Hypoxia in prostate cancer

Peter Vaupel

Department of Radiation Oncology and Radiotherapy, Tumor Pathophysiology Group, University Medical Center, Mainz 55131, Germany.

Correspondence to: Prof. Dr. med. Peter Vaupel, Department of Radiation Oncology and Radiotherapy, Tumor Pathophysiology Group, University Medical Center, Langenbeckstrasse 1, Mainz 55131, Germany. E-mail: vaupel@uni-mainz.de

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Dear Editor,

I have read with great interest the review “Current challenges and opportunities in treating hypoxic prostate tumors” by McKenna et al.[1]. In this review, the authors present, as a key information in Table 1 of their article, values of oxygen partial pressures (pO2) in human tumors and the respective normal tissues, published earlier by our group[2,3] and “adapted” by McKeown[4] later.

In Table 1 of their review, McKenna et al.[1] present oxygen partial pressure (pO2) values together with oxygen concentration (cO2) data. When reviewing the biological role of hypoxia in malignant tumors, authors lacking an expertise in respiratory physiology often convert - without any need - the in vivo pO2 values, originally measured in tumors (and in normal tissues) using pO2 histography[2,3], into O2 concentrations using either Dalton’s law (only valid for gas mixtures within the airways) or Henry’s law for gases dissolved in solutions, which cannot describe the relationship between partial pressures and concentrations of gases in heterogeneous media (e.g., tissues with lipid-rich membranes, the cytosol and the extracellular space, the latter with a high content of free water in cancers). Therefore, it is strongly suggested to avoid any conversion of measured pO2 values into cO2 data since the O2 solubility coefficient is: (1) highly dependent on the tissue water content; and (2) usually not known for heterogeneous cancer tissues in patients. In this context, it has
to be mentioned that authors not familiar with respiratory physiology often use “local O₂ concentrations” by mistake, although pO₂ values have been measured in the original studies (for typical examples see Table 1 in the review by McKenna et al. [1]).

Considering Henry’s law ($cO₂ = \alpha \times pO₂$; $\alpha$: oxygen solubility coefficient), McKenna et al. [1] have communicated questionable oxygenation data grounded on wrong/doubtful O₂ solubility values for malignant and normal tissues, which originally have been communicated for blood plasma, i.e., irrelevant data when heterogeneous tissues such as prostate cancer are considered [8].

Oxygen solubility coefficients for heterogeneous tissues (e.g., for experimental tumors [10]) are significantly lower than those for blood or blood plasma [10]. Due to this misconception, the O₂ concentration data of Table 1 in the review by McKenna et al. [1] are misleading/not correct and should, therefore, be removed from the table. There is no need to present concentration data in this comprehensive review.

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Conflicts of interest

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Patient consent

Not applicable.

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Not applicable.

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REFERENCES