, as explained above, even viewing the evidence in the light most favorable to the verdict, a reasonable jury could have found that the Asserted Claims cover the entire functionally-defined genus of humanized anti-CGRP antagonistic antibodies, see, e.g., [Trial Tr. 3-52:5–23, 3-150:13–22, 15-157:1–4]; the specification disclosed only one covered antibody, see, e.g., [id. at 11-83:20–84:14, 15-163:25–164:19]; there are a large number of antibodies that could potentially antagonize CGRP, and the actual number is not knowable, [id. at 11-79:2–82:21, 11-137:21–138:6, 15-105:1–106:13]; the claims did not identify any amino acid sequence or unique structure for a covered antibody, see, e.g., [id. at 11-84:3–8; '045 Patent at claims 17, 30; '907 Patent at claims 1, 5–6; '908 Patent at claims 1, 5–6]; and a POSA could not predict whether an antibody would satisfy the claims based on its amino acid sequence or structure, and thus antibodies would have to be made and individually tested to determine whether they were viable candidates for antagonizing CGRP, see [Trial Tr. 3-35:10–15, 15-146:23–147:11]. Further, a reasonable jury could only have found that identifying potential antibodies and making them required four steps—in vitro testing, in vivo animal testing, receiving an actual antibody, and humanizing the animal antibody—which would collectively take months and cost at least

tens of thousands of dollars per antibody. [Id. at 2-161:2–10, 2-161:11–15, 15-63:6–14, 15-105:1–106:13, 15-117:11–118:2, 15-150:25–151:12, 15-152:11–19, 15-156:19–22].

These facts amount to nothing more than a "roadmap" for a "trial and error" process to identify and make antibodies within the scope of the Asserted Claims. See Amgen, 598 U.S. at 612–615; Bexalta, slip op. at 10; see also Idenix Pharm. LLC v. Gilead Scis. Inc., 941 F.3d 1149, 1161 (Fed. Cir. 2019) ("A patent owner is 'required to provide an enabling disclosure in the specification; it cannot simply rely on the knowledge of a person of ordinary skill to serve as a substitute for the missing information in the specification.'" (quoting ALZA Corp. v. Andrx Pharm., LLC, 603 F.3d 935, 941 (Fed. Cir. 2010)).

That a POSA could routinely make, test, and humanize candidates does not change this result, as confirmed by the Federal Circuit in Wyeth & Cordis Corp. v. Abbot Lab'ys, 720 F.3d 1380, 1385 (Fed. Cir. 2013). There, the court affirmed the invalidation of patent claims for lack of enablement because the patents required "excessive experimentation." Id. at 1385–86. Though the court accepted that a POSA could "routinely use the assays disclosed in the specification to determine [whether the desired] effects [resulted from] candidate compounds," the court found this was undue experimentation because the specifications disclosed "only a starting point for further iterative research in an unpredictable and poorly understood field," in which

> [s]ynthesizing candidate compounds derived from [the disclosed species] could, itself, require a complicated and lengthy series of experiments in synthetic organic chemistry. Even putting the challenges of synthesis aside, one of ordinary skill would need to assay each of at least tens of thousands of candidates. Wyeth's expert conceded that it would take technicians weeks to complete each of these assays. The specification offers no guidance or predictions about particular substitutions that might preserve the [desired] effects observed in [the disclosed species]. The resulting need to engage in a systematic screening process for each of the many [] candidate compounds is excessive experimentation.

Id. at 1385–86.

Similarly, in Idenix, the Federal Circuit affirmed a non-enablement finding for a patent claiming a method for treating disease by administering an effective amount of certain compounds with a specific chemical and stereochemical structure. 941 F.3d at 1153–54. There, the court found that

> a reasonable jury could only have found that at least many, many thousands of [compounds] meet the structural limitations of claim 1, not all of which are effective to treat [the disease]. Due to the unpredictability of the art, and as admitted by Idenix, each of these compounds would need to be screened in order to know whether or not they are effective against [the disease]. Moreover, a significant number of candidate [compounds] would need to be synthesized before they could be screened, which increases at least the quantity of experimentation required, even if the synthesis was routine. Although the level of skill in the art is high, the [] patent does not provide enough meaningful guidance or working examples, across the full scope of the claim, to allow a POSA to determine which [compounds] would or would not be effective against [the disease] without extensive screening. The immense breadth of screening required to determine which [compounds] are effective against [the disease] can only be described as undue experimentation.

Id. at 1162. Put another way, the court held that "[a] reasonable jury could only have concluded that there were at least many, many thousands of candidate compounds, many of which would require synthesis and each of which would require screening. That constitutes undue experimentation," even if the experimentation was "routine." Id. at 1163. Similarly, here, even if the jury concluded that the state of the art was generally predictable in the sense that an anti-CGRP antagonist antibodies would treat headache, that does not change the fact that, as the court found in Idenix, each potential antibody would have to be synthesized and screened for effectiveness. See id.[25]

[25] Teva attempts to distinguish Wyeth and Idenix as not addressing a class of known compounds that have the feature that accomplished the claimed function. [ECF No. 667 at 27–28]. But, like here, in Idenix the "unpredictability" stemmed in part from the fact that to "know whether or not a [protein] will have [the desired function,] . . . you make it and test it." 941 F.3d at 1161. Similarly, in Wyeth, the Court credited testimony that "the unpredictability of the art" was evidenced by the "ensuing need to assay each candidate": "'until you test [compounds], you

Finally, this case is similar to MorphoSys AG v. Janssen Biotech, Inc., where the Delaware District Court granted summary judgment on invalidity due to lack of enablement for patents claiming humanized antibodies that bound to and blocked an antigen in order to destroy cancerous cells. 358 F. Supp. 3d 354, 372 (D. Del. 2019). There, as relevant here, the court reasoned that a "POSA would require substantial time and effort to discover antibodies within the claims" by "(1) designing a variant of a known antibody; or (2) by isolating an antibody using a de novo technique," which in either case, could require "months" or "longer" of time during which "each [antibody] would need to be designed or isolated, synthesized, and then screened for cell-killing activity, binding to various regions of [the antigen], and/or treatment of cancer, and sequenced to determine whether it met the framework limitations of the [] patent," id. at 370–71 (internal quotation marks omitted) (alteration in original). In sum, the court found that, like Wyeth, Idenix, and another case, Enzo Life Scis., Inc. v. Gen-Probe, Inc., No. 12-cv-00104, 2017 WL 2829625 (D. Del. June 28, 2017), the claims at issue were directed to a "composition of matter genus that is claimed partially by the composition's structure and partially by its function," "allow[ed] a POSA to readily make and use some species," disclosed "only a small subset of [the species] that satisfy the claims' structural limitations," involved an "unpredictable field" because "a POSA could not determine a new [specie]'s functional properties solely from its structure," and a POSA "would need to engage in time-consuming,

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really can't tell whether they work or not [i.e., have [desired] effects].'" 720 F.3d at 1385 (some alteration in original) (internal citations omitted); see also MorphoSys AG v. Janssen Biotech, Inc., 358 F. Supp. 3d 354, 372 (D. Del. 2019) (finding non-enablement, and regarding predictability of the "the nature of the invention," "the state of the prior art," "the relative skill of those in the art," and "the predictability or unpredictability of the art," reasoning that even though some "variants of the disclosed antibodies could be designed and would be 'reasonably expected' to be effective even without screening," for other antibodies within the scope of the claims, "[a] POSA would not be able to predict the function of these antibodies from their sequences").

non-routine trial-and-error testing in order to obtain claimed-but-not-disclosed compositions." MorphoSys, 358 F. Supp. 3d at 374–75; see also id. at 373 ("to enable the ***full scope*** of the claims as construed by the Court, it is not sufficient that the patent allows a POSA readily to make and use ***some*** species within the broad, claimed genus"); id. at 375 (enabling "a subset of all [working] embodiments covered by the claims" does not enable the full scope of the claims if "a POSA could not have discovered the non-disclosed working embodiments without undue experimentation") (citing Idenix, 2018 WL 922125, at *21–22)).[26] The Court reaches the same conclusions here.

In sum, the facts that a reasonable jury must have found lead this Court to conclude that Lilly proved by clear and convincing evidence that the Patents-in-Suit are, as a matter of law, invalid for lack of enablement.[27]

C. Future Lost Profits

1. Background Facts

The jury awarded $49,800,000 in future lost profits damages, [ECF No. 593 at 10], presumably based on the testimony and calculations of Teva's expert Dr. Mark Berkman, [Trial

[26] Teva's cited cases to not support a finding of enablement. In PPG Industries, Inc. v. Guardian Industries Corp., the Federal Circuit found that the party moving for an injunction showed a likelihood of success on the merits by making a strong showing that the patent at issue, which related to the composition of windshield glass, was not invalid for lack of enablement. 75 F.3d 1558, 1560 (Fed. Cir. 1996). There, the enablement argument focused on an error in the specification that would lead one to believe that making certain embodiments was more difficult than it was, see id. at 1561–62, but the court found that the specification nonetheless "made it clear that such a composition could be made, and it indicated to one skilled in the art how to [make it]," id. at 1565. There is no similar issue here. In addition, in Cephalon, Inc. v. Watson Pharmaceuticals, Inc., unlike here, the Federal Circuit found that "evidence on the record" regarding undue experimentation amounted to "[u]nsubstantiated statements indicating that experimentation would be 'difficult' and 'complicated.'" 707 F.3d 1330, 1339.

[27] Though it does not need to reach the issue, the Court notes that the parties at trial did not have the benefit of the Supreme Court's recent decision in Amgen or the Federal Circuit's decision in Bexalta.

Tr. 8-48:7–21]. Dr. Berkman testified that future lost profits damages should have been $158.3 million, based on the combination of lost sales and higher rebate costs due to sales of Emgality®. [Id. at 8-48:7–49:4]. To arrive at that number, he relied on Lilly's internal sales forecasts from its strategic plans, which provided "a long-term view of the market, including the size of the market, the number of patients, expected revenues, and products." [Id. at 8-50:6–25 (referring to the testimony of Lilly's Chief Financial Officer)]. The inputs to Dr. Berkman's calculations included, based on Lilly's strategic plans, (1) the total size of the CGRP antibody market, (2) number of Emgality® units sold, (3) Emgality® revenue, and (4) Emgality® net price per unit. [Id. at 8-52:1–55:8].

As to some examples of the details and assumptions underlying his calculation, Dr. Berkman explained that he calculated the share of the market attributable to Ajovy®, and accounted for the fact that "the market has become more crowded over time." [Trial Tr. 8-56:13–57:22]. He further assumed that Ajovy® and Emgality® would sell at the same price because he did not have pricing data for Ajovy®. [Id. at 8-58:15–22]. In addition, he calculated Teva's future costs based on actual 2022 costs and a projected decline in production costs going forward. [Id. at 8-59:19–60:8].

Dr. Berkman also testified that because of market changes and the fact that Lilly's internal forecasts for projected future sales changed between 2021 and 2022, [Trial Tr. 8-84:25–87:13, 8-171:11–172:21], his future profits calculation decreased by nearly 60%, [id. at 8-84:25–85:14, 14-116:7–23]. When asked whether it was his view "that [his] estimate . . . is reasonably calculated and not speculative," he responded that

> [a]t any point in time there's going to be some uncertainty, but you're left, then, with the challenge of not taking into account any future losses. And so I don't think that Teva would agree that they don't suffer any losses going forward. So I'm

> making my best estimate given the available – data available to me at the time I'm asked to make the estimate[,]

[id. at 8-85:15–23], and later that "[i]t's the result of forecasting error that comes about by perhaps a more sizable shift in the market than was anticipated in prior forecasts," [id. at 8-86:19–21].

2. Discussion

A jury's damages award "must be upheld unless the amount is 'grossly excessive or monstrous,' clearly not supported by the evidence, or based only on speculation or guesswork." Brooktree Corp. v. Advanced Micro Devices, Inc., 977 F.2d 1555, 1580 (Fed. Cir. 1992) (quoting L.A. Memorial Coliseum Comm'n v. Nat'l Football League, 791 F.2d 1356, 1360 (9th Cir. 1986), cert. denied, 484 U.S. 826 (1987)); see also Oiness v. Walgreen Co., 88 F.3d 1025, 1031 (Fed. Cir. 1996) (same). "Although projected future losses may be recovered when sufficiently supported, . . . the amount of lost profits awarded must not be speculative." Brooktree, 977 F.2d at 1581 (internal citation omitted); see also Oiness, 88 F.3d at 1031 (same). "The burden of proving future injury is commensurately greater than that for damages already incurred, for the future always harbors unknowns." Brooktree, 977 F.2d at 1581; see also Oiness, 88 F.3d at 1031 (same). Although estimates of future lost profits "necessarily contain some speculative elements," the jury must have had before it "such facts and circumstances to enable it to make an estimate of damage based upon judgment, not guesswork." Oiness, 88 F.3d at 1031 (internal quotations and citations omitted). In assessing whether future lost profits damages are speculative, relevant considerations may include whether the projections are based on economic principles, market surveys or reliable sales growth rates, see id. at 1032–33, as well as the "uncertainties of future pricing, future competition, and future markets," and whether it is a "fast-moving field," see Brooktree, 977 F.2d at 1581. "To the extent that there were conflicts

in the evidence, [] the trial court upon motion for judgment n.o.v. . . . may [not] substitute its choice of result for that of the jury." Id. at 1580.

Here, the jury was instructed that

> While estimates of future lost profits may necessarily contain some speculative elements, Teva must provide sufficient evidence for you to reasonably estimate future damages based upon judgment, not guesswork.

[Trial Tr. 15-205:24–206:2]. Lilly argues that the future profits evidence that the jury relied on is impermissible speculation and guesswork because "new entrants to the market (oral CGRP receptor antagonists known as gepants) have caused and continue to cause seismic shifts in the level of competition, eroding market share and access for CGRP antibodies increasing uncertainty of future pricing," [ECF No. 650 at 26], as well as because, for example, evidence at trial showed that Dr. Berkman's inputs and thus calculations changed from year to year and during the case, [id. at 27–29].

To be sure, Dr. Berkman's calculations relied on data representing an uncertain future, as is necessary for future profits calculations. Nevertheless, Dr. Berkman relied on actual sales data as well as Lilly's projections for future sales, and he explained to the jury how he accounted for updated projections and uncertainties in the market and made ***downward*** adjustments accordingly. The jury ultimately awarded future profits far lower than Dr. Berkman's calculation, suggesting that it too weighed the evidence and accounted for future market dynamics.

Dr. Berkman's reliance on actual sales data, Lilly's projections, and the adjustments he made make this case different from Oiness, where the Federal Circuit found the damages expert's future lost profits methodology "flawed" where, for example, based on 900% sales volume growth for the one-year period between when the patent application was filed (1984) and issued (1985), he took a "conservative approach" and projected 450% annual grown for several

years, and 150% growth near the end of the patent term. 88 F.3d at 1028, 1031. There, the court reasoned that, among other flaws, the expert used sales "figures from the first months" after the introduction of the product into the marketplace and "extrapolat[ed] [] demand over future years" without any "sound economic reasoning to support his assumption that [] sales would quadruple and double throughout the life of the patent." Id. at 1031–32.

It is also different from Shockley v. Arcan, Inc., where the Federal Circuit found a jury award "assume[d] continued demand and growth rates, profit margins, and other market factors against the clear weight of the evidence." 248 F.3d 1349, 1363 (Fed. Cir. 2001). There, the expert based future profits on "the number of sales that [the party] told him to assume it would have made," which the court found was "a benchmark without any basis in economic reality." Id. at 1363.[28]

In contrast, in Lam, the Federal Circuit affirmed a future profits award, finding that in a "two-supplier market[,] . . . an award based on projected lost sales is neither remote nor speculative when there is evidence of actual pre-infringement and post-infringement growth rates" because "[s]uch evidence illustrates the proven detriments suffered by the patent owner," and they "were not picked out by mere speculation or guess, but rather, found . . . as the result of an extrapolation of actual data." Lam, Inc. v. Johns-Manville Corp., 718 F.2d 1056, 1068 (Fed. Cir. 1983). Similarly, here, Dr. Berkman extrapolated his calculations from actual data, and the

[28] There was also evidence before the jury that raised significant doubts about whether the assumed sales volume was reasonable. See Shockley, 148 F.3d at 1364.

jury was free to weigh whether that data, and the additional projections he relied on, were overly speculative in light of market dynamics (e.g., a market with more than two participants).[29]

Accordingly, because Dr. Berkman based his calculations on actual data as well as on Lilly's projections, and explained how he arrived at his own projections and made adjustments in light of market dynamics, the jury heard substantial evidence that would enable them to determine, by a preponderance of the evidence, whether Dr. Berkman's calculations were too speculative. The Court will therefore not overturn the jury's verdict.

IV. CONCLUSION

Accordingly, Lilly's motion for JMOL, [ECF No. 649], is GRANTED insofar as the Patents-in-Suit are invalid on the basis of inadequate written description and lack of enablement, and DENIED as to the issue of future lost profits.

SO ORDERED.

September 26, 2023

/s/ Allison D. Burroughs
ALLISON D. BURROUGHS
U.S. DISTRICT JUDGE

[29] Lilly points to Fail-Safe, L.L.C. v. A.O. Smith Corp., 744 F. Supp. 2d 870, 887–88 (E.D. Wisc. 2010), for the proposition that "opinions based on 'early hopes' for market potential, or that 'assume[] the validity of [internal] projections,' cannot sustain a future lost profits award." [ECF No. 650 at 29]. But there, in finding an expert's opinion unreliable on a motion in limine, the court found that the expert had improperly relied on internal "hopeful" projections for an unlaunched product, and used outdated market data to project the future market. Id. at 888. In contrast, here, Dr. Berkman relied on projections tied to actual prior sales and made several adjustments that he explained to the jury, including adjusting for updated actual sales data and future projections.