RED WINE POLYPHENOLS ACT AS ANTIMUTAGENS IN EXPERIMENTAL GENOTOXICITY

M.V. Bukatin, N.A. Kolobrodova, O.Yu. Kuznetsova

Federal State Budgetary Educational Institution of Higher Education
«Volgograd State Medical University» of the Ministry of Healthcare of the Russian Federation
Russia, Volgograd, pl. Pavshikh Bortsov, 1, 400131
State Budgetary Institution «Volgograd Medical Science Center»
Russia, Volgograd, pl. Pavshikh Bortsov, 1, 400131

Introduction

Pharmaceuticals with antimutagenic activity are promising agents for combined therapy of pathologies based on increased level of spontaneous genomic instability or induced one. However, their extensive use against environmental and industrial mutagens in healthy individuals is limited. [1]. Thus, a search for new sources of antimutagens is needed. We have encountered lots of data for grapes and red wine polyphenols such as procyanidins, antocyans, quercetin, resveratrol and others having protective genomic properties. [2, 3]. At the same time, the mechanisms underlying these positive effects are described poorly.

The aim of our work was to estimate the role of red wine polyphenols in correction of induced genomic instability in mouse bone marrow cells and in *Salmonella typhimurium* cells.

Material and methods

Antimutagenic effects of red wine in conditions of chromosomal instability induced by dioxidine (300 mg/kg, i.p.) were investigated by the routine cytogenetic method in mouse bone marrow cells.

Outbred mice (20-22 g, 8-10 weeks, N = 70) were used.

Bacterial reverse mutation test (Ames test) with histidine-requiring strain TA100 of *Salmonella typhimurium* and sodium azide (5 μg/dish) was carried out to detect possible point mutations.

Results and discussion

The results obtained from the cytogenetic examination are summarized in Table 1.

Table 1

Effects of red wine on chromosomal aberration types in mouse bone marrow cells (M±m)

Version of experiment	Number of cells	Single-dose introduction			
		Aberrations per 100 cells			
		Total	Single fragments	Paired fragments	Exchanges
Control	700	3,00±0,01	2,66±0,70	0±0	0,33±0,30
Dioxidine 300 mg/kg	700	19,00± 0,08	17,60±1,1	1,40±0,02	0±0
Red wine 3,6 ml/kg + dioxidine 300 mg/kg	700	14,66±1,90	5,33±0,30	2,66±0,50	6,66±0,20
Red wine 36 ml/kg + dioxidine 300 mg/kg	700	28,33±2,60	13,33±0,90	7,0±0,30	8,00±1,10
Version of experiment	**Number of cells**	**5-day-dose introduction**			
		Aberrations per 100 cells			
		Total	Single fragments	Paired fragments	Exchanges
Control	700	3,00±0,01	2,66±0,70	0±0	0,33±0,30
Dioxidine 300 mg/kg	700	18,33±1,30	11,00±1,20	5,00±0	2,33±0,70
Red wine 3,6 ml/kg + dioxidine 300 mg/kg	700	19,00±1,20	9,33±0,60	6,66±0,90	3,00±0,60

Red wine 36 ml/kg + dioxidine 300 mg/kg	700	14,20±0,70	5,20±0,70	4,20±0,80	4,80±1,20

As it follows from the quantitative data, red wine had a tendency to decrease chromosome aberrations. It was most evident for the repeat-dose introduction of 36 ml/kg.

Ames test showed results presented in Table 2.

Table 2

Effects of red wine on revertant colonies of *S. typhimurium* strain TA100 in vitro

Version of experiment	Geometric mean	Standard deviation	Increase in number of revertants over positive control
Spontaneous revertant	136,45	1,08	-
Sodium azide 5 μg/dish (positive control)	351,92	1,54	-
Red wine 0,1 μl/dish + sodium azide 5 μg/dish	355,49	1,21	0,99
Red wine 1 μl/dish + sodium azide 5 μg/dish	384,55	1,28	0,92
Red wine 10 μl/dish + sodium azide 5 μg/dish	196,11	1,33	1,79
Red wine 100 μl/dish + sodium azide 5 μg/dish	156,63	1,03	2,25
Red wine 1000 μl/dish + sodium azide 5 μg/dish	128,14	1,08	2,75

Thus, red wine provided significant effect against sodium azide-induced mutagenesis at the doses 0,1 and 1 μl/dish.

Conclusions

In our experiments, red wine showed dose-dependent protective action against genomic instability at the gene level of organization of genetic material. The properties of the used bacterial strain and the known mechanism of specific genotoxicity of sodium azide based on intracellular increase of reactive oxygen species allow to assume that antimutagenic effect of red wine is possibly due to antioxidant action of polyphenols.

Abstract

The role of red wine polyphenols in correction of induced genomic instability in mouse bone marrow cells and in *Salmonella typhimurium* cells was examined. Dose-dependent protective action against genomic instability at the gene level of organization of genetic material was revealed. This effect was probably caused by antioxidant action of polyphenols.

Keywords

Polyphenols, red wine, genomic instability, antimutagens

References

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