

The effect of antibacterial agents on plasma vitamin C levels

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Summary

Previous report on the estimation of plasma ascorbic acid levels in patients with chronic osteomyelitis indicated that the plasma ascorbic acid level is reduced in patients on antibiotics. The plasma study of the effects of anti-bacterial agents on plasma ascorbic acid *in vitro*, was carried out to substantiate the hypothesis that these agents lower plasma ascorbic acid levels. Increasing amounts of each of seven anti-bacterial agents: ampicillin, chloramphenicol, cefotaxime, gentamycin, benzyl and procaine penicillin combination (seclopen), co-trimoxazole, and streptomycin significantly ($P < 0.01$, $r = -0.9587$) reduced plasma vitamin C levels *in vitro*. There was moderate but insignificant reduction in plasma vitamin C levels with clindamycin ($r = -0.799$). The reduction of the plasma vitamin C levels observed in the presence of the eighth anti-bacterial agent, clindamycin, lacked significance ($r = -0.799$). The cause of this reduction of plasma vitamin C levels by anti-bacterial agents *in vitro* is not yet understood. A supplement of vitamin C may be required in patients on anti-bacterial agents.

Résumé

Auparavant les travaux de ce centre sur l'estimation du niveau de l'acide plasma ascorbique sur les malades avec osteomyelitis chronique malades sur l'antibiotique[8]. Ce papier qui est un follow-up est sur les effets des agents anti-bacterie dans l'acid plasma ascorbique dans le vitro, porte deliors pour confirmer l'hypothese que ces agents bousse le niveau d'acide plasma ascorbique. Augmentation du montant de chaque `un de sept agents anti-bacterie: ampicilline, chloramphenicole, cefotaxime, gentamycine, seclopen, co-trimoxazole et streptomycine significativement ($P < 0.01$) co-efficient de régression $r = -0.9587$

reduct le niveau du plasma vitamin C dans le vitro. La réduction du niveau de plasma vitamine C observe en presence du huitieme agent anti-bacterie, clindamycin, manque la signification ($r = -0.799$). La raison de cette reduction du niveau de plasma vitamine C par les agents antibacterie dans le vitro n'est pas encore compris. Un supplement de vitamine C est donc recommandée pour les malades sur les agents d'anti-bacterie.

Introduction

Vitamin C and certain antibiotics are now well known factors in the wound healing process[1,2]. The biosynthesis of collagen, osteoid and substances for intercellular cement is known to require vitamin C which acts as one of the co-factors for the enzymic post-translational hydroxylation of lysine, proline and aromatic acids at the ribosomal level[3,4,5]. Some antibiotics such as streptomycin and chloramphenicol also produce their effect at the ribosomal level[6,7]. The observation that orthopaedic patients on antibiotics had significantly lower plasma vitamin C levels than the control subjects[8] prompted us to study the effect of increasing concentration of different anti-bacterial agents on plasma vitamin C *in vitro*.

Method

10ml of blood were collected by venepuncture from each of 10 normal male volunteers in the age range 21 to 28 years between 8 and 10 a.m. at the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria. The blood was put in a lithium heparinized tube and plasma separated after centrifugation.

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Table 1: Mean plasma vitamin C concentration in mg/100ml

Antibacterial Agent	A	B	C	D	E	r	P
	0 mg	2 mg	5 mg	10 mg	12 mg		
1. Ampicillin	0.652 ±0.355	0.642 ±0.352	0.583 ±0.333	0.528 ±0.232	0.453 ±0.263	- 0.978	< 0.01
2. Chloramphenicol	0.876 ±0.287	0.814 ±0.277	0.719 ±0.27	0.616 ±0.243	0.523 ±0.236	- 0.994	< 0.01
3. Cefotaxime	01.51 ±0.576	1.40 ±0.459	1.22 ±0.461	0.97 ±0.375	0.66 ±0.247	- 0.981	< 0.01
4. Clindamycin	0.494 ±0.439	0.418 ±0.339	0.401 ±0.328	0.268 ±0.363	0.372 ±0.381	- 0.799	< 0.05 N.S.
5. Gentamycin	0.683 ±0.399	0.593 ±0.399	0.433 ±0.326	0.331 ±0.26	0.226 ±0.28	- 0.986	< 0.01
6. Seclophen	0.665 ±0.144	0.652 ±0.136	0.565 ±0.198	0.403 ±0.164	0.366 ±0.181	- 0.992	< 0.01
7. Co-Trimoxazole	0.665 ±0.167	0.603 ±0.183	0.453 ±0.176	0.402 ±0.175	0.277 ±0.208	- 0.971	< 0.01
8. Streptomycin	0.634 ±0.207	0.502 ±0.158	0.382 ±0.177	0.293 ±0.196	0.16 ±0.164	- 0.977	< 0.01

* Each value is a mean of 10 observations

N S = not significant

r = coefficient of regression

p = level of significance

The co-efficient of regression (r) for clindamycin was -0.799 which was not significant in this study. All the other anti-bacterial agents had significant (P < 0.01) coefficient of regression in their respective interaction with plasma vitamin C.

Discussion

The results show that increasing amount of chloramphenicol, seclophen[®], gentamycin, co-trimoxazole, streptomycin and ampicillin respectively decrease plasma vitamin C concentration *in vitro*. Although clindamycin also appears to reduce vitamin C levels, the co-efficient of regression (r) did not attain an acceptable level of significance (1%). Vitamin C depletion in white blood cells has been reported in patients on tetracycline[11]. Although the functions of vitamin C at the physiological level[12] and molecular level[5] are now well known, the

mechanism by which antibiotics lower or reduce vitamin C concentration is not understood. The effect is certainly not based on similarity of structure or mode of action[13]. The very low absorbance of the anti-bacterial blank indicate that the anti-bacterial agent did not interfere with the chemical reaction between vitamin C and the dinitrophenylhydrazine reagent as was suggested by Alabi *et al*[8].

This study has shown that seven out of eight anti-bacterials significantly lowered vitamin C levels *in vitro*. Although the cause of this reduction of ascorbate in the presence of anti-bacterial is not understood, we suggest that vitamin C supplement may be required in patients on antibiotic therapy.

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