



# The interference effect of gold nanoparticle with blood erythropoietin level

Sora Yasri<sup>1\*</sup>, Viroj Wiwanitkit<sup>2</sup>

## Abstract

**Introduction:** Erythropoietin is an important renal hormone that plays an important role in renal endocrine regulation. The erythropoietin is essential for the management of anemia in renal failure case. Additionally, monitoring of blood erythropoietin level is a routine practice in diagnosis and follow-up of management in patients with anemia.

**Objectives:** Similar to any laboratory investigation, an important consideration in erythropoietin measurement is the laboratory interference in analytical process.

**Patients and Methods:** In this study, the authors perform an experimental study to assess the effect of gold nanoparticle on the blood erythropoietin level.

**Results:** Results showed significant interference. In the present day, the new nano-substances are widely used including new drugs.

**Conclusion:** The interference of nanoparticle becomes an interesting issue that the practitioner should recognize and aware during application of blood erythropoietin level. The gold nanoparticle can alter the blood erythropoietin level in laboratory investigation. This should be an important consideration in the present day that there are many newly available nanosubstances.

**Keywords:** Erythropoietin, Laboratory, Gold nanoparticle, Interference

**Citation:** Yasri S, Wiwanitkit V. The interference effect of gold nanoparticle with blood erythropoietin level. J Renal Endocrinol. 2019;5:e09.

**Copyright** © 2019 The Author(s); Published by Nickan Research Institute. This is an open-access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

## Introduction

An important function of the kidney is endocrine activity. The kidney can produce an important hormone namely erythropoietin (1). Erythropoietin plays an important role in hematopoiesis process. The abnormal erythropoietin production might result in the anemia. The dysfunction on production of erythropoietin will result in anemia in patients with advanced renal disease (1,2).

The management of anemia in patients with kidney impairment is an important issue in the clinical management of the patients. Erythropoietin therapy is an important treatment in the management of renal failure (3,4). The investigation of blood erythropoietin might be useful in monitoring of patients under this treatment (5).

In fact, blood erythropoietin is an important clinical chemistry parameter that is clinically used for diagnosis and follow-up management of patients with anemia (5). In addition to the patients with renal problems, the investigation of blood erythropoietin can be useful for the patients with other diseases that induce ineffective erythropoiesis such as thalassemia (6). An important concern on investigation of the blood erythropoietin level

is the accuracy of the laboratory investigation. Similar to any other laboratory parameters, the quality control of the laboratory analysis is needed. The assessment for the interference from other substances is an important process in laboratory medicine. The effect of any substance on erythropoietin should be recognized.

## Objectives

In this study, we sought to perform a laboratory experimental study to assess the effect of nanosubstance on the measurement of blood erythropoietin level.

## Patients and Methods

### Study design

This is a laboratory experimental study. The study is performed in a certified clinical laboratory. Overall 100 blood samples were used in the experimental study. For each sample, the blood sample was divided into two parts. The first part was directly analyzed for blood erythropoietin level. The second part was added with 1 droplet (1 µL) of gold nanoparticle solution before further analyzed for blood erythropoietin level by chemiluminescence method

### ■ Implication for health policy/practice/research/medical education

The problem of laboratory inference is an important issue in the measurement of blood erythropoietin level. The gold nanoparticle can alter the blood erythropoietin level in laboratory investigation.

(normal value 5-30 mU/mL). All analyses were performed by the same automated clinical chemistry analyzer at the same time and place under the routine quality control process.

### Ethical issues

The research followed the tenets of the Declaration of Helsinki.

### Statistical analysis

The results from analysis of all blood samples in the two groups were compared by descriptive statistical analysis. Data was entered to SPSS software version 24. Accordingly, *P* value less than 0.05 was considered significant.

### Results

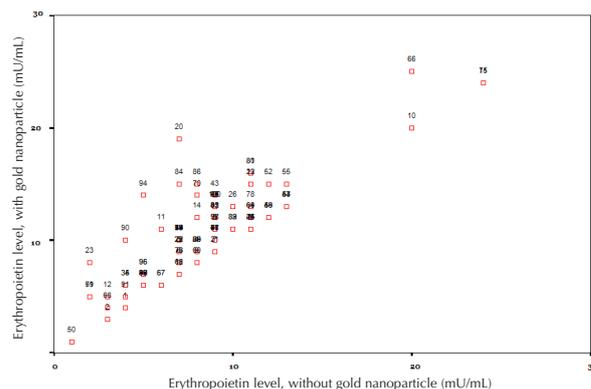
According to the experiment, the average blood erythropoietin levels in the groups with and without gold nanoparticle solution adding are equal to  $8.3 \pm 3.9$  mU/mL and  $10.5 \pm 4.2$  mU/mL, respectively (Figure 1). There is a significant difference in blood erythropoietin level between the two groups ( $P < 0.05$ ).

### Discussion

In the present day, the nanotechnology becomes the new useful technology and can also be applied in medicine. In clinical nephrology, the role of nanosubstance in the clinical management of the patients can be seen (7). An interesting consideration on the newly available nanosubstance is its effect on clinical management of the patients. In the present study, the authors investigate the effect of gold nanoparticle on laboratory investigation on blood erythropoietin.

Of interest, the gold nanoparticle can significantly alter the blood erythropoietin level. This means the presence of significant interference. As noted by Cheon and Ozene (8) the available assay methods had problems to measure erythropoietin level. The interference is an important problem that should be mentioned. The assessment for possible interference is required in any clinical laboratory.

Indeed, the interference of nanoparticle on the clinical chemistry investigation is an important concern at present due to the widespread use of many new nanosubstances including nano drugs. In a recent report, the significant interference of nanoparticle on lipid profile investigation was been reported (9). The similar problem is also observed for the investigation of erythropoietin level, while the problem of laboratory inference is an important



issue in measurement of blood erythropoietin level.

### Conclusion

The gold nanoparticle can alter the blood erythropoietin level in laboratory investigation. This should be an important consideration in the present day that there are many newly available nanosubstances.

### Authors' contribution

SY and VW wrote the manuscript equally.

### Conflicts of interest

The authors declared no competing interests.

### Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

### Funding/Support

None

### References

1. Jelkmann W. Regulation of erythropoietin production. *J Physiol*. 2011; 589:1251-8.
2. Sato Y, Yanagita M. Renal anemia: from incurable to curable. *Am J Physiol Renal Physiol*. 2013; 305:F1239-48.
3. Zadrazil J, Horak P. Pathophysiology of anemia in chronic kidney diseases: A review. *Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub*. 2015; 159:197-202.
4. Debeljak N, Sytkowski AJ. Erythropoietin and erythropoiesis stimulating agents. *Drug Test Anal*. 2012;4:805-12
5. Urabe A. Erythropoietin determination in clinical medicine. *Rinsho Byori*. 1993; 41:361-5.
6. Paritpokee N, Wiwanitkit V, Bhokaisawan N, Boonchalermvichian C, Preechakas P. Serum erythropoietin levels in pediatric patients with beta-thalassemia/hemoglobin E. *Clin Lab*. 2002; 48:631-4.
7. Panchapakesan U, Sumual S, Pollock C. Nanomedicines in the treatment of anemia in renal disease: focus on CERA (Continuous Erythropoietin Receptor Activator). *Int J Nanomedicine*. 2007;2:33-8
8. Cheon K, Ozene N. Effect of gold nanoparticle on blood lipid profile test. *Adv Lab Med Int*. 2018; 8:43-46.
9. Lindstedt G, Lundberg PA. Are current methods of measurement of erythropoietin (EPO) in human plasma or serum adequate for the diagnosis of polycythaemia vera and the assessment of EPO deficiency? *Scand J Clin Lab Invest*. 1998; 58:441-58.