Data in Brief 18 (2018) 176–179

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Data on a simple method for producing a solution that contains a high partial pressure of oxygen and a low partial pressure of carbon dioxide

Yoshihiro Tange *, Shigenori Yoshitake

Department of Medical Engineering, Kyushu University of Health and Welfare, Japan

ARTICLE INFO

Article history:
Received 2 February 2018
Accepted 27 February 2018
Available online 8 March 2018

ABSTRACT

The data presented here shows a simple method for producing a solution that contains a high partial pressure of oxygen (pO_2) and a low partial pressure of carbon dioxide (pCO_2). This novel solution was created by simply injecting oxygen gas into conventional supplemental bicarbonate fluid for renal replacement therapy. We compared the gas profiles of the novel solution and the conventional fluid in vitro. There was a significant increase in pO_2 and pH, and a significant decrease in pCO_2 in the experimental solution, in each of which an additional volume of oxygen was injected. The method shown here is capable of facilitating an increase of pO_2 and decrease of pCO_2 by using a closed fluid bag without any special devices.

Specifications Table

Subject area	*Medicine*
More specific subject area	*Biotechnology*
Type of data	*Table, figure*

* Corresponding author.
E-mail address: tan@phoenix.ac.jp (Y. Tange).

https://doi.org/10.1016/j.dib.2018.02.079

How data was acquired	*Gas profiles measured by EG6+ cartridge (Abbott Japan Co., Ltd, Osaka, Japan) with an i-STAT system (300F, Abbott, Japan)*
Data format	*Analysed data*
Experimental factors	*Simply injected oxygen gas into supplemental fluid bag.*
Experimental features	*Samples were prepared by injecting oxygen gas via a syringe into conventional bicarbonate supplemental fluid (sublood BSG, Fuso, Osaka, Japan). The volumes of oxygen injected into the fluid were zero for the control solution, and 500, 1000, and 1400 mL into 2020 mL of the supplemental fluid for the experimental solution.*
Data source location	*Nobeoka City, Miyazaki, Japan*
Data accessibility	*All data are included in this document.*

Value of the data

- A solution with high pO_2 and low pCO_2 was obtained using a simple method.
- This method only requires oxygen gas.
- This method did not require any special devices, unlike those previously reported.

1. Data

Intravenous fluid with a high partial pressure of oxygen (pO_2) was shown to improve hypoxia in several animal models [1–3]. Further studies demonstrated that fluids containing high amounts of dissolved oxygen achieved supersaturated oxygen levels in the bloodstream, but special devices were needed to create these fluids [4,5]. If such fluids were simpler to create, they could be used easily at the bedside. The data presented here shows a simple method for producing a solution that contains a high pO_2 and a low pCO_2, using the supplemental fluid.

2. Experimental design, materials and methods

2.1. Materials

Samples were prepared using a conventional bicarbonate supplemental fluid (sublood BSG, Fuso, Osaka, Japan); the air was removed using a syringe (Nipro, Osaka, Japan). The composition of supplemental fluid is shown in Table 1.

2.2. Methods

The samples were injected with oxygen gas via a syringe connected to an oxygen piping line. The volumes of oxygen injected into the fluid were zero for the control solution, and 500, 1000, and 1400 mL into 2020 mL of supplemental fluid for the experimental solution. To determine the gas

Table 1
Detail components in the supplemental fluid.

Bags	Components
A solution	$NaCl$, KCl, $NaHCO_3$
B solution	$NaCl$, KCl, $CaCl_2{\cdot}2H_2O$, $MgCl_2{\cdot}6H_2O$, CH_3COONa, $C_6H_{12}O_6$

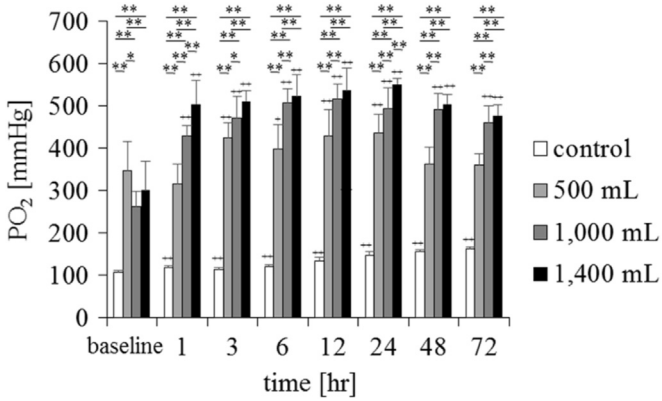

Fig. 1. Changes in pO_2 in the conventional supplemental fluid and a supersaturated oxygen solution ($n = 6$, mean $\pm$ standard deviation). The control was a conventional supplemental solution, and the experimental solution was created by injecting 500, 1000, and 1400 mL of oxygen into 2020 mL of the supplemental solution. $^{**}P < 0.01$, $^{*}P < 0.05$, comparison between groups; $++P < 0.01$, $+P < 0.05$ vs baseline. There was a significant increase in pO_2 in the control group after 1 h vs at the baseline. In the experimental groups, there was a significant increase in pO_2 until 72 h after the injection of 500 mL, 1000 mL, and 1400 mL of oxygen. The time course of the experimental and control solutions was compared using repeated-measures analysis of variance, and the groups were compared with Bonferroni correction, as appropriate.

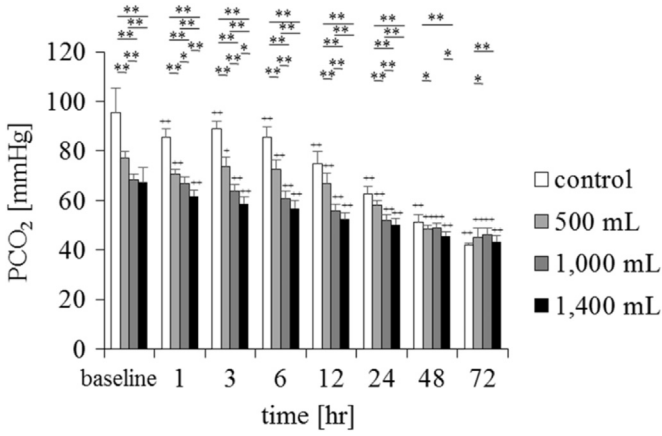

Fig. 2. Changes in pCO_2 in the conventional supplemental fluid and a supersaturated oxygen solution ($n = 6$, mean $\pm$ standard deviation). The control was a conventional supplemental solution, and the experimental solution was created by injecting 500, 1000, and 1400 mL of oxygen into 2020 mL of supplemental solution. $^{**}P < 0.01$, $^{*}P < 0.05$, comparison between groups; $++P < 0.01$, $+P < 0.05$ vs baseline. There was a significant decrease in pCO_2 after 1 h when compared to the baseline value. The time course of the experimental and control solutions was compared using repeated-measures analysis of variance, and the groups were compared with Bonferroni correction, as appropriate.

profile in the supplemental fluid, we sampled the fluid in bags containing dissolved oxygen after shaking them for one minute. We determined the pO_2, pCO_2, and pH values using an EG6+ cartridge (Abbott Japan Co., Ltd, Osaka, Japan) with an i-STAT system (300F, Abbott, Japan). Samples were analysed immediately after the injection of oxygen for obtaining the baseline data, and for up to 72 h subsequently ($n = 6$). The room temperature was set at 24 $\pm$ 0.5 °C. Figs. 1–3 show the changes in the gas profiles of the solutions. The values for the supplemental fluid immediately after the injection of 500, 1000, and 1400 mL of oxygen were set as the baseline values.

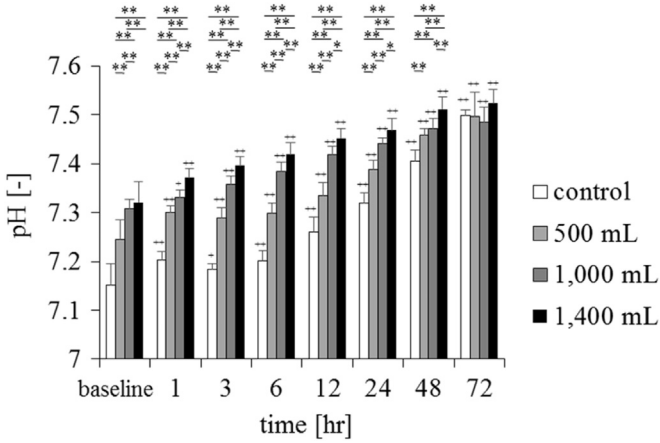

Fig. 3. Changes in pH in the conventional supplemental fluid and a supersaturated oxygen solution ($n = 6$, mean $\pm$ standard deviation). The control was a conventional supplemental solution, and the experimental solution was created by injecting 500, 1000, and 1400 mL of oxygen into 2020 mL of supplemental solution. $^{**}P < 0.01$, $^{*}P < 0.05$, comparisons between groups; $+P < 0.05$, $++P < 0.01$ vs baseline. There was a significant increase in pH after 1 h when compared to the baseline value, which was constant until 48 h in all the oxygen-injected groups. The time course of the experimental and control solutions was compared using repeated-measures analysis of variance, and the groups were compared with Bonferroni correction, as appropriate.

Acknowledgements

The authors are thankful to the laboratory students of the Department of Medical Engineering, Kyushu University of Health and Welfare.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Transparency document. Supplementary material

Transparency document associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2018.02.079.

References

[1] L. Wang, C. Liu, H. Zhang, C. Gao, W. Chai, R. Xu, H.X. Wang, L. Xu, Intravenous administration of hyperoxygenated solution attenuates pulmonary edema formation in phosgene-induced acute lung injury in rabbits, J. Surg. Res. 164 (2010) 131–138.
[2] C. Gao, X. Sun, G. Zhang, H. Zhang, H. Zhao, Y. Yang, L. Han, L. Xu, W. Chai, Hyperoxygenated solution preconditioning attenuates lung injury induced by intestinal ischemia reperfusion in rabbits, J. Surg. Res. 146 (2008) 24–31.
[3] C. Gao, G. Zhang, X. Sun, H. Zhang, J. Kuai, H. Zhao, L. Yao, D. Yu, Y. Yang, L. Xu, W. Chai, The effects of intravenous hyperoxygenated solution infusion on systemic oxygenation and intrapulmonary shunt during one-lung ventilation in pigs, J. Surg. Res. 159 (2010) 653–659.
[4] N. Matsuki, T. Ishikawa, S. Ichiba, N. Shiba, Y. Ujike, T. Yamaguchi, Oxygen supersaturated fluid using fine micro/nano-bubbles, Int. J. Nanomed. 9 (2014) 4495–4505.
[5] Y. Tange, H. Migita, S. Yoshitake, Y. Isakozawa, S. Takesawa, T. Imamiya, T. Yoshida, Dialysate with high partial pressure of oxygen enhances oxygenation in blood during simulated circulation of hemodialysis, Adv. Biomed. Eng. 1 (2012) 43–46.