**Original Research Article** **Biochemistry**

International Journal of Life science and Pharma Research

**ISSN 2250-0480**

# INVESTIGATING THE EFFECT OF CURCUMIN SUPPLEMENT CONSUMPTION ON SYSTEMATIC INFLAMMATION IN HEMODIALYSIS PATIENTS

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## ABSTRACT

Patients with Chronic Renal Failure (CRF) are exposed to extremely high risk for cardiovascular disease compared with others, so that at the initial stages of CRF, the incidence of cardiovascular diseases is higher than the progress of the disease toward the last stage of failure. Therefore, the present study aimed to investigate the effect of curcumin on serum lipid profile and systematic inflammation in hemodialysis patients. In this study, clinical practice was performed on 64 hemodialysis patients in Mashhad's hospitals. Sampling in this study was based on random assignment method in the form of permuted block randomization. After gathering information, they were coded and transferred to the computer and after ensuring the accuracy of data, they were analyzed by SPSS 16 and chi-square test, fisher test, t-test, and Kolmogorov-Smirnov test. According to the analyses, the results of hypotheses testing showed that curcumin supplement consumption does not decrease the concentration of triglyceride, cholesterol, LDL of hemodialysis patients, and CRP. Also, the results of this study showed that curcumin supplement only has a slight effect on decreased cholesterol concentration, LDL of serum, and CRP in hemodialysis patients.

**KEYWORDS**: *curcumin, systematic inflammation, hemodialysis*

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**Received on: 18-08-2017**
**Revised and Accepted on: 17-08-2018**
**DOI: http://dx.doi.org/10.22376/ijpbs/lpr.2018.8.4.L39-47**

# INTRODUCTION

Chronic Renal Failure (CRF) can be observed in 10-13% of the population among which only a small part progress toward End-Stage Renal Failure (ESRF) and requires dialysis of transplant.[1,2] Evidences have shown that patients with CRF, are exposed to extremely high risk for cardiovascular disease compared with others, so that at the initial stages of chronic renal failure, the incidence of cardiovascular diseases is higher than the progress of the disease toward ESRF.[3] In patients with CRF, the incidence of cardiovascular diseases and mortalities resulted from these diseases are significantly higher than population and age.[4] High risk of cardiovascular and mortalities resulted from cardiovascular are recognized very well at the initial stages of CRF; indeed, the complications of cardiovascular diseases are the major mortality reason in patients with ESRD.[5] Therefore, about 50% of mortalities in hemodialysis patients are due to these diseases and frequency of cardiovascular diseases in these patients is 3-45 times more than those of the whole society.[6,7] In hemodialysis patients, high concentration of inflammatory factors, hyperlipidemia, and oxidative stress constitute three important risks to cause cardiovascular diseases. Various studies have shown that inflammation exists in 30 to 50% and hyperlipidemia exists in 50 to 70% of these patients.[8-10] Prevalent treatment for high level of blood lipids is the use of statins group. Studies have shown that statins have preventive effects on hemodialysis patients, but these drugs have complications such as headache, constipation, abdominal pain, and memory impairment.[11] Over the years, various studies were conducted to find therapeutic methods to decrease the concentration of inflammatory factors and oxidative stress in hemodialysis patients. However, no valid treatment was found in this context. Nowadays, the use of supplements to treat diseases has gain a particular position. One of these supplements is curcumin that is active ingredient of turmeric plant that has considerable antioxidant characteristics.[12] Evidences show that curcumin has the ability to inhibit the proliferation of inflammatory cells, invasion of these cells, and angiogenesis with different mechanisms.[13] Curcumin is a safe and non-toxic substance that shows its effects through decreasing the proliferation of inflammatory factors, cytokines, kinases, and enzymes that cause inflammation. [13] Also, this substance decreases free radicals, inhibits peroxidation of lipids, and increases activity of superoxide dismutase.[14] Since most of patients who under hemodialysis finally die due to hemodialysis and cardiovascular complications. This study aimed to investigate the effect of curcumin consumption on serum lipid profile and systematic inflammation in hemodialysis patients.

# MATERIALS AND METHODS

The present study has resulted from MA thesis in nursing education and special care trend with ethics code number of IR.MEDSAB.REC.1395.123 we appreciate cooperation rendered by authorities, professors, and all personnel and patients in Mantasaieh Hospital in Mashhad who helped us in this study. This clinical practice study was conducted on 64 hemodialysis patients in hospitals in Mashhad. Inclusion criteria included interest to participate in the study, informed consent, history in dialysis for six months, age range between 25 and 75, BMI between 18.5 and 30, absence of infectious diseases especially hepatitis, lack of consumption of nonsteroidal anti-inflammatory drugs, acetonitrile, estrogen, progesterone, and curcumin supplement at least one month before the start of the study, no addiction, lack of acute heart disease, liver failure, thyroid, severe digestive diseases, stomach ulcers, gallstones, pregnancy, or breastfeeding. Exclusion criteria included high blood pressure during the study, lack of interest for cooperation, death, kidney transplant, increased dose of anti-fat medicines, and change in lifestyle of diet, consuming herbal remedies for lipid lowering, and lack of consumption of 9 pills during two months of intervention. According to the statistics consultant and similar studies, mean and standard deviation of triglyceride in intervention group and control group were 141.74±52.02 and 197.05±96.98 with confidence of 95%, test power of 80%, and sample size of 32. After obtaining informed consent, those who had inclusion criteria were selected by the sampling method and this procedure continued until the required level was resulted. Data collection instruments in this study consisted of personal and clinical characteristics form, laboratory questionnaire, and interview. In this study, hemodialysis patients in Imam Reza Hospital in Mashhad who had begun hemodialysis for more than 6 months and had inclusion criteria were invited to participate in the study and in this regard, topic, goals, and safety of curcumin consumption were explained. Then, informed written consent was obtained .At the beginning of the study, 5 ml blood was taken from subjects (to investigate blood lipid profiles and inflammatory

factors) before connecting to hemodialysis device. After dialysis, height and weight of patients were measured. Patients were randomly assigned into intervention group and control group. Sampling was done as non-probability and purpose-based. Then, permutation blocks were used to randomly assign subjects in two groups of Sina Corkumin Capsule Consumers and Placebo Capsules Consumers. Sampling in this study was based on permuted block randomization, so that a sample was prepared from output of software R for this purpose and it was used to obtain samples. First, since two medical methods are available, each block included 4 different letters (ABCD)It was decided to assign two letters to a certain treatment method randomly. Then, blocks were randomly selected. All patients who had inclusion criteria were placed in one of these modes: Letters "A" and "B" for curcumin group and letters "C" and "D" for control or placebo group. In this study, patients received curcumin supplement for 8 weeks,1 time per a day with the dose of 80 ml after breakfast. At the time of the study, bottles containing curcumin of placebo were coded as A and B to observe lack of awareness regarding the type of supplementreceived by each group. Also, blood samples were given to a person in laboratory who did not know anything about patients in research groups. Also, all patients were asked not to consider any change in their diet and physical activity during the study and report any change in drugs they use. At the end of the study, 5 ml blood samples were taken from the patients after 12-14 hours fasting and after dialysis.Their height and weight were measured. The Status of the patients were taken into consideration to control them in terms of supplement consumption and prevention of exclusions almost every 7 days through meeting the patients in hemodialysis unit and those patients who did not use more than 15% of supplements (9 pills) were excluded from the study. This case was studied by providing pills consumption table for each day and signings it by patients after eating each pill.

***Validity and Reliability of Instruments***

CRP was measured by ELSIA method using kits made by Monobind Company and serum profile lipid with Pars kits and they were valid and reliable. After collecting information, the forms were coded and transferred to the computer and after ensuring the accuracy, they were analyzed by SPSS 16 and parametric and non-parametric tests at the significance level pf $P \leq 0.05$.

***Research Findings***

***Normality of Data***

The normality of data in this study has been shown in Table (1).

**Table 1**

***Investigating the normality of research variable***

| | Variable | Kolmogorov-smirnov | P-value |
|---|---|---|---|
| CRP | before intervention | 0.41 | <0.005 |
| | after intervention | 0.35 | <0.005 |

Patients' average weight before intervention was 66.69±14.52 kg in experimental group and 71.63±13.11kg in control group where after intervention, these levels changed to 65.16±72.24 kg in experimental group and 70±17.33kg in control group. Average weight of hemodialysis patients before and after intervention is shown in Table (2).

**Table 2**

***Average weight of hemodialysis patients before and after intervention***

| The weight of group | Before intervention | | After intervention | | t | p-value |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | |
| Experimental group | 66.69 | 14.52 | 65.72 | 19.24 | -1.22 | 0.22 |
| Control group | 71.63 | 13.11 | 70 | 17.33 | | |

According to the data, comparing average weights in both groups before and after intervention showed that there is no significant difference between groups in terms of weight (t- -1.22) (P- 0.22). Average weight of hemodialysis patients before and after intervention is shown in Fig.1.

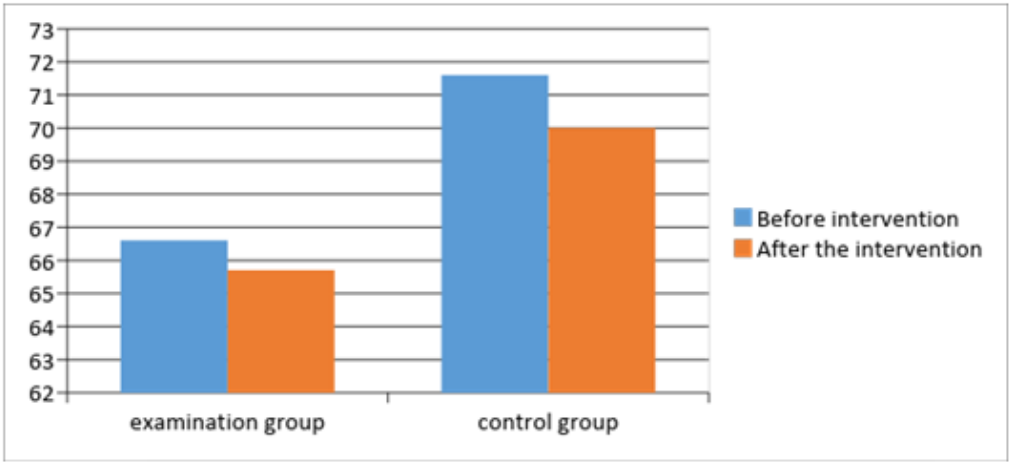


**Figure 1**
***Weight average of hemodialysis patients before and after intervention***

Other findings of this study showed that average BMI in dialysis patients was estimated as 24.44±5.08. Average BMI of participants in this study is presented in Table (3). Comparing average BMI of research groups before and after intervention showed no significant difference between research groups in terms of BMI (r- -0.39) (P- 0.69).

**Table 3**
***Average BMI of hemodialysis patients before and after intervention***

| BMI | Before intervention | After intervention | t |
|---|---|---|---|
| Group | Mean | Mean | |
| Experimental group | 23.15+5.74 | 24.28+6.5 | -0.39 |
| Control group | 25.68+4.06 | 25.13+5.7 | |

***P>0.01***

Average BMI of hemodialysis patients before and after intervention is shown in Fig.2.

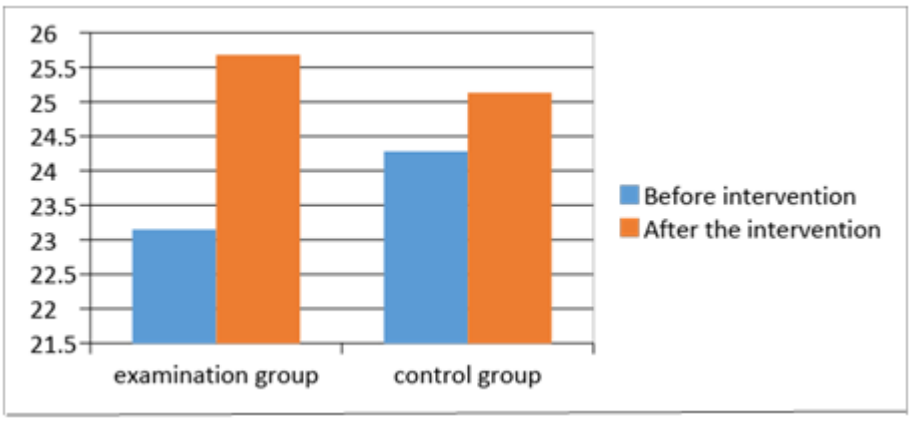


**Figure 2**
***Average BMI of hemodialysis patients before and after intervention***

Before intervention, average concentration of albumin in experimental group was 4.1±21.25 and in control group it was 3.79±0.3. Also, average concentration of albumin after intervention in control group was 4.4±12.04 and in control group was 3.81±0.31. Average albumin concentration in research groups before and after intervention showed no significant difference between them (Z- -0.81) (P- 0.41).

**Table 4**
***Average albumin concentration of hemodialysis patients before and after intervention***

| Albumin Group | Before intervention | | After intervention | | Wilcoxon | p-value |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | |
| Experimental group | 4.21 | 1.25 | 4.12 | 1.04 | -0.81 | 0.41 |
| Control group | 3.79 | 0.302 | 3.81 | 0.31 | | |

Average albumin concentration of hemodialysis patients before and after intervention is shown in diagram 16-4.

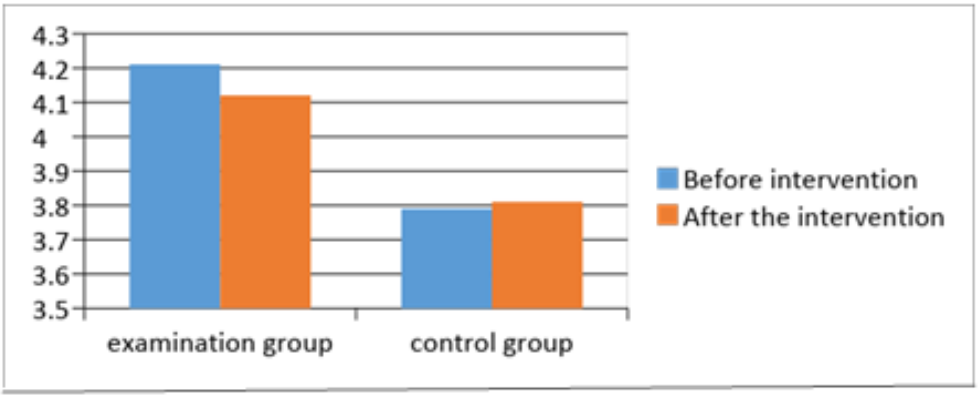


**Figure 3**
***Average albumin concentration in hemodialysis patients before and after intervention***

Average Blood Urea Nitrogen (BUN) before intervention in experimental group was 126.12±44.36 and in control group it was 122.09±26.42. Also, average albumin concentration after intervention in experimental group was 130.51±74.61 and in control group it was 126.06±23.68. Average BUN concentration in hemodialysis patients before and after intervention is shown in Table (5).

**Table 5**
***Average BUN concentration in hemodialysis patients before and after intervention***

| Urea nitrogen Group | Before intervention | | After intervention | | t | p-value |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | |
| Experimental group | 126.12 | 44.36 | 130.74 | 51.61 | -1.41 | 0.16 |
| Control group | 122.09 | 26.42 | 126.06 | 23.68 | | |

According to tables shown above, comparing the mean of BUN concentration before and after intervention in both groups showed that no significant difference exists between them (t- -1.41) (P- 0.16). Average BUN in hemodialysis patients before and after intervention is shown in Fig.4.

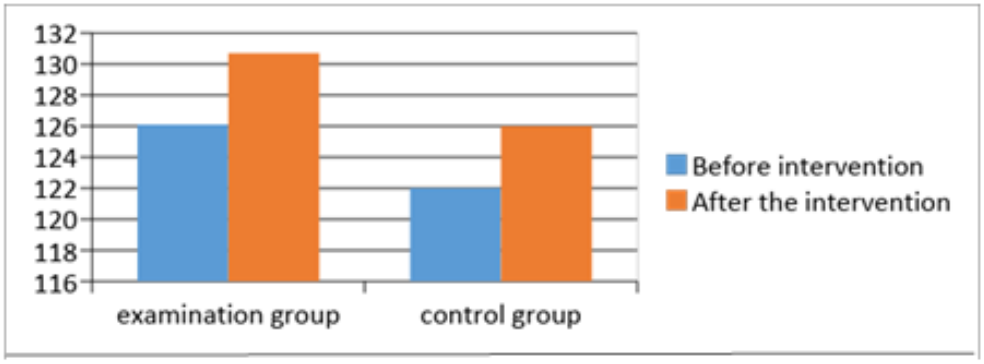


**Figure 4**
***Average BUN in hemodialysis patients before and after intervention.***

Average creatinine concentration before intervention in experimental group was 8.79±2.49 and in control group it was 9.3±2.3. Also, average creatinine after intervention in experimental group was 8.2±63.48 and in control group it was 9.48±2.46. Average creatinine concentration in hemodialysis patients before and after intervention is shown in Table 6.

**Table 6**
***Average creatinine concentration in hemodialysis patients before intervention***

| Creatinine Group | Before intervention | | After intervention | | t | p-value |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | |
| Experimental group | 8.79 | 2.49 | 8.63 | 2.48 | -0.054 | 0.95 |
| Control group | 9.3 | 2.3 | 9.48 | 2.46 | | |

According to the table given above, average creatinine before and after intervention in both groups showed no significant difference (t- -0.054) (P- 0.95). Average creatinine concentration in hemodialysis patients before and after intervention is shown in Fig.5.

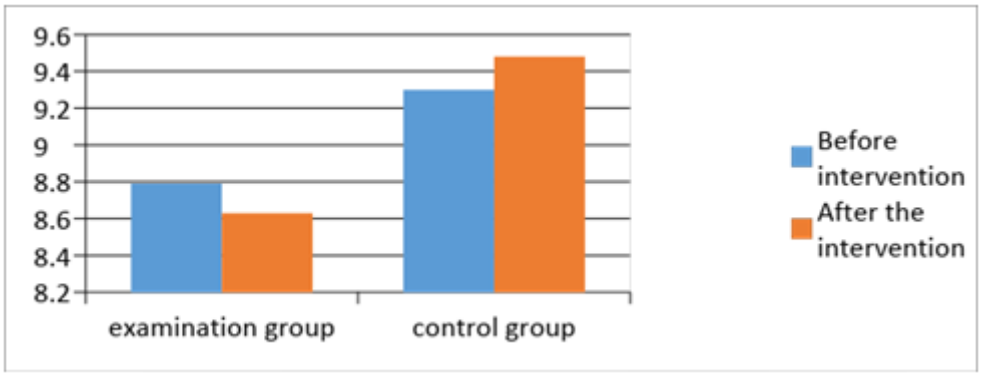


**Figure 5**
***Average creatinine concentration in hemodialysis patients before and after intervention***

Other results of the study showed that the average concentration of Fasting Blood Sugar (FBS) before intervention in experimental group was 93.5±32.71 and in control group it was 99±22.27. Also, Average FBS after intervention in experimental group was 89.31±94.56 and in control group it was 88.45±24.89. Average FBS concentration in hemodialysis patients before and after intervention is shown in Table (6). Comparing average FBS concentrations before and after intervention in research groups showed no significant difference (Z- -2.45) (P- 0.014). According to the findings of this study, average rank of FBS before intervention was higher than its level after intervention; therefore, it level has decreased after intervention.

**Table 7**
***Average FBS concentration in hemodialysis patients before and after intervention***

| FBS Group | Before intervention | | After intervention | | Wilcoxon | p-value |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | |
| Experimental group | 93.5 | 32.71 | 89.94 | 31.56 | -2.45* | 0.014 |
| Control group | 99 | 29.27 | 88.45 | 24.89 | | |

***P<0.05***

Average FBS concentration in hemodialysis patients before and after intervention is shown in Table (6).

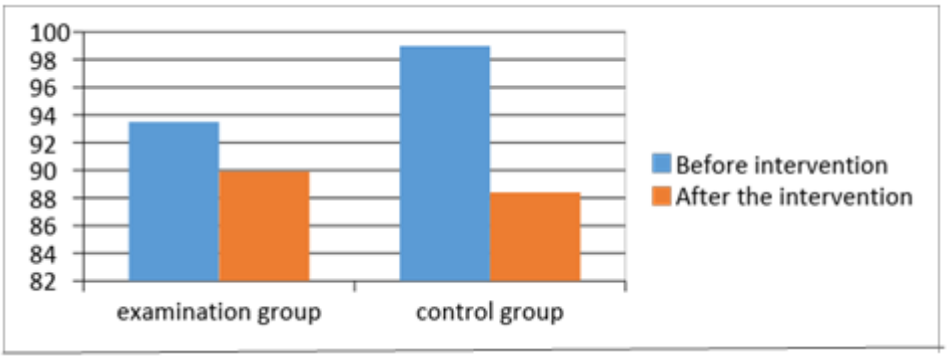


**Figure 6**
***Average FBS concentration in hemodialysis patients before and after intervention***

***Determining the concentration of hs-CRP at the beginning and end of the study in both groups***
Investigating hs-CRP concentration at the beginning of the study showed that hs-CRP concentration average in experimental group was 22.06±36.95 and its domain ranged between 3 and 12. Also, average concentration in control group was 84.25±38.2 and its domain ranged between 2 and 110. Investigating hs-CRP concentration at the end of the study showed that its average in experimental group was 18.75±26.76 with its domain ranging between 2 and 110. Also, average hs-CRP concentration in control group was 18±23.64 and its domain ranged between 2 and 110. Average hs-CRP concentration in hemodialysis patients before and after intervention in shown in Table (8).

**Table 8**
***Average hs-CRP concentration in hemodialysis patients before and after intervention***

| CRP | Before intervention | | After intervention | | Wilcoxon | p-value |
|---|---|---|---|---|---|---|
| Group | Mean | SD | Average | SD | | |
| Experimental group | 22.06 | 36.95 | 18.75 | 26.76 | -1.51 | 0.13 |
| Control group | 16 | 38.02 | 18 | 23.64 | | |

Comparing the mean of hs-CRP before and after intervention in both groups showed no significant difference between them (Z- -1.151) (P- 0.13).

***Minor findings of the study***
Before intervention, average albumin concentration in experimental group was 4.21±1.25 and in control group it was 3.79±0.3. Also, average albumen concentration after intervention in experimental group was 4.12±1.04 and in control group it was 3.81±0.31. Average BUN before intervention in experimental group was 126.12±44.36 and in control group it was 122.09±26.42. Also, average albumen concentration after intervention in experimental group was 130.74±51.61 and in control group it was 126.06±23.68. Average BUN concentration before intervention in experimental group was 126.12±44.36 and in control group it was 122.09±26.42. Also, average albumen concentration after intervention in experimental group was 130.74±51.61 and in control group it was 126.06±23.68. Average creatinine concentration before intervention in experimental group was 8.79±2.49 and in control group it was 9.3±2.3. Also, average creatinine concentration after intervention in experimental group was 8.63±2.48 and in control group it was 9.48±2.46. Other results of the study showed that average concentration of FBS before intervention in experimental group was 93.5±32.71 and in control group it was 99±29.27. Also, average FBS after intervention was 89.94±31.56 and in control group it was 88.45±24.89.

## CONCLUSION

According to the findings of this study, these results were obtained. The research hypothesis "curcumin supplement decreases CRP concentration in hemodialysis patients" is rejected. At the end, it should be mentioned that curcumin supplement slightly decreased CRP, but this level was not significant. Therefore, the results of this study showed that curcumin supplement alone had a slight effect on decreased CRP in hemodialysis patients. Since CRF is among chronic diseases that

has increased in recent years and its incidence in the United States has increased by 10 times in the last 20 years and its annual growth in Iran is 11% and it causes high expenses for the society followed by physical and mental problems, studies on this context to improve the status of patients are necessary. In recent years, numerous studies have been conducted to find treatment methods to decrease the concentration of inflammatory factors and oxidative stress in hemodialysis patients, but no valid method is created in this context. According to the special place of supplements in treatments and absence of the effect of curcumin supplement in this study, it is hoped that more studies on this context as well as the use of other treatments beside curcumin lead to more valid methods to improve the status of CRF patients.

## ACKNOWLEDGEMENT

The authors also appreciate the Deputy of Research, Medical University of Sabzevar.

## CONFLICT OF INTEREST

Conflict of interest declared none.

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