



Empirical assessment of laser safety for photoacoustic-guided liver surgeries: erratum

JIAQI HUANG,¹ ALYCEN WIACEK,²  KELLEY M. KEMPSKI,¹
 THERON PALMER,¹ JESSICA IZZI,³ SARAH BECK,³ AND MUYINATU
 A. LEDIJU BELL^{1,2,4,*} 

¹Department of Biomedical Engineering, Johns Hopkins University, MD 21218, USA

²Department of Electrical and Computer Engineering, Johns Hopkins University, MD 21218, USA

³Department of Molecular and Comparative Pathobiology, Johns Hopkins University, MD 21218, USA

⁴Department of Computer Science, Johns Hopkins University, MD 21218, USA

*mledijubell@jhu.edu

Abstract: This erratum corrects the Monte Carlo simulation results reported in our recently published manuscript [*Biomed. Opt. Express* **12**, 1205 (2021)], which affects the results in Section 3.1. We also correct a summary statement regarding Table 4. These corrections do not alter the main findings of our publication.

© 2021 Optica Publishing Group under the terms of the [Optica Open Access Publishing Agreement](#)

We recently published the results of an empirical methodology to assess laser-related tissue damage applied to liver tissue [1]. In Section 3.1 we report results of Monte Carlo simulations, which were performed with the incorrect optical properties. Specifically, the absorption and scattering values for human skin were reported incorrectly in Table 1, and the units for the absorption and scattering values were input as mm^{-1} rather than cm^{-1} . We provide an updated Table 1 here to reflect the correct values and their respective units. In addition, we clarify here that the optical properties for human skin are from the dermis, and the scattering coefficient was calculated from the reported reduced scattering at 750 nm in Ref. [2] based on the following equation:

$$\mu_s = \frac{\mu'_s}{1 - g} \quad (1)$$

where μ_s and μ'_s are the scattering and reduced scattering coefficients, respectively, and g is the anisotropy, which was assumed to be 0.8 following Ref. [2]. The output of these simulations was an image that displayed the normalized fluence in units of $\log_{10}(\text{cm}^{-2})$. The mean and standard deviation of this normalized fluence was quantified within a tissue depth up to 0.2 cm within a 2D slice parallel to the light propagation direction to assess relative fluence differences across tissue types. With the correct simulation parameters, Fig. 2 in [1] should be updated as shown in Fig. 1.

Table 1. Optical properties modeled with Monte Carlo simulations

	Absorption (mm^{-1})	Scattering (mm^{-1})	Anisotropy	Reference
Human Skin (dermis)	0.14	12.3	0.8	[2]
Human Liver	0.5	6.5	0.78	[3]
Swine Liver	0.1	7	0.9	[4]

While reviewing these changes, we noticed that the number of swine reported in Table 4 with minimal to mild inflammation was miscounted in the text. Therefore, Section 3.4 should state, "Swine 2 and 3 experienced... minimal to mild inflammation on 4 [not 6] out of 12 laser application sites as indicated in Table 4."

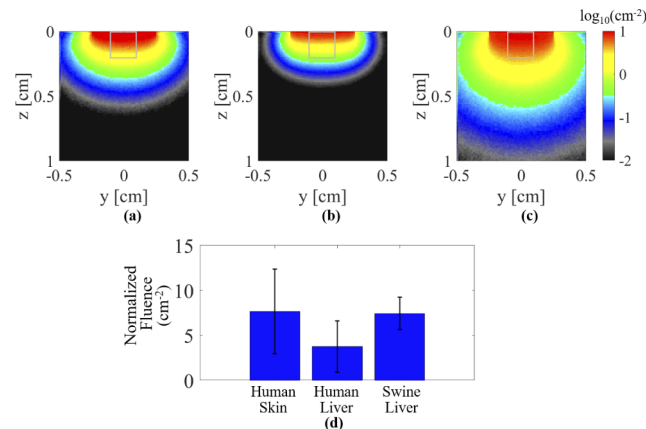


Fig. 1. (Replacement for Fig. 2 in original manuscript [1]) Simulated fluence profiles for (a) human skin tissue, (b) human liver tissue, (c) swine liver tissue in log compressed units of cm^{-2} . (d) Mean \pm one standard deviation of normalized fluence measured within the regions of interest outlined on each simulated profile result.

These corrections do not alter the details reported in the abstract, discussion, and conclusion sections of [1], and they do not affect the main findings of our manuscript.

Funding. Alfred P. Sloan Foundation; National Science Foundation (ECCS-175152); National Institutes of Health (T32GM007057-44).

References

1. J. Huang, A. Wiacek, K. M. Kempinski, T. Palmer, J. Izzì, S. Beck, and M. A. L. Bell, "Empirical assessment of laser safety for photoacoustic-guided liver surgeries," *Biomed. Opt. Express* **12**(3), 1205–1216 (2021).
2. E. V. Salomatina, B. Jiang, J. Novak, and A. N. Yaroslavsky, "Optical properties of normal and cancerous human skin in the visible and near-infrared spectral range," *J. Biomed. Opt.* **11**(6), 064026 (2006).
3. I. Carneiro, S. Carvalho, R. Henrique, L. Oliveira, and V. V. Tuchin, "Measuring optical properties of human liver between 400 and 1000 nm," *Quantum Electron.* **49**(1), 13–19 (2019).
4. J.-P. Ritz, A. Roggan, C. Isbert, G. Müller, H. J. Buhr, and C.-T. Germer, "Optical properties of native and coagulated porcine liver tissue between 400 and 2400 nm," *Lasers Surg. Med.* **29**(3), 205–212 (2001).