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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BRYAN R. SMITH and ELIVER GHOSN

Appeal 2018-001863
Application 14/020,794[1]
Technology Center 1600

Before ERICA A. FRANKLIN, ELIZABETH A. LAVIER,
and DAVID COTTA, *Administrative Patent Judges*.

LAVIER, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellants seek review of the Examiner's rejections of claims 10, 12, 13, 24, 25, 27–29, 31–34, and 46–57. We have jurisdiction under 35 U.S.C. § 6(b). For the reasons set forth below, we AFFIRM.

BACKGROUND

The Specification relates to using carbon nanotubes to visualize tissues and deliver therapeutic treatment. Spec. ¶ 3. Claim 10 is illustrative, and recites:

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[1] Appellants identify the real party in interest as the Board of Trustees of the Leland Stanford Junior University. Br. 3.

> 10. A method for locating a tumor in a mammalian subject, wherein the mammalian subject comprises a subset of monocytes selected from Ly-6C^{hi} monocytes or CD14^{+} monocytes, and wherein the method comprises:
>
> a) delivering single walled carbon nanotubes (SWNTs), which are conjugated to a detectable label to form conjugated carbon nanotubes, to the mammalian subject;
>
> b) allowing the subset of monocytes to selectively internalize said conjugated carbon nanotubes, thereby producing conjugated carbon nanotubes-carrying monocytes;
>
> c) allowing the tumor to take up the conjugated carbon nanotubes-carrying monocytes; and
>
> d) imaging the conjugated carbon nanotubes-carrying monocytes expressing Ly-6C^{hi} or CD14^{+} and taken up by the tumor, wherein the detectable label enables imaging of the SWNTs by a method selected from the group consisting of: fluorescent intravital microscopy, Raman imaging, photoacoustic imaging, ultrasound imaging, near-infrared imaging, magnetic resonance imaging, radiolabel-based imaging, computed tomography, and X-ray imaging.

Br. 13 (Claims Appendix).

REJECTIONS MAINTAINED ON APPEAL

1. Claims 10, 12, 13, 24, 51, and 53 stand rejected under 35 U.S.C. § 112(a) as failing to comply with the written description requirement. Ans. 4.

2. Claims 10, 12, 13, 24, 51, and 53 stand rejected under 35 U.S.C. § 112(a) as failing to comply with the enablement requirement. Ans. 7.

3. Claims 10, 12, 13, 27–29, 31–34, 46, 48–50, 55, and 57 stand rejected under 35 U.S.C. § 103(a) (pre-AIA) as unpatentable over Bangera.[2] Ans. 13.

4. Claims 24, 25, 47, 51–54, and 56 stand rejected under 35 U.S.C. § 103(a) (pre-AIA) as unpatentable over Bangera, Kutryk,[3] and Swirski.[4] Ans. 22.

DISCUSSION

A. Rejections 1 & 2

The gist of the written description and enablement rejections is the same: that the Specification's disclosure is inadequate "as it relates to which peptides *other* than" (Ans. 4) those containing RGD and RAD can be used with the invention. *See id.* at 6 (written description), 7 (enablement).[5] As the Examiner acknowledges, the rejected independent claims do not require a peptide. *E.g., id.* at 6. Instead, "when it is set forth that a peptide is present (*see* claims 12, 13, 51, and 53, for example), written description is lacking for peptides other than RGD/RAD and RGD/RAD containing peptides." *Id.; see also id.* at 11 (discussing enablement).

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[2] Bangera et al., US 2010/0068808 A1, published Mar. 18, 2010.
[3] Kutryk et al., US 2005/0025752 A1, published Feb. 3, 2005.
[4] Swirski et al., *Ly-6C^{hi} Monocytes Dominate Hypercholesterolemia-Associated Monocytosis and Give Rise to Macrophages in Atheromata*, 117 J. CLIN. INVEST. 195 (2007).
[5] The Specification explains that conjugating RGD peptides to SWNTs causes a marked increase in tumor targeting, in comparison to RAD-SWNTs. Spec. ¶ 29. "RAD peptides serve as a control for RGD peptides." *Id.* ¶ 47.

Nanotube/peptide conjugation is not required for the invention to function. *See* Spec. ¶ 50; Smith Decl. ¶¶ 10–12.[6] Therefore, the rejected claims that do not recite peptides cannot be said to be inadequately described or enabled based on this non-essential element. Moreover, we agree with Appellants that the Specification provides adequate support for peptides other than RGD. *See* Br. 8. The written description and enablement requirements are both considered from the perspective of the ordinarily skilled artisan. From this viewpoint, the Specification's exemplary teachings regarding RGD-conjugated SWNTs (*see* Spec. Examples 1 & 2) are sufficient, as swapping out one peptide for another would have been a matter of routine experimentation. Indeed, as the Examiner acknowledges with respect to the § 103 rejections (Rejections 3 and 4), it was known in the prior art that "[v]arious peptides may be used with the nanostructures for targeting" (Non-Final Action 12 (discussing Bangera ¶¶ 74, 84)[7]).

Accordingly, we do not sustain Rejections 1 and 2.

B. Rejections 3 & 4

In Appellants' view, "the 'tubular nanostructures' of Bangera are not capable of being selectively internalized. This is due to the structure of the tubular nanostructures described in Bangera, which are targeted to a lipid bilayer membrane and form a pore in the lipid bilayer membrane." Br. 9. Accordingly, Appellants argue that Bangera not only fails to teach or suggest the claimed methods, but indeed teaches away from them;

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[6] Declaration of Bryan R. Smith, Ph.D., under 37 C.F.R. § 1.132, dated Nov. 10, 2016.
[7] Non-Final Action dated Jan. 19, 2017.

furthermore, any attempt to modify Bangera to achieve the claimed invention would render Bangera inoperable and change Bangera's principle of operation. *Id.* at 8; *see also id.* at 10–11.

These arguments are not persuasive, because they disregard Bangera's embodiments in which the nanostructures are modified with ligands, especially CD14, which allows for selective targeting of monocytes/macrophages. *See* Ans. 19–20 (citing Bangera ¶ 83[8]). Appellants argue that "the Office Action conflates the concept of selective internalization of the nanotubes by monocytes (which are type of white blood cell) as recited in the independent claims and the targeting of tumor cells as purportedly disclosed in Bangera." Br. 10. But where the monocytes *are* the tumor cells, Bangera's CD14-bearing nanostructures are selectively targeted to $CD14^+$ monocytes. *See* Bangera ¶¶ 83, 167.

Furthermore, while Appellants focus on Bangera's embodiments in which the nanostructure is inserted into the lipid bilayer of the cell membrane (*see* Br. 9 (discussing Bangera Fig. 1C)), Bangera also teaches embodiments in which the tubular nanostructures are selectively directed toward organelles within the cell (such as mitochondria) (*see* Bangera ¶ 151; *see also* Ans. 20–21) or in which the nanostructures are "actively taken up by the cell through the process of endocytosis" (*id.* ¶ 155). Thus, even if we agreed with Appellants that insertion of the nanostructure into the lipid bilayer of the cell membrane does not amount to "internaliz[ation]" for

[8] The Examiner's Answer cites "pages 11–12, bridging paragraph" of Bangera. Ans. 20. For consistency with citations to Bangera elsewhere in this Decision, we cite to the corresponding paragraph number of Bangera.

purposes of claim 10 (*see* Br. 10),[9] the mitochondrial insertion and endocytosis embodiments of Bangera assuredly do. In sum, we agree with the Examiner's assessment:

> Both Bangera et al and Appellant disclose overlapping nanostructure which is conjugated to a detectable label that are used for the same purpose and targets the same population (e.g., CD14 monocytes) . . . . [I]f the compositions are the same, they cannot have mutually exclusive properties. In other words, if the conjugate composition comprises the same components in both Appellant's and Bangera et al's invention both inventions would be capable of being internalized. This logic appears to be consistent with Bangera et al's teaching that the nanostructures are able to cross the cell's membrane to reach the membrane of targeted internal organelle.

Ans. 21–22.

Having considered Appellants' arguments, we are not persuaded of any reversible error by the Examiner in rejecting claim 10. Appellants do not separately argue claims 12, 13, 27–29, 31–34, 46, 48–50, 55, and 57; these fall with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv). Accordingly, we sustain Rejection 3 in its entirety. Appellants' arguments in support of the claims subject to Rejection 4 are not distinct from those made regarding Rejection 3 (*see* Br. 8, 11). We thus sustain Rejection 4 in its entirety for the same reasons.

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[9] For the reasons discussed by the Examiner at page 16 of the Non-Final Action and page 21 of the Answer we agree with the Examiner that insertion of the nanostructure into the lipid bilayer of the cell membrane does amount to "internaliz[ation]."

CONCLUSION

Rejections 1 and 2 are not sustained. Rejections 3 and 4 are sustained.[10] No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

[10] Because a § 103 rejection stands as to each of the appealed claims, our disposition of this appeal is an affirmance, not an affirmance-in-part.