SOME PROPERTIES OF CELLULAR YEAST EXTRACTS

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Among the many representatives of the yeast-like fungi there are species which are pathogenic or conditionally pathogenic for man. However, the factors causing the pathogenicity of these organisms up until now remain little-known.

In the present work the properties of cell extracts (juices) from 5 species of asporogenic yeasts of the Candida genus and, for comparison, extracts from the cells of nutritive yeasts (Saccharomyces cerevisiae)were studied.

EXPERIMENTAL METHOD

The extracts were obtained by repeated freezing of yeast cells with subsequent pulverization until they were thawed. Then they were examined in the presence of coagulase, protease, hemolysin and toxins. Moreover, the diluted cellular juice was added in series to the appropriate substrate (plasma, erythrocyte suspension, gelatin solution) and after determination of the exposure time subsequent dilution of the extract showing an effect was made.

Chemical analysis of the biologically active fractions was carried out according to previously described methods [1].

EXPERIMENTAL RESULTS

In Table 1 are presented the results of a study of the activity of the extracts isolated from different organisms. All of them possessed the ability to coagulate plasma and caused hyperemia when injected in the skin of rabbits. Cellular juice from strains of Candida pseudotropicalis did not show hemolytic activity and in conformity with strains of Candida krusei the juice did not cause proteolysis. The activity of the extracts varied depending on the culture species; however, no regularity was noted between the pathogenicity of a culture and the activity of the cell extract. Injection of the latter into white mice in amounts of 0.4-0.5 ml caused instantaneous death of the animals. In addition, a dependence of the toxicity of the extract on the pathogenicity of the culture was not observed.

TABLE 1. Biological Activity of Yeast Extracts

Culture	No. of strains	Reaction titer			Dermonecrotic test (size of site in mm)
		coagulation of plasma	proteolysis	hemolysis	
Candida albicans	10	4,8	32,3	4,6	17×18
" tropicalis	10	1,7	25,6	4,8	17×17
" pseudotropicalis	10	4,8	0,9	0	14×14
" krusei	7	1,7	0	5,7	15×15
" guilliermondii	10	2,1	0,8	7,2	16×16
Saccharomyces cerevisiae	4	4,0	12,0	12,0	15×14

Note. The value of the titer is given as the denominator of the dilution of extract giving an effect (average data). For example, for the first row 1:4.8; 1:32.3 and 1:4.6.

TABLE 2. Chemical Properties of Extract Fractions from C. albicans Cells

Fraction	Reducing sugar	Total nitrogen	Phosphorus	Chromatographic analysis of fraction hydrolysates	
	in %			no. amino acids	monosaccharides
Plasmocoagulase	28,0	1,2	10,6	2	Mannose, Glucose
Protease	40,5	0,85	3,1	2	Mannose, Glucose, Ribose
Toxin	4,0	0,7	3,2	6	Traces of galactose

Heating at 56° for 30 min completely deprived the cell juice of hemolytic activity and weakened its proteolytic capacity. In the presence of immune and normal sera both of these properties did not appear. The toxic substance showed thermostability. Its joint injection with immune serum somewhat decreased the toxicity of the extract. Dialysis in distilled water for 18 h at 5° decreased the activity of the cell juice an average of 75%.

Plasmocoagulase, protease, hemolysin and toxin from Candida albicans were obtained separately using the method of fractional precipitation. The activity of the fractions obtained were as follows: for plasmocoagulase —0.25 mg/ml, for protease—0.2 mg/ml, minimum lethal dose of toxin for white mice was 125 mg/kg.

The results of a chemical analysis of the fractions are presented in Table 2.

The insignificant amount of nitrogen in the plasmocoagulase and protease along with the large amount of reducing sugars and phosphorus attracts attention. On the basis of this data at the present time it is not possible to link the effect of the preparations obtained with their chemical components; however, the biologically active fractions of the yeasts described here are of interest as aggressive factors able under certain conditions to resist the action of the defense mechanisms of the macroorganism.

SUMMARY

Biological activity of extracts produced from the cells of 5 Candida species and Saccharomyces cerevisiae was studied. It was found that the extracts obtained from all experimental microorganisms were capable of coagulating plasma and caused the death of white mice when injected intravenously. Extracts from some microorganisms had proteolytic and hemolytic activity.

LITERATURE CITED

1. N. P. Elinov and G. A. Vitovskaya, Biokhimiya, No. 2 (1963), p. 312.