

ENZYMATIC TREATMENT'S INFLUENCE ON DERMATAN SULPHATE CHANGES IN HIDE

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INTRODUCTION

The requirement of qualitative opening-up of derma structure during beamhouse processes was old-established, but the chemical nature of opening-up was not full explained. Several hypotheses were promoted in which was the supposition that opening-up of collagen fibre structure was the removing of materials named "cementing" [1]. There are two main "cementing" materials in a derma tissue of skin/hide. One of them is the hyaluronic acid which considerable amount is removing during the process of soaking. The second is acidic dermatan sulphate. The highly charged dermatan sulphate glycosaminoglycan side chains are split from the proteoglycan backbone by the strong alkali. The amount of dermatan sulphate depends on the hide or skin type, section and layer.

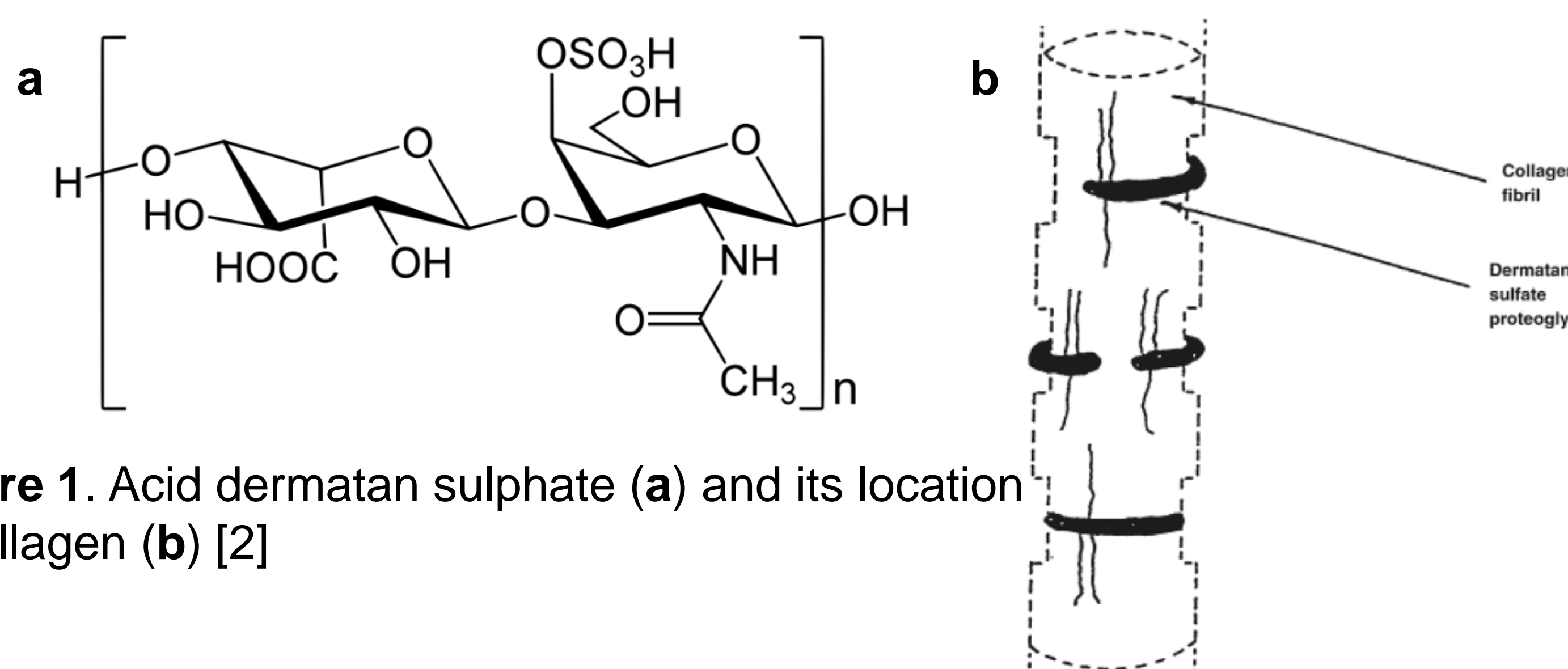


Figure 1. Acid dermatan sulphate (a) and its location in collagen (b) [2]

Developing new and less polluting technologies of leather processing it is paid special attention to lime and sulphides, which is used for beamhouse processes, trying to decrease their amounts or replace them by other systems of materials. It is supposed that as the components of such systems can be enzymatic preparations (EP), which characterize by wide spectra of effect. Accordingly, the development of enzymatic unhairing process has raised the question, what the influence have the enzymes on dermatan sulphate in the treated hide?

To get the answer, an action of sodium sulphide separately and of sodium sulphide combined with proteolytic enzyme (enzyme preparation *NUE O.6 MPX*) on a kinetic of change of both collagen proteins and dermatan sulphate changes was explored.

EXPERIMENTAL

Salted cowhide was used as raw material. The soaked and washed hide was cut into pieces 5x10 cm and series were prepared from these pieces. Commercial products: sodium sulphide (Na_2S) containing 60% Na_2S ; $\text{Ca}(\text{OH})_2$ (98-99%) and enzyme preparation containing alkaline protease *NUE O.6 MPX* (Novo Nordisk, Denmark) were used for experiments.

The amount of collagen proteins (CP) removed was estimated from the amount of hydroxyproline in the soaking and unhairing solutions. The amount of hydroxyproline was determined using the photo colorimetric method [3]. The content of dermatan sulphate in hide or pelt was determined using the modified method of R. Gibbons and M. Wolfrom [4].

The processing of pieces with chemicals was performed in a laboratory drum with a capacity of 3 litres. The pieces were treated under methods presented in Table 1.

Table 1. Methods of hide unhairing-opening up of derma

Control method	Experimental methods	
1 st	2 nd	3 rd
H_2O 150%, $\text{Ca}(\text{OH})_2$ 3%, Na_2S 7 g/l, duration 24 h run continuously 4 h, later 5 min. every 4 h.	H_2O 150%, Na_2S 7 g/l, duration 24 h run continuously 4 h, later 5 min. every 4 h.	H_2O 150%, 3%, Na_2S 7 g/l, enzyme preparation <i>NUE O.6 MPX</i> 0.3%, duration 24 h run continuously 4 h, later 5 min. every 4 h.

RESULTS

The investigation of unhairing process has shown that the addition of enzyme into unhairing solution changes character of removal of collagenous proteins. Firstly, it increases more than two times the release of collagen comparing with treatment without enzyme. Secondly, initially (during first 10 hours) the removal goes faster even comparing with traditional unhairing-derma opening up (Fig. 2).

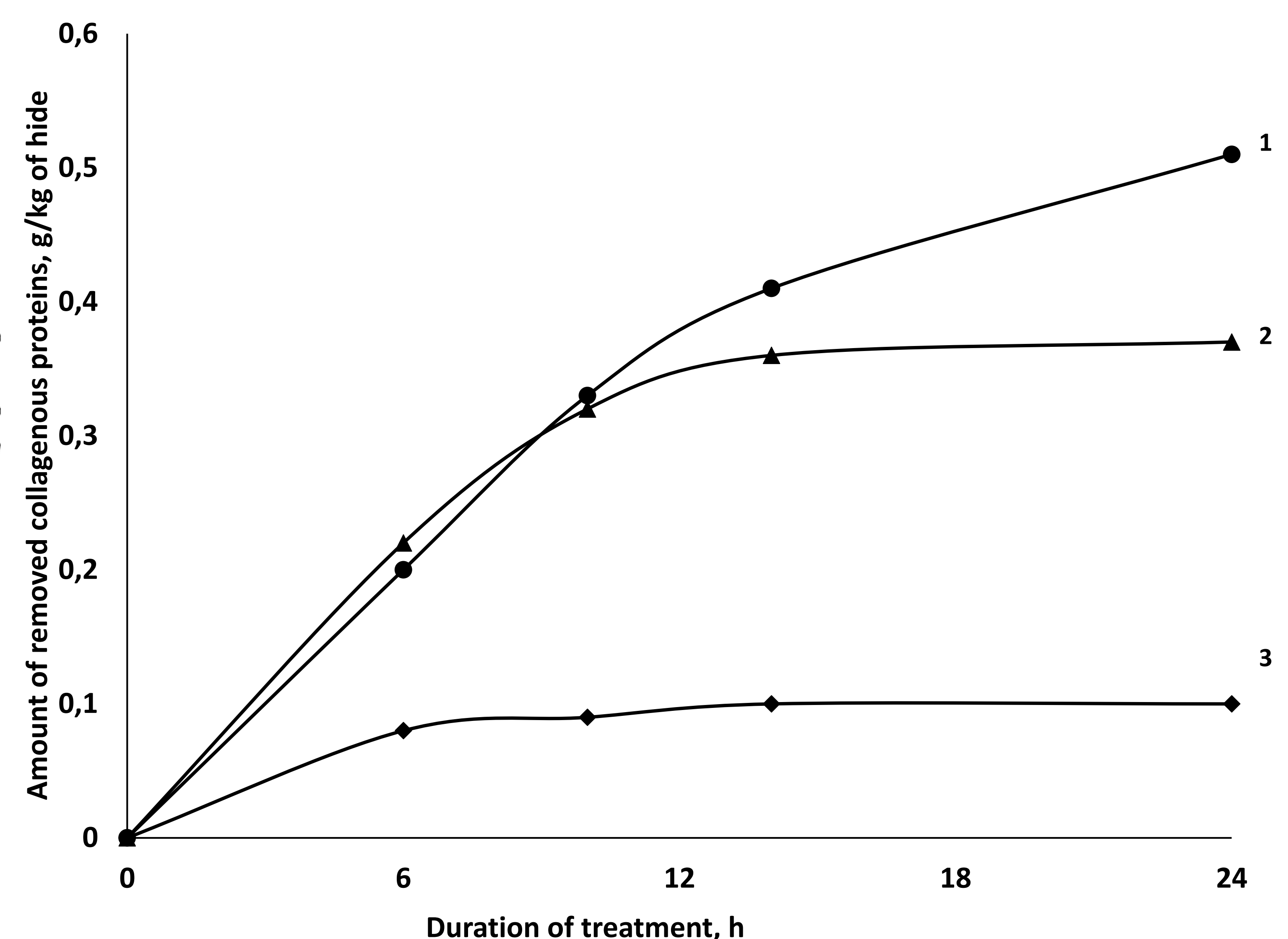


Figure 2. Kinetics of removal of collagenous proteins. 1 – control unhairing; 2 – treatment with Na_2S + *NUE 0.6 MPX*; treatment with Na_2S .

The addition of enzyme into unhairing solution changes character of removal of dermatan sulphate as well as of removal of collagenous proteins (Table 2).

Table 2. Kinetics of dermatan sulphate change in collagen of hide

Duration of unhairing, hours	Amount of dermatan sulphate in hide (%) when treating according to unhairing method		
	1 st	2 nd	3 rd
0	0.5	0.5	0.5
6	0.34	0.36	0.46
10	0.3	0.33	0.42
14	0.28	0.3	0.4
24	0.24	0.28	0.37

CONCLUSIONS

The investigation of unhairing process has shown that the use enzyme in the unhairing systems influences on kinetic of change of dermatan sulphate content in hide derma tissue. The degradation of dermatan sulphate goes faster and the amount of the one remains less when enzyme is used. The most intense process goes during first 6 hours, later the process slows down.

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