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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* RONALD STEWART HILL, RICHARD CHRIS KLANN  
and FRANCIS V. LAMBERTI

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Appeal 2015-004374  
Application 12/039,214<sup>1</sup>  
Technology Center 1600

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Before LORA M. GREEN, RICHARD M. LEOVITZ, and  
JEFFREY N. FREDMAN, *Administrative Patent Judges*.

LEOVITZ, *Administrative Patent Judge*.

DECISION ON APPEAL

This appeal involves claims directed to a bioactive hydrogel matrix. The Examiner finally rejected the claims as obvious under 35 U.S.C. § 103(a). We have jurisdiction under 35 U.S.C. § 134. The Examiner's decision is affirmed-in-part. A new grounds of rejection under 35 U.S.C. § 103(a) is set forth pursuant to 37 C.F.R. § 41.50(b).

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<sup>1</sup> "The '214 Application."

STATEMENT OF CASE

Appellants appeals from the Examiner's final rejection of claims 1–12, 15–30, and 45–49. The claims stand rejected by the Examiner as follows:

1. Claims 1–3, 5–10, 12, 15–23, 28–30, and 45–49 under 35 U.S.C. § 103(a) (pre-AIA) as obvious in view of Usala '587 (U.S. Pat. No. 6,261,587 B1, patented July 17, 2001), Liu et al., (U.S. Pat. No. 5,972,385, patented Oct. 26, 1999), and Lin et al., (U.S. Publ. Pat. App. No. 2004/0091462 A1, publ. May 13, 2004). Ans. 2.

2. Claim 45 under 35 U.S.C. § 103(a) (pre-AIA) as obvious in view of Usala '587, Liu, Lin, and Falchuk (U.S. Publ. Pat. App. No. 2002/0169201, publ. Nov. 14, 2002). Ans. 5.

3. Claims 1–12, 24–27, and 45 under 35 U.S.C. § 103(a) (pre-AIA) as obvious in view of Rhee et al., (U.S. Pat. No. 5,470,911, patented Nov. 28, 1995), Usala '331 (U.S. Pat. No. 5,824,331, patented Oct. 20, 1998), and Lin. Ans. 8.

4. Claim 45 under 35 U.S.C. § 103(a) (pre-AIA) as obvious in view of Rhee, Usala '331, Lin, and Falchuk. Ans. 10.

Claim 1, the only independent claim on appeal, is reproduced below (bracketed numbers added for reference to the individual components):

1. A bioactive hydrogel matrix comprising [1] gelatin, [2] a polysaccharide, [3] one or more components selected from the group consisting of polar amino acids, polar amino acid analogs or derivatives, divalent cation chelators, and combination thereof, [4] hydroxyapatite, and [5] demineralized bone matrix (DBM).

USALA '587, LIU, AND LIN

We shall reverse this rejection for the reasons stated by Appellants.

The Examiner determined that it would have been obvious to one of ordinary skill to have combined the teachings in Usala '587 with Liu and Lin. Final Rej. 3–6. However, as pointed out by Appellants, the purpose of Usala '587's composition is for promoting vascularization, for preventing an immune response, and for reducing inflammation. Appeal Br. 8 (last paragraph). Lin describes a composition for forming bone. *Id.* at 5. The Examiner did not provide a persuasive reason as to why Lin's bone composition would be combined with Usala '587. For this reason, we reverse the rejection of claims 1–3, 5–10, 12, 15–23, 28–30, and 45–49 as obvious in view of Usala '587, Liu, and Lin.

RHEE, USALA '331, AND LIN, AND  
FURTHER IN VIEW OF FLACHUK

Rejection

The claimed bioactive hydrogel matrix is required to have five components: 1) gelatin; 2) polysaccharide; 3) one or more of 3a) polar amino acids or 3b) divalent chelators; 4) hydroxyapatite; and 5) demineralized bone matrix (DBM).

[FF1]<sup>2</sup> Gelatin is a form of denatured collagen. '214 Appl. 11: 28–30; 12: 23–31.

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<sup>2</sup> “FF” refer to findings of fact.

[FF2] The '214 Application teaches that the gelatin and polysaccharide can be cross-linked, such as gelatin cross-linked to dextran. *Id.* at 32: 6–31.

[FF3] The Examiner found that Rhee describes a composition for soft and hard tissue augmentation comprising (Final Rej. 8–10) (numbered according to claim 1):

[FF4] 1) Collagen, a gelatin (Abstract; col. 4, ll. 26–31; col. 13, ll. 60–67);

[FF5] 2) Glycosaminoglycan, a polysaccharide (Abstract; col. 4, ll. 26–31 col. 7, ll. 14–15);

[FF6] 4) Hydroxyapatite (col. 12, ll. 39–43).

Compositions comprising conjugates with ceramic particles, preferably hydroxyapatite and/or tricalcium phosphate, are particularly useful for the repair of stress-bearing bone due to its high tensile strength.

*Id.*

The Examiner found that it would have been obvious to have included hydroxyapatite in Rhee's composition because it is "particularly useful for the repair of stress-bearing bone due to its high tensile strength." Final Rej. 9.

[FF7] The collagen and glycosaminoglycan<sup>3</sup> are covalently bound. Rhee, col. 4, ll. 25–32.

The conjugate comprising a glycosaminoglycan covalently bound to a hydrophilic synthetic polymer may be further bound to collagen to form a three component conjugate having different properties.

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<sup>3</sup> "Useful glycosaminoglycans include hyaluronic acid, the chondroitin sulfates, keratan [sic, keratin] sulfate, chitin and heparin." Rhee, Abstract.

*Id.* at Abstract.

One (1) milliliter of 35 mg/ml collagen in solution (pH 2) is mixed with 1 ml of a 2% (w/v) acidified solution of difunctionally activated S-PEG. The S-PEG-collagen solution is immediately mixed with 2 ml of a 10 mg/ml solution of deacetylated hyaluronic acid (pH 13), neutralizing the pH of the mixture and causing the difunctionally activated S-PEG to covalently bond with both the collagen and the hyaluronic acid.

*Id.* at col. 30, ll. 916 (Example 3)

[FF8] Rhee also describes including cytokines and growth factors, such as bone morphogenic protein, in its composition. *Id.* at Abstract; col. 4, ll. 36–41; col. 12, ll. 66.

[FF9] The material described by Rhee can be used in the repair and replacement of bone. *Id.* at col. 4, ll. 41–45.

[FF10] Rhee does not describe the presence of 3) one or more of 3a) polar amino acids or 3b) divalent chelators; and 5) DBM in its composition.

[FF11] The Examiner found that Ursala '331 describes a matrix with collagen based gelatin (Ursala '331, col. 3, ll. 41–44; col. 17, ll. 8–23) which can include dextran (*id.* at col. 17, ll. 8–23) (, 3a) polar amino acids (col. 3, ll. 41–44), and 3b) divalent cation chelators (*id.* at col. 3, ll. 47–50).

[FF12]

Depending on the desired physical properties, these substrates can have their resistance to force (firmness) increased or decreased by addition of other chemicals. As described in the example below, such firmness is increased by addition of amino acid moieties with polar R groups or accessible hydrogen/hydroxyl groups to increase dipole moment attractions and hydrogen bonds as the enhanced substrate cools.

*Id.* at col. 13, ll. 36–43.

[FF13]

The resistance of the matrix to force can be increased by the addition of chelators that remove divalent cation interference from the hydrogen bond and dipole moment interactions.

*Id.* at col. 3, ll. 47–50.

The storage matrix can benefit by the addition of a divalent chelator, such as citrate, EDTA or EGTA, which can increase the rigidity of the matrix . . .

*Id.* at col. 12, 16–18.

[FF14]

The Examiner found that it would have been obvious to one of ordinary skill in the art to add 3) one or more of 3a) polar amino acids or 3b) divalent cation chelators to Rhee's bone growth composition to increase firmness and resistance to force as taught by Ursala '331. Final Rej. 10.

[FF15] The Examiner determined:

One of ordinary skill in the art would have had a reasonable expectation of success [in adding polar amino acids and divalent cation chelators to Rhee] because Rhee et al teach that one of their embodiments is intended for hard tissue augmentation and would therefore benefit from these properties for increased strength.

*Id.*

[FF16] The Examiner found that Lin describes a composition for repairing bone which includes osteotherapeutic materials, such as 5) DBM (Lin, Abstract; present in Examples (*id.* at ¶¶ 133–140, 150–152, 170).

[FF17] Lin's composition can also include BMP (*id.* at ¶¶ 3, 4), 3) hydroxyapatite (*id.* at ¶ 5), and 1) gelatin (*id.* at ¶ 42), and 2) polysaccharides (*id.*)

[FF18] The Examiner found that it would have been obvious to one of ordinary skill in the art to have included 5) DBM into Rhee's composition because Lin teaches that DBM is desirable and beneficial for bone repair, the same purpose of Rhee's composition. Final Rej. 11.

#### Issue

Appellants contend that Rhee does not describe a single embodiment with the "presently claimed" materials. Appeal Br. 10. Appellants argue that the "mere disclosure of a number of materials is insufficient to provide the level of predictability required to make a *prima facie* case of obviousness." *Id.* at 11. Appellants contend that the Examiner did not provide "any evidence that a person of ordinary skill in the art would find reason to pick and choose elements from Rhee that are included in the specifically claimed composition." *Id.* With respect to the addition of polar amino acids, chelators, and DBM, Appellants argue that the Examiner did not establish that "a person of ordinary skill in the art would predict that a composition as presently claimed would provide for excellent bone regeneration." *Id.*

Appellants provided evidence to establish the non-obviousness of the claimed invention, namely experimental results purported to show "surprising results arising from the presently claimed combination of specific materials." *Id.* at 12.

The issue in this rejection is whether the Examiner established that one of ordinary skill in the art would have had reason to make a composition comprising the components 1) through 5) as recited in claim 1, and whether

such composition has unexpected results when compared to the closest prior art.

#### Discussion

The Examiner provided explicit reasons as to why one of ordinary skill in the art would have utilized 3) one or more of 3a) polar amino acids or 3b) divalent chelators; 4) hydroxyapatite; and 5) demineralized bone matrix (DBM) in Rhee's matrix comprising 1) gelatin and 2) the polysaccharide glycosaminoglycan. Final Rej. 8–10. Specifically, the Examiner found that components 3) through 5) are each described as beneficial to bone growth and repair, providing a reason to have utilized them in Rhee's gelatin/ glycosaminoglycan matrix which is useful for the same purpose. FF6, FF14, FF15, FF18. The Examiner's reasoning is supported by a preponderance of the evidence in the record. FF6, FF9, FF12, FF13, FF16, FF17. Appellants did not identify a persuasive error in the Examiner's reasoning nor fact-finding.

#### Unexpected results

A showing of “unexpected results” can be used to demonstrate the non-obviousness of a claimed invention. *Soni*, 54 F.3d 746, at 750 (“One way for a patent applicant to rebut a *prima facie* case of obviousness is to make a showing of ‘unexpected results,’ *i.e.*, to show that the claimed invention exhibits some superior property or advantage that a person of ordinary skill in the relevant art would have found surprising or unexpected.”). These results must be “surprising or unexpected” to one of ordinary skill in the art when compared to closest prior art. *In re Soni*, 54

F.3d 746, 750 (Fed. Cir. 1995). Unexpected results must also be “commensurate in scope with the degree of protection sought by the claimed subject matter.” *In re Harris*, 409 F.3d 1339, 1344 (Fed. Cir. 2005).

Appellants provided a declaration under 37 C.F.R. § 1.132 by Ronald Stewart Hill, Ph.D., a co-inventor of the '214 Application (Hill Decl. (2012)). Dr. Hill describes test results obtained with “the presently claimed hydrogel matrix with a bone morphogenetic protein (BMP). Hill Decl. (2012) ¶ 4. The hydrogel matrix tested was “E-Matrix,” a commercial product comprising “a combination of a polypeptide and a polysaccharide according to the claims of the present patent application.” *Id.* Dr. Hill did not identify the polypeptide or polysaccharide present in E-Matrix. Dr. Hill also did not state whether the polypeptide and polysaccharide were cross-linked or not.

Dr. Hill performed a first experiment in which low and high concentrations of BMP were utilized in E-Matrix to promote bone growth in a rat spinal fusion model. *Id.* at ¶¶ 4, 5. Dr. Hill also performed the experiment using different concentrations of BMP. *Id.* at ¶ 6.

Dr. Hill testified:

It was surprising to find that, although the lower doses of BMP-2 were ineffective for achieving maximum possible bone growth, combination of the impractically low dose BMP-2 with a hydrogel matrix according to the present claims still achieved bone growth performance that matched or exceeded that seen with high dose BMP-2 treatment.

*Id.* at ¶ 5.

Dr. Hill’s statement was accompanied by the experimental data upon which he based this opinion. *Id.* at ¶¶ 5, 6, 7.

We agree with the Examiner that the showing described by Dr. Hill in these first experiments is not adequate to demonstrate that the claimed invention is not obvious over the cited prior art because it was not compared to the closest prior art. A showing of “new and unexpected results” must be “relative to prior art.” *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1322 (Fed. Cir. 2004). To establish unexpected results, the claimed subject matter must be compared with the closest prior art. *In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991).

In this case, Rhee describes a composition useful for bone growth that comprises collagen (gelatin) covalently bound to the polysaccharide glycosaminoglycan. FF3, FF4, FF7, FF9. Both components are the same as those recited in the claims, namely, 1) gelatin and 2) polysaccharide. Rhee also teaches that BMP can be added to its composition. FF8. Appellants did not compare E-Matrix to Rhee’s composition. Rather, Appellants used a composition to demonstrate unexpected results that was like Rhee’s composition, namely, a bone growth composition comprising 1) gelatin and 2) polysaccharide. All that Appellants have demonstrated is that a prior art composition facilitates the effect of BMP on bone growth. “Mere recognition of latent properties in the prior art does not render nonobvious an otherwise known invention.” *In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991).

Even if Appellants experiment is proper for demonstrating unexpected results, the showing is still deficient because it represents only a single embodiment of claim 1. Specifically, claim 1 recites “a polysaccharide.” Appellants did not establish that any polysaccharide within the scope of the claim would enhance the bone-promoting activity of BMP. Appellants have

not even identified the specific components of E-Matrix to determine what polysaccharide was utilized and whether the protein in it was, in fact, gelatin.

Appellants contend that the Examiner mischaracterized Rhee, and that Rhee does not disclose a hydrogel formed of gelatin and polysaccharide. Reply Br. 5; Appeal Br. 16. We do not agree. Rhee specifically mentions the polysaccharide glycosaminoglycan “conjugated to a synthetic hydrophilic polymer such as polyethylene glycol (PEG), which is optionally conjugated to collagen as well.” Rhee, col. 1, ll. 20–26. Appellants appear to take the position that a “working” example is necessary in order for the disclosure to serve as the closest prior art. Again, we do not agree. Rhee’s disclosure of a composition with both gelatin and the polysaccharide glycosaminoglycan is concrete and specific. There is no picking and choosing as alleged by Appellants (Reply Br. 5, 6); Rhee says to make it, even if the collagen is optional. Moreover, Example 3 in Rhee makes a polymer of collagen and hyaluronic acid (a polysaccharide) along with PEG. *Id.* a col. 30, ll. 9–16; FF7.

Dr. Hill also conducted additional experiments “to evaluate the effect of various bone graft Materials” when implanted into the vertebral bodies of rats. Hill Decl. (2012) ¶ 10. Dr. Hill performed the experiments using five treatment groups (*id.*):

- 1) Absorbable collagen sponge (ACS).
- 2) Absorbable collagen sponge and BMP.
- 3) Test material 1: “hydrogel matrix encompassed by the present claims, hydroxyapatite (HA), and demineralized bone matrix (DBM).”
- 4) Test material 2: Grafton by Osteotech.

5) Test material 3: DBX by Synthes. “The DBX® product provides DBM combined with hyaluronate.” *Id.* at ¶ 23

Dr. Hill describes how the experiments were performed and how the results were quantified to determine the effect of the test material on bone growth. *Id.* at ¶¶ 10–13. Dr. Hill reported the result of the experiments. Table 5 summarized bone fusion and manual palpitation of the bone in all the test groups. Dr. Hill testified that the bone fusion scores “in the Group using Test Material 1 [said to be a matrix of claim 1] were significantly higher than the two Groups using Test Material 2 and Test Material 3.” *Id.* at ¶ 15. Dr. Hill further explained that while the group with ACS and BMP showed 100% fusion, the new bone formation was less than Test Material 1. *Id.* at ¶ 16.

Dr. Hill further testified, citing experimental data shown in Figs. 1–3: Using a quantification protocol, animals in the Group using Test Material 1 demonstrated significantly greater new bone formation than all other treatment Groups, including the rhBMP-2 Group (1070 mm<sup>3</sup> vs. 475 mm<sup>3</sup>,  $p < 0,05$ ). *Id.* at ¶ 17.

Based this and other data, Dr. Hill concluded:

The above data illustrates the surprisingly efficacious results when using the material according to the present invention formed of the hydrogel matrix, DBM, and HA. We believe the excellent results arise from the osteoinductivity of the DBM, the mechanical properties of the HA, and the biocompatibility and structural effects of our specific hydrogel matrix i.e. ability to maintain the full implant volume for new bone formation at the implant site.

*Id.* at ¶ X.

We do not find that the evidence, when considered as part of all the evidence in the record, establishes the non-obviousness of the claimed

invention. *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling USA, Inc.*, 699 F.3d 1340, 1349 (Fed. Cir. 2012).

To begin, we have not been directed to information that identifies the components of the hydrogel matrix of Test Material 1, said to be representative of the claims. This is troubling since the claims require both gelatin and a polysaccharide, and we have not been able to confirm that gelatin is present in the hydrogel matrix nor what polysaccharide was utilized. In our opinion, such information should have been divulged since one of ordinary skill in the art, would have wanted to know the specific components of the matrix, e.g., to know whether such matrix was known in the art at the time of the invention, and, to determine whether the results were due to the merits of the invention, rather than something already known in the art. *See J.T. Eaton & Co. v. Atlantic Paste & Glue Co.*, 106 F.3d 1563 (Fed. Cir. 1997).

Even without this information, we find the showing defective for the full scope of the claims. Ans. 19. While Dr. Hill has provided factual support for his testimony about the results exhibited by a “material according to the present invention formed of the hydrogel matrix, DBM, and HA,” he did not demonstrate that other embodiments within the scope of the claim would show such “surprisingly efficacious” results. Hill Decl. (2012) ¶ 21. For example, the claimed matrix comprises a polysaccharide, which is reasonably understood to be a genus of polysaccharide molecules with different structures. However, only one matrix was used in the experiments. We have not been told whether the matrix contained only one type of polysaccharide, whether multiple types of polysaccharide were present, and what specific polysaccharide was used. We also have not been told the form

of the matrix. For example, the Application teaches that the gelatin and polysaccharide can be cross-linked. FF2. The claims cover both a cross-linked and non-cross-linked matrix, but Appellants have not disclosed whether the two components in the matrix are linked or not.

When unexpected results are demonstrated, it must be established that such results would be obtained by other embodiments with the claim scope, i.e., other polysaccharides, and cross-linked and uncross-linked forms of the hydrogel matrix.<sup>4</sup> Dr. Hill attributed the unexpected results, in part, on “the biocompatibility and structural effects of *our specific hydrogel matrix* i.e. ability to maintain the full implant volume for new bone formation at the implant site.” Hill Decl. (2012) ¶ 21 (emphasis added). Consequently, the composition and structural state of the hydrogel would be reasonably expected to affect the outcome in the bone material experiments. For this reason, we are not persuaded that the results obtained from the single

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<sup>4</sup> (“Even assuming that the results were unexpected, Harris needed to show results covering the scope of the claimed range. Alternatively Harris needed to narrow the claims.”); *In re Greenfield*, 571 F.2d 1185, 1189 (CCPA 1978) (“Establishing that one (or a small number of) species gives unexpected results is inadequate proof, for ‘it is the view of this court that objective evidence of non-obviousness must be commensurate in scope with the claims which the evidence is offered to support.’”) (quoting *In re Tiffin*, 448 F.2d 791, 792 (CCPA 1971)); (Finding the claim scope broad, and the “probative value of appellants’ evidence . . . quite narrow,” the court in *In re Clemens*, 622 F.2d 1029, 1036 (CCPA 1980) concluded this “is not a case in which the probative value of a narrow range of data can be reasonably extended to prove the unobviousness of a broader claimed range.” *Cf. In re Kollman*, 595 F.2d 48, 56 (CCPA 1979) (where it was held that the nonobviousness of a broader claimed range was proven by a narrower range of data, when one having ordinary skill in the art could “ascertain a trend in the exemplified data which would allow him to reasonably extend the probative value thereof.”).

embodiment of one hydrogel is indicative of the full scope of hydrogel embodiments covered by the claim. Indeed, Dr. Hill appears to attribute the unexpected results to the “specific hydrogel matrix” utilized in the experiments, but the claims are not limited to such a specific hydrogel matrix.

In addition to this, it is not evident to us that the comparison made by Dr. Hill represented the closest prior art. Ans. 21. Rhee described a composition comprising collagen cross-linked with glycosaminoglycan. FF7. However, Dr. Hill did not compare the material said to be within the scope of claim 1 (Test Material 1) to Rhee’s material. Treatments 1) and 2) were performed with only collagen; treatment 5) was performed with DBX that comprises DBM and hyaluronate, but no collagen. Hill Decl. (2012) ¶ 23. The complete composition of Grafton in treatment 4) was not disclosed.

Appellants argue that DBX in treatment 5) is closer, because it comprises hyaluronate and DBM. Reply Br. 2. Hyaluronate is a glycosaminoglycan which is a polysaccharide. Thus, DBX comprises two of the components recited in claim 1, a polysaccharide and DBM. The Examiner disputed this.

In *In re Merchant*, 575 F.2d 865, 868 (CCPA 1978), the court acknowledged that “no all-encompassing principle or test can be delineated for determining the closest prior art.” However, the court stated that a “comparison of the claimed invention with the disclosure of each cited reference to determine the number of claim limitations in common with each reference, bearing in mind the relative importance of particular limitations, will usually yield the closest single prior art reference.” *Id.* In *In re*

*Johnson*, 747 F.2d 1456, 1461 (Fed. Cir. 1984), the court further held that “an applicant must compare to the closest prior art, even if that art was not relied on by the examiner.” Moreover, the court stated that “[w]here two references were equally close to the claimed invention there is no reason for insisting that applicant compare with one reference, the one relied upon by the examiner, instead of another.” *Id.* The court noted, however, that such a determination is “premised on the notion that the teachings of the closest prior art references are sufficiently similar so that the testing of one compound showing unexpected results would provide the same information as to the relevant teachings of the other equally close references.” *Id.*

In this case, even if DBX is considered to be the closest prior art because it comprises two of the five components,<sup>5</sup> the showing is still not persuasive.

First, as already explained, the showing is not commensurate in scope with the claim. The comparison was made with only one embodiment within the scope of claim 1.

Secondly, and independently, we note that the claimed composition has five components. It has not been established by adequate evidence that the composition tested by Dr. Hill contained all five components. Dr. Hill stated: “Test material 1 (a material comprising a hydrogel matrix

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<sup>5</sup> The Examiner found that Rhee also describes the presence of gelatin beads and hydroxyapatite. Ans. 21. Appellants take the position that the Examiner “require Appellant to review Rhee, pick and choose variously disclosed elements therefrom and reconstruct a composition that is as close as possible to the claimed composition” which is adverse [to] the prevailing law.” Reply Br. 6. Because we find the showing defective, we have not reached the issue of whether Rhee comprises at least three of the five components of claim 1, making it closer prior art than DBX which has only two.

encompassed by the present claims, hydroxyapatite (HA), and demineralized bone matrix (DBM).” Hill Decl. (2012) ¶ 10. Claim 1 also requires component 3) of “one or more components selected from the group consisting of polar amino acids, polar amino acid analogs or derivatives, divalent cation chelators, and combination thereof.” Dr. Hill did not mention which of components 3), *if any*, are present in the matrix.

Appellants, in the Reply Brief, assert component 3) is present. Reply Br. 4. However, an argument made by counsel in a brief does not substitute for evidence lacking in the record. *Estee Lauder, Inc. v. L’Oréal, S.A.*, 129 F.3d 588, 595 (Fed. Cir. 1997).

In our opinion, the requirement that there be a nexus between the evidence and the merits of the claimed invention (see *In re GPAC, Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995)) demands that the embodiment said to be representative of the claimed subject matter is coextensive with all the recited limitations of the claim. Such a requirement has been made in cases where commercial success was at issue. *Ormco Corp. v. Align Technology Inc.*, 463 F.3d 1299, 1311–1312 (Fed. Cir. 2006). It is logical that all the components of the claimed invention must be present in the embodiment relied upon to establish unexpected results because each claimed component, absent evidence to the contrary, would be reasonably expected to impact the performance of the claimed invention. Accordingly, we find the showing independently defective for the failure to establish the presence of component 3).

Third, while we do not base our decision on this reason, we are wary of relying on test results to establish non-obviousness of a claimed invention when the exact ingredients (polysaccharide, polar amino acid, chelator),

concentrations, and structure (e.g., matrix is cross-linked or not) of the embodiment said to exhibit the unexpected results have not been disclosed.

#### Dependent claims

Because dependent claims 2–12, 24–27, and 45 were not argued separately, these claims fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv).

#### RHEE, USALA '331, LIN, AND USALA '587

We set forth the following new ground of rejection pursuant to 37 C.F.R. § 41.50(b):

Claims 15–23, 28–30, and 46–49 are rejected under 35 U.S.C. § 103(a) (pre-AIA) as obvious in view of Rhee, Usala '331, Lin, and Usala '587.

#### Claims 15, 18

Claims 15 and 18 recite specific polar amino acids. Polar amino acids were known in the art at the time of the invention, e.g., as evidenced by Usala '587. Consequently, the selection of a specific polar amino acid would have been obvious to one of ordinary skill in the art.

#### Claims 16, 17, and 19

Claims 16, 17, and 19 recite specific concentrations of polar amino acids. As found by the Examiner, Usala '587 describes the addition of polar amino acids to increase rigidity of the matrix (Final Rej. 4), the same function disclosed by Lin at column 4, ll. 24–29. The Examiner found that

the amounts of polar amino acids disclosed in Usala '587 reasonably suggest the claimed amounts (Final Rej. 4), a finding undisputed by Appellants.

#### Claims 20, 21

Claim 20 depends from claim 1, and further recites that the chelator is ethylenediaminetetraacetic acid (“EDTA”). As found by the Examiner, Usala '331 teaches the addition of a chelator to increase matrix rigidity. FF13. Usala '331 also discloses that the chelator can be EDTA as recited in the claim. FF13.

In regard to the recited amounts of 0.01 to 10 mM of EDTA in claim 21, such amounts would be routinely determinable as evidenced by Usala '587 which teaches such amounts for the same purpose in increasing matrix rigidity. Usala '587, col. 3, l. 66 to col. 4, l. 9.

#### Claim 22

Claim 22 depends from claim 1, and further recites a list of medicaments that can be included in the bioactive hydrogel matrix.

Lin teaches that various osteotherapeutic, drugs, and therapeutic agents can be added to its bone composition, reasonably suggesting therapeutics with the specific activities recited in the claim. Lin ¶¶ 3, 9, 105, 117.

#### Claim 23

Claim 23 depends from claim 1, and further recites “wherein the bioactive hydrogel matrix further comprises cells selected from the group

consisting of stem cells, progenitor cells, and mixtures thereof.” Lin discloses that its matrix can comprise stem cells. Lin ¶¶ 3, 105.

#### Claims 28, 29

Claim 28 depends from claim 1, and further recites that the bioactive hydrogel matrix is in dehydrated form.

Claim 29 depends from claim 1, and further recites that the dehydrated bioactive hydrogel matrix is in particulate form.

Rhee teaches both features:

The conjugates can be dehydrated to form a relatively solid implant for use in hard tissue augmentation. The dehydrated, solid implant can further be ground into particles which can be suspended in a non-aqueous fluid and injected into a living being (preferably human) for soft tissue augmentation. Once in place, the solid implants or particles rehydrate and expand in size approximately three- to five-fold.

Rhee, Abstract.

#### Claim 30

Claim 30 depends from claim 1, and further recites “at least a portion of the bioactive hydrogel matrix is in crosslinked form, the polysaccharide being covalently crosslinked to the gelatin.” This feature is described by Rhee. FF7.

#### Claim 46

Claim 46 depends from claim 1, and further recites “wherein the gelatin is present at a concentration of about 0.01 to about 40 mM.

The Examiner found that these recited concentrations are described in Usala '587. Final Rej. 4. Because Usala '587 describes a hydrogel, we find that it would have been obvious to have utilize the amounts of gelatin in Usala '587 for the hydrogel of Rhee.

#### Claims 47–49

Claims 47–49 recite that the polysaccharide of claim 1 is dextran, “wherein the dextran has a molecular mass of about 300,000 to about 600,000 Da, and the polydispersity of the molecular mass of the dextran is about 1 to about 3 (claim 48) and “wherein the dextran is present at a concentration of about 0. 01 to about 1 mM” (claim 49).

The Examiner made findings in the Final Rejection that Lin and Rhee teach a matrix with dextran with recited molecular weights or that one of ordinary skill in the art would have had reason to select such weights. Final Rej. 9, 10, 11. It therefore appears to have been an oversight by the Examiner in not including claims 47 and 48 in the rejection.

With regard to the concentrations recited in claim 49, the Examiner found that such concentrations are described in Usala '587. Final Rej. 4. Because Usala '587 describes a hydrogel, we find that it would have been obvious to have utilize the amounts of dextran in Usala 587 for the hydrogel of Rhee.

#### SUMMARY

1. The rejection 1–3, 5-10, 12, 15–23, 28–30, 45–49 as obvious in view of Usala '587, Liu, and Lin is reversed.

2. The rejection of claim 45 as obvious in view of Usala '587, Liu, Lin, and Falchuk is reversed.

3. The rejection of claim 1–12, 24–27, and 45 as obvious in view of Rhee, Usala '331, and Lin is affirmed.

4. The rejection of claim 45 as obvious in view of Rhee, Usala '331, Lin, and Falchuk is affirmed.

5. Claims 15–23, 28–30, and 46–49 are rejected as obvious in view of Rhee, Usala '331, Lin, and Usala '587. This is a new ground of rejection.

#### NEW GROUNDS OF REJECTION

This decision contains new grounds of rejection pursuant to 37 C.F.R. § 41.50(b) (effective September 13, 2004, 69 Fed. Reg. 49960 (August 12, 2004), 1286 Off. Gaz. Pat. Office 21 (September 7, 2004)). 37 C.F.R. § 41.50(b) provides that “[a] new ground of rejection pursuant to this paragraph shall not be considered final for judicial review.”

37 C.F.R. § 41.50(b) also provides that the Appellants, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

(1) Reopen prosecution. Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the Examiner, in which event the proceeding will be remanded to the Examiner. . . .

(2) Request rehearing. Request that the proceeding be reheard under § 41.52 by the Board upon the same record. . . .

The amendment and/or new evidence under 37 C.F.R. § 41.50(b)(1), or the request for rehearing under 37 C.F.R. § 41.50(b)(2), must be filed within 2 months from the date of the Board’s decision. In accordance with 37 C.F.R. § 41.50(f), this 2-month time period may not be extended by the filing of a petition and fee under 37 C.F.R. § 1.136(a), but only under the provisions of 37 C.F.R. § 1.136(b).

AFFIRMED-IN-PART; § 41.50(b)