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Need for improved contrast dyes to prevent life-threating consequences using non-human biological substances

Abstract

Despite the advancement of clinical techniques to detect lesions in different organs of the human body, yet considerable life-threatening risks are involved in the exogenous introduction of contrast dyes into blood circulation. This occurrence is more common in less developed countries where the clinicians and hospitals are ill-prepared to undertake the procedures or tackle emergency situations arising from the clinical conditions of the admitted patients.

Keywords: angiogram, CT-scan, radioactive IV, MRI, tomography, GVHD

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Introduction

Development of improved contrast dyes[1–4] is of paramount importance and urgent need but seemingly grossly neglected either due to insufficient innovation or the lackadaisical attitude of making a "quick buck" by the medical industry to not invest at a rapid pace in the manufacture of next generation dyes, but bent upon efforts to market the existing materials.[5,6]

A most common dangerous consequence of the emergency diagnostic procedures undertaken is organ damage particularly leading to kidney failure, if not immediately but eventually due to steady deterioration of the otherwise "normal" condition of the organ. Organ such as of kidney failure naturally prompts the intervention through dialysis with an expectation, if affordable and/or eventual availability of a matching donor, should the affected patient survive the ongoing ordeal until the transplant. Needless to state here is that the transplanted organ could be fraught with deleterious effects such as face a rejection by the recipient, or onset of graft-versus-host disease (GVHD). Reagent induced cardiac stress test is another example of the risk involved in the IV injection of a radioactive contrast dye for echocardiogram. Stroke (intracranial hemorrhage) is yet another dangerous side effect of the contrast dyes should their circulation in the brain adversely affect the blood flow particularly if it leads to formation of a blood clot, or sensitize that clot, or any benign or hitherto undetected tissue growth.[7]

Biological substances for contrast dyes

Why not use the biologically occurring fluorescence reagents such as the covalent peridinin-chlorophyll *a*-protein (PerCP), or the non-covalent lumazine/protein (LumP) for further development of safer contrast dyes than the existing ones?[8–10] *In vivo* antibody generation to these non-human biological substances will not cause any transient systemic complications due to autoimmunity. But then lumazine is a riboflavin precursor and hence does not fall under the category of substances foreign to humans.[11,12] Peridinin which is a carotenoid can actually be a potential functional antioxidant during the transient nature of the invasive procedure.[13,14] Both peridinin and chlorophyll-*a*, protect each other due to any detection-laser induced excited states, are may be even free radicals, quenching mediated by peridinin[14] using the human systemic biological substances. As a result, chlorophyll *a* is expected to be intact *in vivo* during the invasive procedures, since the carotenoid, peridinin, can play the dual role of being a coincidentally present antioxidant as well as a protector of its neighboring/adjacent transiently co-introduced component, chlorophyll-*a*.[12–14]

Certainly their sensitivity of detection can be improved through the replacement of necessary detection parts/components such as the lasers equipped with relevant filters, within the currently used medical instruments. The pros and cons of these non-human biological substances outweigh the development of metabolic disorders generated by the currently used synthetic contrast dyes. While the biological nature of the algae/plant or bacterial derived substances are favorable for their digestive nature, the quantity of the protein components could be small but rapidly metabolized during the detection procedures. However a saline mixed reagent IV flow into the blood circulation would off-set their metabolic degradation during the detection procedure and can thus maintain a steady-state level of these fluorescence detection reagents within the human body. Such replenishment of these biological substances for lesion detection sets-off a desirable race to prevent their loss due to their metabolic degradation. Development of procedure induced life-threatening complications to the patients could be greatly reduced with the exception of human (physician) errors if efforts are made to undertake further advancement of the lesion detection technologies in this suggested direction. Such an emitting light detection *in vivo* has been previously reported.[15]

Conclusion

Safer and undesirable life-threatening side effects could be achieved upon development of newer generation contrast dyes for intravenous injection procedures.

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Conflict of interest

The author declares no conflict of interest.

References

1. Lauenstein TC, Semelka RC. Emerging techniques: Whole-body screening and staging with MRI. *J Magn Reson Imaging*. 2006;24(3):489–498.
2. Brant-Zawadzki MN. The role of computed tomography in screening for cancer. *Eur Radiol*. 2005;15(4):52–54.
3. Ahmadinia K, Smucker JB, Nash CL, et al. Radiation exposure has increased in trauma patients over time. *J Trauma Acute Care Surg*. 2012;72(2):410–415.
4. Huber-Wagner S, Lefering R, Qvick LM, et al. Effect of whole-body CT during trauma resuscitation on survival: A retrospective, multicentre study. *Lancet*. 2009;373(9673):1455–1461.
5. Berlin L. Potential legal ramifications of whole-body CT screening: taking a peek into Pandora's box. *AJR Am J Roentgenol*. 2003;180(2):317–322.
6. *Whole-body scans more marketing than science, say Medical Physicists*. USA: American Institute of Physics; 2006.
7. Macdougall NJ, McVerry F, Baird S, et al. Iodinated contrast media and cerebral hemorrhage after intravenous thrombolysis. *Stroke*. 2011;42(8):2170–2174.
8. Banhart J. Advanced Tomographic Methods in Materials Research and Engineering. *Monographs on the Physics and Chemistry of Materials*. New York, USA: Oxford University Press; 2008.
9. Floyd J, Geipel P, Kempf AM. Computed tomography of chemiluminescence (CTC): instantaneous 3D measurements and Phantom studies of a turbulent opposed jet flame. *Combustion and Flame*. 2011;158(2):376–391.
10. Koka PS. Biomarker discovery and biotherapeutics applications of photosynthetic light-harvesting and bioluminescence light-emitting chromophore-protein complexes in stem cell biology and regenerative medicine. *J Stem Cells*. 2014;9(3):127–133.
11. Harvey RA, Plaut GW. Riboflavin Synthetase from Yeast properties of complexes of the enzyme with lumazine derivatives and riboflavin. *J Biol Chem*. 1996;241(9):2120–2136.
12. Koka P, Lee J. Separation and structure of the prosthetic group of the blue fluorescence protein from the bioluminescent bacterium *Photobacterium phosphoreum*. *Proc Natl Acad Sci U S A*. 1979;76(7):3068–3072.
13. Koka P, Song PS. The chromophore topography and binding environment of peridinin-chlorophyll *a*-protein from marine dinoflagellate algae. *Biochimica et Biophysica Acta (BBA)- Protein Structure*. 1977;495(2):220–231.
14. Koka P, Song PS. Protection of chlorophyll *a* by carotenoid from photodynamic decomposition. *Photochemistry and Photobiology*. 1978;28(4-5):509–514.
15. Zhang Q, Yu YA, Wang E, et al. Eradication of solid human breast tumors in nude mice with an intravenously injected light-emitting oncolytic vaccinia virus. *Cancer Res*. 2007;67(20):10038–10046.

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