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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte HARTWIG SCHRÖDER, WEOL KYU JEONG, ANNEGRET SERWE, and OSKAR ZELDER

Appeal 2017-007193
Application 13/516,034
Technology Center 1600

Before JEFFREY N. FREDMAN, RICHARD J. SMITH, and DAVID COTTA, *Administrative Patent Judges*.

FREDMAN, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal[1,2] under 35 U.S.C. § 134 involving claims to a recombinant *Corynebacterium*. The Examiner rejected the claims as obvious under 35 U.S.C. § 103(a) and on the grounds of nonstatutory double patenting. We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

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[1] Appellants identify the Real Party in Interest as BASF SE (*see* App. Br. 1).
[2] We have considered and herein refer to the Specification of June 14, 2012 ("Spec."); Final Office Action of Sept. 10, 2015 ("Final Action"); Appeal Brief of Sept. 12, 2016 ("App. Br."); and Examiner's Answer of Jan. 19, 2017 ("Answer").

Statement of the Case

Background

"[T]he present invention provides a microorganism which has an intracellular lysine decarboxylase activity and an enhanced lysine import activity" and produces cadaverine (Spec. 1:30–31, 35). The microorganism has "no or a decreased acetylcadaverine-forming activity" (Spec. 2:14). The "preferred . . . species" of the microorganism is "*Corynebacterium glutamicum*" (Spec. 8:21).

The Claims

Claims 1, 2, 5, 8–10, 12, 14–16, 18, 20, 24, and 25 are on appeal. Claim 1 is representative and reads as follows:

> 1. A recombinant *Corynebacterium* comprising no or a decreased acetylcadaverine-forming activity, an intracellular lysine decarboxylase activity, and an enhanced lysine import activity as compared to a naturally-occurring *Corynebacterium* from which said recombinant *Corynebacterium* is derived, wherein the acetylcadaverine-forming activity is decreased due to insertions or deletions within a gene encoding an acetylcadaverine-forming polypeptide comprising an amino acid sequence being at least 95% identical to SEQ ID NO: 11, and wherein the lysine import activity is enhanced due to insertions or deletions within a gene encoding a lysine exporter polypeptide comprising an amino acid sequence which has at least 95% sequence identity to SEQ ID NO: 3.

The Rejections[3]

A. The Examiner rejected[4] claims 1, 2, 5, 8–10, 14–16, 20, 24, and 25 under 35 U.S.C. § 103(a) as obvious over Zelder,[5] Mimitsuka,[6] Mimizuka 1[7], Mimizuka 2[8], Kikuchi[9], Meng[10], Mateos[11], and Vrljic[12] (Ans. 2–7).

B. The Examiner rejected claims 12 and 18 under 35 U.S.C. § 103(a) as obvious over Zelder, Mimitsuka, Mimizuka 1, Mimizuka 2,

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[3] The Examiner objected to claims 9 and 40 (Final Act. 3). Appellants state that they "will take appropriate actions to address these objections upon resolution of the instant Appeal" (App. Br. 5).

[4] The rejection heading includes claims 38 and 39; however, these claims are not on appeal.

[5] Zelder et al., WO 2007/113127 Al, published October 11, 2007.

[6] Mimitsuka et al., *Metabolic Engineering of Corynebacterium glutamicum for Cadaverine Fermentation,* 71(9) BIOSCI. BIOTECHNOL. BIOCHEM., 2130–2135 (2007).

[7] Mimizuka et al., JP 2002-223770 A, published August 13, 2002.

[8] Mimizuka et al., JP 2004-222569 A, published August 12, 2004.

[9] Kikuchi et al., *Characterization of a second lysine decarboxylase isolated from Escherichia coli,* 179(14) J. BACTERIOL., 4486–4492 (1997).

[10] Meng et al., *Nucleotide Sequence of the Escherichia coli cad Operon: a System for Neutralization of Low Extracellular pH,* 174(8) J. BACTERIOL., 2659–2669 (1992).

[11] Mateos et al., *Nucleotide Sequence of the Homoserine Dehydrogenase (thr A) Gene of Brevibacterium Lactofermentum,* 15 NUCLEIC ACIDS RES. 10598 (1987).

[12] Vrljic et al., *A New Type of Transporter with a New Type of Cellular Function: L-lysine Export from Corynebacterium Glutamicum,* 22 MOL. MICROBIOL., 815–826 (1996).

Kikuchi, Meng, Mateos, Vrljic, Soksawatmaekhin[13], and Nakagawa[14] (Ans. 7–8).

C. The Examiner rejected[15] claims 1, 2, 5, 8–10, 12, 14–16, 18, 20, 24, and 25 on the grounds of nonstatutory obviousness type double patenting over claims 1–3 of US 9,745,608 B2 in view of Mimitsuka (Final Act. 13).

D. The Examiner rejected claims 1, 2, 5, 8–10, 14–16, 20, 24, and 25 on the grounds of nonstatutory obviousness type double patenting over claims 1–3 and 10–15 of U.S. 8,741,623 B2 in view of Mimitsuka, Mimizuka 1, Mimizuka 2, Kikuchi, Meng, Mateos, and Vrljic (App. Br. 6).

E. The Examiner rejected claims 12 and 18 on the grounds of nonstatutory obviousness type double patenting over claims 1–3 and 10–15 of U.S. 8,741,623 B2 in view of Mimitsuka, Mimizuka 1, Mimizuka 2, Kikuchi, Meng, Mateos, Vrljic, Soksawatmaekhin, and Nakagawa (App. Br. 6).

A and B. Obviousness

Because both of the obviousness rejections turn on the same issue and rely upon the basic combination of Zelder, Mimitsuka, Mimizuka 1,

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[13] Soksawatmaekhin et al., *Excretion and uptake of cadaverine by CadB and its physiological functions in Escherichia coli,* 51(5) MOL. MICROBIOL., 1401–1412 (2004).

[14] Nakagawa, *Corynebacterium glutamicum ATCC 13032 DNA, complete genome,* GenBank accession number BA000036.3, (2004), GenBank accession number BAC00096, 2002, protein; http://www.ncbi.nlm.nih.gov/nuccore/42602314?sat=34&satkey=2171562.

[15] Copending Application No. 13/985,330 issued as US 9,745,608 B2 on August 29, 2017. This rejection is therefore no longer provisional.

Mimizuka 2, Kikuchi, Meng, Mateos, and Vrljic, we will consider them together.

We begin with claim interpretation. The Specification states that the "term 'decreased activity' includes the expression of a gene product, e.g. of a lysine exporter molecule, spermidine synthase, homoserine dehydrogenase or others, at a lower level than that expressed prior to manipulation of the microorganism or in a comparable microorganism which has not been manipulated" (Spec. 15:7–10). Therefore, consistent with the Specification, a decreased acetylcadaverine forming activity will be interpreted as any decrease in the amount of acetylcadaverine as compared to the amount formed by the naturally-occurring bacterium. Similarly, an enhanced lysine import activity will be interpreted as any increase in the amount of intracellular lysine as compared to the naturally-occurring bacterium. Consistent with the Specification and claims, this increase or decrease is due to insertions and deletions in the claimed sequences.

The Examiner finds that Zelder teaches:

> a process for the production of cadaverine by constructing a *C. glutamicum* mutant strain from a lysine producer LU11271, wherein said mutant strain is obtained by genetically modifying the LU11271 strain to (i) introduce a disruption in an endogenous gene encoding an acetyltransferase responsible for the formation of acetyl cadaverine . . . and [to] (ii) introduce a plasmid comprising the *E. coli* cadA and ldcC genes which encode lysine decarboxylases.

(Ans. 2–3.)

The Examiner finds that the "acetyltransferase of Zelder et al. is 98.4% sequence identical to the polypeptide of SEQ ID NO: 11" (Ans. 3).

The Examiner finds that Zelder teaches "(a) Mimizuka 1 discloses the production of cadaverine by introducing a lysine decarboxylase and a lysine/cadaverine antiporter into a lysine producing organism, and (b) Mimizuka 2 teaches the production of cadaverine by culturing a microorganism that has lysine decarboxylase activity and homoserine auxotrophy" (Ans. 3).

The Examiner finds that Mimitsuka teaches that "disruption of the gene encoding homoserine dehydrogenase in *C. glutamicum* allows *C. glutamicum* to produce L-lysine (homoserine auxotrophy) and that L-lysine is a precursor of cadaverine since L-lysine is converted into cadaverine in a reaction catalyzed by lysine decarboxylase" (Ans. 4).

The Examiner finds that Vrljic teaches that the sequence of the "*C. glutamicum* lysine exporter [is] SEQ ID NO: 3" and that the "lysine exporter specifically exports L-lysine from the cell" (Ans. 4).

The Examiner finds that a person of ordinary skill in the art would be:

> motivated to further modify the *C. glutamicum* mutant strain of Zelder et al. as described above for the benefit of improving the production of cadaverine. As indicated above, Mimitsuka et al. specifically teach that disruption of the gene encoding homoserine dehydrogenase *in C. glutamicum* allows *C. glutamicum* to produce L-lysine, which can then be converted to cadaverine via lysine decarboxylase. A person of ordinary skill in the art is motivated to disrupt the gene encoding the lysine exporter of SEQ ID NO: 3 for the benefit of improving the production of cadaverine since Mimitsuka et al. teach that L-lysine is a precursor of cadaverine and Vrljic et al. teach that a functional lysine exporter would direct intracellular L-lysine to the culture medium. Thus, disruption of the endogenous gene encoding the lysine exporter of SEQ ID NO: 3 would allow more lysine to stay in the cell and be available for intracellular cadaverine production.

(Ans. 6.)

The issue with respect to these rejections is: Does the evidence of record support the Examiner's conclusion that the combination of Zelder, Mimitsuka, Mimizuka 1, Mimizuka 2, Kikuchi, Meng, Mateos, and Vrljic renders the claims obvious?

Findings of Fact

1. Zelder teaches a "process for the production of cadaverine" by "the use of recombinant microorganism comprising DNA molecules in a deregulated form which are essential to produce cadaverine" (Zelder 1:5–7).

"acetylcadaverine-forming activity"

2. Zelder teaches that "a significant portion of the cadaverine produced in the microorganism according to the inventive process is acetylated" and "to block this acetylation reaction . . . and in order to increase the yield of cadaverine it is a preferred embodiment of the invention to deregulate the diamine acetyltransferase . . . to decrease its activity, e.g. by deletion or disruption of the gene" (Zelder 9:20–26).

3. Zelder teaches the details of constructing a mutant *C. glutamicum* by disrupting the acetyltransferase gene (Zelder 16–18).

4. Zelder teaches that a mutant *C. glutamicum* with a disrupted acetyltransferase gene "showed no accumulation of acetylcadaverine" and "cadaverine productivity was improved by disruption of the gene resulting in elimination of acetylcadaverine formation" (Zelder 17:18–21).

5. Zelder provides the sequence for the acetyltransferase gene (Zelder 17:26–18:6). The Examiner finds this sequence is greater than 95% identical to SEQ ID NO: 11 (*see* Ans. 3).

"lysine decarboxylase activity"

6. Zelder teaches that lysine decarboxylase "catalyzes the decarboxylation of L-lysine into cadaverine" (Zelder 4:30).

7. Zelder teaches "a lysine decarboxylase activity, is introduced into a microorganism where the respective gene activity, e.g. the lysine decarboxylase activity, has not been observed before . . . preferably by means of genetic engineering" (Zelder 4:24–28).

8. Zelder teaches that the mutant includes a lysine decarboxylase gene (Zelder 14:31, 16–17).

9. Zelder teaches "[i]n the broth cultured with all recombinant strains containing the lysine decarboxylase genes a significant amount of cadaverine was accumulated" (Zelder 15:11–12).

10. Mimitsuka teaches a *C. glutamicum* with a lysine decarboxylase gene that produces cadaverine from L-lysine (Mimitsuka 2130).

"lysine exporter polypeptide"

11. Mimitsuka teaches: "Cadaverine, the expected raw material of polyamides, is produced by decarboxylation of $_{L}$-lysine. If we could produce cadaverine from the cheapest sugar, and as a renewable resource, it would be an effective solution against global warming" (Mimitsuka 2130).

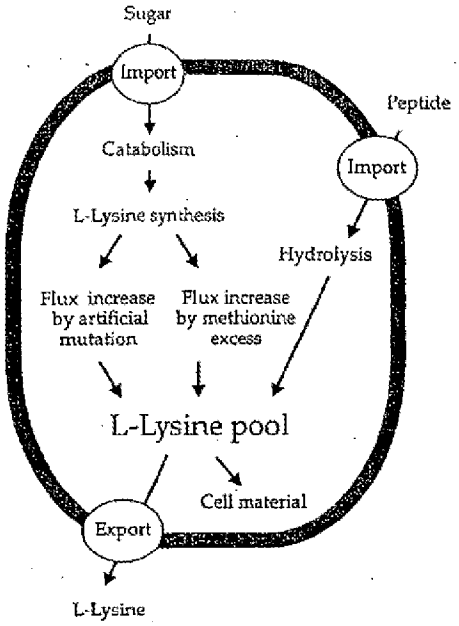
12. Mimitsuka teaches "it should be possible to convert $_{L}$-lysine to cadaverine completely by allowing the reaction to run for several min, but L-lysine in the medium was not converted to cadaverine" (Mimitsuka 2134 (col. 2)).

13. Vrljic teaches "identification of *lysE*, which encodes the translocator specifically exporting $_{L}$-lysine from the cell" (Vrljic 815).

14. Vrljic teaches that a mutant without a lysine exporter is unable to secrete lysine and will accumulate an "extremely high concentration of" "intracellular lysine" (Vrljic 820 (col. 1)).

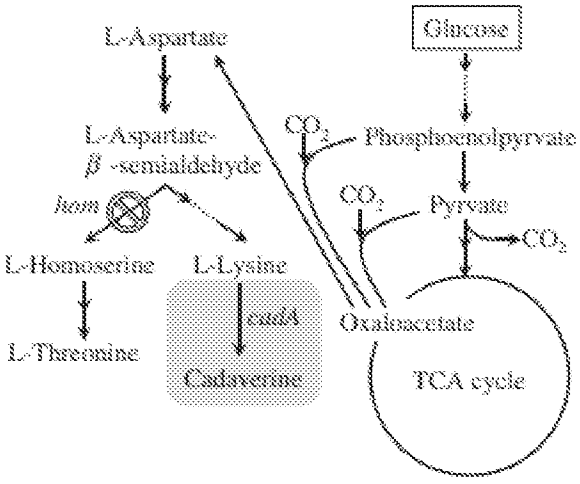
15. Vrljic teaches that *C. glutamicum's* lysine exporter has a sequence of SEQ ID NO: 3 (Vrljic 817, Fig. 2).

16. Figure 8 of Vrljic is reproduced below:



"**Fig. 8**. The physiological function of the L-lysine exporter in *C. glutamicum*. The exporter serves to excrete an excess of L-lysine" (Vrljic 821 (col. 1)).

17. Figure 2 of Mimitsuka is reproduced below:



"**Fig. 2**. Strategy of Cadaverine Fermentation by *C. glutamicum*" showing that intracellular lysine is a precursor for cadaverine synthesis (Mimitsuka 2131 (col. 2)).

Principles of Law

A prima facie case for obviousness requires "a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does" *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

Analysis

We adopt the Examiner's findings of fact and conclusions of law (*see* Ans. 2–8; FF 1–16) and agree that the cited prior art renders the claims obvious. We address Appellants' arguments below.

Appellants contend

> the Examiner finds the required "reasonable expectation of success" only in the production of a modified recombinant *Corynebacterium* but not whether the cadaverine production would have been increased as proposed. Thus, it appears that the alleged "reasonable expectation of success" does not support the motivation suggested by the Examiner to make the

> necessary modification so to arrive at the claimed subject matter.

(App. Br. 8.)

We do not find this argument persuasive for two reasons. First, claim 1 does not include a limitation requiring an increase in the amount of cadaverine production. *See In re Self*, 671 F.2d 1344, 1348 (CCPA 1982) ("[A]ppellant's arguments fail from the outset because . . . they are not based on limitations appearing in the claims.")

However, more importantly, Zelder specifically suggests production of cadaverine in a recombinant *C. glutamicum* (FF 1, 3) and explains that increased cadaverine levels would result from eliminating a pathway in the cell that uses cadaverine as a precursor for acetyl cadaverine (FF 2). Zelder evidences that "cadaverine productivity was improved by disruption of the gene resulting in elimination of acetylcadaverine formation" (FF 4).

Zelder also teaches increasing cadaverine levels by adding an enzymatic pathway that converts lysine to cadaverine, specifically lysine decarboxylase (FF 6–7) and teaches that after inserting the lysine decarboxylase genes "a significant amount of cadaverine was accumulated" (FF 9).

Lastly, Zelder teaches that lysine is a precursor for cadaverine (FF 11) and Mimitsuka teaches conversion of lysine into cadaverine in the cadaverine synthesis pathway (FF 17). Mimitsuka explains that only lysine in the cell, not in the extracellular medium, is useful for cadaverine synthesis (FF 12). Based on this teaching, the Examiner notes that increasing intracellular levels of lysine would have been expected to increase cadaverine production to some degree by the ordinary artisan based on the

cadaverine synthesis pathway (*see* Ans. 35; FF 12, 17). Vrljic teaches that a mutant without a lysine exporter is unable to secrete lysine and will accumulate an "extremely high concentration of" "intracellular lysine" (FF 14, 16).

Thus, the Examiner finds it would have been obvious to modify Zelder's obvious recombinant *C. glutamicum* that has active lysine decarboxylase to produce cadaverine and inactivated acetyltransferase gene to prevent conversion of the cadaverine to acetylcadaverine to further inactivate the lysine exporter gene in order to maximize the intracellular lysine pool and consequent production of cadaverine because "[i]f we could produce cadaverine from the cheapest sugar, and as a renewable resource, it would be an effective solution against global warming" (FF 11).

To the extent that Appellants directly contest the reasonable expectation of success in generating a recombinant *C. glutamicum* that increases cadaverine levels based on the three enzymatic changes, Zelder evidences that adding a lysine decarboxylase gene and inactivating the acetyltransferase gene increase cadaverine levels (FF 4, 9) and Vrljic evidences that inactivating the lysine exporter gene increases levels of the cadaverine precursor lysine (FF 14). These teachings provide evidence that there would have been a reasonable expectation of success in producing a recombinant *C. glutamicum* that increases cadaverine levels. "Obviousness does not require absolute predictability of success . . . *all that is required is a reasonable expectation of success*." *In re Kubin*, 561 F.3d 1351, 1360 (Fed. Cir. 2009).

Appellants contend "experimental data presented in the instant specification actually support a conclusion that the skilled artisan would not

have had a reasonable expectation that the production of cadaverine would have been increased by disrupting an endogenous lysine exporter gene" (App. Br. 9).

We are not persuaded. Appellants acknowledge that "[d]eletion of the lysine exporter (lysE), the strain 'LU14646 delta lysE,' results in a reduced loss of lysine to the growth medium, but results only in the production of additional 3.3 g/l of cadaverine to the final production level of 9.9 g/l of cadaverine" (App. Br. 9). Thus, Appellants' own data shows that the level of cadaverine produced will increase by deleting the lysine exporter.

Whether there would have been expected to be, as Appellants argue, a "maximal capacity of the lysine decarboxylase or by a maximal level of cadaverine which can be tolerated by the producing cell" (App. Br. 9) does not rebut the Examiner's reasonable expectation of some degree of increase in cadaverine levels due to reduced export of lysine (*see* Ans. 36). The Examiner did not find that all the lysine would be used to produce cadaverine, but merely that it would be "reasonable to expect some increase in cadaverine production as a result of an increase in intracellular lysine due to the reduction/elimination of lysine export to the medium" (Ans. 35).

Appellants contend that according to the Examiner's logic, "one . . . would . . . expect an increase in acetyl-cadaverine production" in the strain with higher cadaverine, because the strain "would not only produce the normal level of acetyl-cadaverine, but also use the additional cadaverine produced by the higher supply of intracellular lysine" and that an increase in acetyl-cadaverine did not occur (App. Br. 9–10).

We find this argument unpersuasive because the Examiner "has made no proposition as to how acetylcadaverine synthesis is impacted by deletion

of the endogenous lysine exporter gene because the cell of Zelder et al. already lacks acetylcadaverine synthesis ability due to the deletion of the acetyltransferase gene" (Ans. 36 (emphasis omitted)). That is, there would only have been an expectation of an increase in acetylcadaverine if the acetyltransferase gene was present in the cell (FF 3). However, Zelder teaches that deletion of this gene abolishes acetylcadaverine synthesis (FF 4) and, therefore, the ordinary artisan would not have expected acetylcadaverine synthesis to impact production of cadaverine in a cell containing all three alterations.

Appellants contend

> one skilled in the art would not have been motivated to combine these two mutations (i.e. deletion of cadaverine acetyltransferase and lysine exporter) in one strain because he or she would not have had a reasonable expectation of success that a higher level of cadaverine production could have been achieved.

(App. Br. 10.) Appellants contend "the results shown by the recombinant *Corynebacterium* recited in the present claims are rather unexpected and surprising, which further evidences the nonobviousness nature of the claimed subject matter" (App. Br. 10).

We find these arguments unpersuasive. Zelder teaches that two of the mutations result in increased cadaverine levels (FF 4, 9). Mimitsuka teaches "it should be possible to convert L-lysine to cadaverine" but that lysine exported to the extracellular medium will not be converted (FF 12), so that inactivation of the export would have been expected to result in increased conversion of lysine to cadaverine (FF 16–17). Thus, we agree with the Examiner that there would have been a reasonable expectation of success because "there is absolutely no evidence to show that 10.2 g/L of cadaverine

is near a toxicity threshold level, or that higher concentrations of cadaverine cannot be tolerated by the lysine decarboxylase" (Ans. 37 (emphasis omitted)).

We find the unexpected and surprising results argument unpersuasive because Appellants do not identify any specific teaching in the Specification or other evidence of record that identifies the results as surprising or unexpected. "It is well settled that unexpected results must be established by factual evidence. Mere argument or conclusory statements . . . [do] not suffice." *In re Soni*, 54 F.3d 746, 750 (Fed. Cir. 1995). Nor is there any evidence that the results of the particular strains disclosed in the examples are commensurate in scope with the breadth of claim 1 encompassing any lysine decarboxylase gene and inactivation of any gene 95% identical to SEQ ID NOs: 3 and 11 (*see* claim 1). Unexpected results must 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 contend that

> other than asserting that the motivation to combine the references is the production of more cadaverine, the Examiner has not identified any particular reason that would have prompted the skilled artisan to specifically pick and choose these two mutations, i.e., deletion of cadaverine acetyltransferase and deletion of lysine exporter gene, and combine them in the way the present application does.

(App. Br. 11.) Appellants further contend that "it is clear that the Examiner's finding of obviousness is based on the knowledge gleaned ***only***

from Appellants' disclosure, which constitutes an impermissible hindsight reconstruction of the claimed invention" (App. Br. 11).

We do not find the Appellants' picking and choosing argument persuasive because Zelder specifically teaches to produce cadaverine (FF 1), teaches that disrupting the acetyltransferase gene increased cadaverine production (FF 3–4), and teaches that inserting a lysine decarboxylase gene increased cadaverine production (FF 8–9). Mimitsuka teaches that lysine transport to the medium results in reduced cadaverine production (FF 12) and Vrljic teaches that lysine transport to the medium can be abolished by inactivating the lysine transporter gene (FF 14). Moreover, simply because the prior art "discloses a multitude of effective combinations does not render any particular formulation less obvious." *Merck & Co. v. Biocraft Labs., Inc.*, 874 F.2d 804, 807 (Fed. Cir. 1989). In *Corkill*, an obviousness rejection was affirmed in light of prior art teachings that "hydrated zeolites will work" in detergent formulations, even though "the inventors selected the zeolites of the claims from among 'thousands' of compounds." *In re Corkill*, 771 F.2d 1496, 1500 (Fed. Cir. 1985).

We also find the hindsight argument unpersuasive. While we are fully aware that hindsight bias may plague determinations of obviousness, *Graham v. John Deere Co.*, 383 U.S. 1, 36 (1966), we are also mindful that the Supreme Court has clearly stated that the "combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR*, 550 U.S. at 416.

Here, the Examiner has provided specific reasons based on evidence to combine the three genetic modifications to produce a recombinant *C. glutamicum* that increases cadaverine production levels (*see* Ans. 6). These

reasons include Zelder's specific desire to produce cadaverine (FF 1) and Mimitsuka's teaching that if "we could produce cadaverine from the cheapest sugar, and as a renewable resource, it would be an effective solution against global warming" (FF 11).

Appellants argue that the lysine/cadaverine and lysine exporter have different functions, and it is unclear why upregulating one in Mimitsuka would motivate one of ordinary skill in the art to downregulate another (App. Br. 12). Appellants contend "[i]t is further unclear as to why one skilled person, in view of the art disclosing the upregulation of a lysine/cadaverine antiporter which transports lysine into a cell, would have been motivated to down-regulate a lysine exporter which transports lysine out of the cell" (App. Br. 12). Appellants then argue that it is unclear why a skilled artisan "'would have been highly motivated to ***further reduce the production of acetylcadaverine*** by disrupting the gene encoding a lysine exporter'" (App. Br. 12).

We find these arguments unpersuasive for the reasons discussed at length above. To briefly reiterate, Zelder expressly teaches to inactivate acetylcadaverine synthesis to improve cadaverine production (FF 2–4). Mimitsuka teaches that only lysine in the cell, not in the extracellular medium, is converted to cadaverine (FF 12), thus, suggesting that it is desirable to retain lysine in the cell for cadaverine synthesis. Vrljic teaches that a mutant without a lysine exporter is unable to secrete lysine and will accumulate an "extremely high concentration of" "intracellular lysine" (FF 14). The ordinary artisan would have recognized that higher levels of the

intracellular lysine precursor would allow for higher levels of formation of the product, cadaverine, as desired by Zelder and Mimitsuka (FF 1, 11).

Conclusion of Law

The evidence of record supports the Examiner's conclusion that the combination of Zelder, Mimitsuka, Mimizuka 1, Mimizuka 2, Kikuchi, Meng, Mateos, and Vrljic renders the claims obvious.

C. Nonstatutory Obviousness Type Double Patenting over '608 patent

Appellants do not dispute the rejection of the claims under obviousness-type double patenting over claims 1–3 of U.S. Patent No. 9,745,608 B2 in view of Mimitsuka on the merits (*see* App. Br. 5). We, therefore, summarily affirm the obviousness-type double patenting rejection over U.S. Patent No. 9,745,608 B2. *See* Manual of Patent Examining Procedure § 1205.02 ("If a ground of rejection stated by the examiner is not addressed in the appellant's brief, . . . that ground of rejection" will be summarily sustained by the Board.).

D. and E. Nonstatutory Obviousness Type Double Patenting over '623 patent

U.S. Patent No. 8,741,623 B2 corresponds to Zelder (App. Br. 13). For the reasons given above in the analysis of the obviousness rejection, we find that that the combination of the claims of U.S. Patent No. 8,741,623 B2 in combination with Mimitsuka, Mimizuka 1, Mimizuka 2, Kikuchi, Meng, Mateos, and Vrljic renders claim 1, 2, 5, 8–10, 14–16, 20, 24, and 25 obvious and that the combination of Mimitsuka, Mimizuka 1, Mimizuka 2, Kikuchi, Meng, Mateos, Vrljic, Soksawatmaekhin, and Nakagawa renders claims 12 and 18 obvious.

SUMMARY

In summary, we affirm the obviousness and obviousness-type double patenting rejections.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED