

Effect of Natto Extract (NKCP) on Human Blood

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<Introduction>

Natto, a traditional food in Japan, is said to have an effect on the rheology of human blood after oral ingestion. We extracted a substance with a molecular weight of 34,134 (NKCP) from *Bacillus subtilis natto* culture and reported the effect of NKCP on human blood coagulation/ fibrinolysis parameters at the last year meeting of this society.

In this study, the effect of NKCP on human blood was evaluated using an oscillating viscometer and compared with those of representative drugs.

<Method>

Venous blood was collected using a syringe with a 21-G needle from healthy volunteers who gave their written informed consent (20-24 year old, nonsmokers, males). To blood immediately after collection was added 30 μ l of an NKCP physiological saline solution, followed by mixing by inverting the collection tube. The mixture was set in an oscillating viscometer. This viscometer determines blood viscosity at a shear rate of 400-500/s by vibrating the end of a titanium cylindrical detector at 500 Hz, allowing real-time determination of changes in blood viscosity from immediately after collection to coagulation. The NKCP solution was set at final concentrations of 0.05, 0.25, and 0.5 mg/ml. The control was physiological saline. Blood samples from 4-5 subjects were determined at each concentration, including the control.

<Results>

The haematocrit in 18 subjects was almost consistent, and the mean value was $45.0 \pm 1.8\%$. After a plateau phase of about 180 seconds, blood viscosity increased with the progression of coagulation in both control and 0.05 mg/ml NKCP treatment groups. However, coagulation was delayed and blood viscosity decreased in the 0.25 and 0.5 mg/ml NKCP treatment groups.

These results were similar to those for antithrombin agents, heparinoids, and protease inhibitors among many drugs of various kinds previously studied, suggesting the inhibition of coagulation enzymes.

<Discussion>

Even if an unknown substance is measured using an oscillating viscometer, the obtained pattern of changes in viscosity predicts the effect on blood coagulation and fibrinolysis. The results of this study showed that the effect of NKCP at 0.5 mg/ml is comparable to that of heparin at 0.25-0.5 IU/ml, argatroban at 5.0×10^{-4} - 9.5×10^{-4} M, or nafanostat mesilate at 5.0×10^{-6} - 1.0×10^{-5} M. NKCP may be useful in the prevention and treatment of thrombosis, awaiting further study.