

Supplementary Table S1. Optimization of hyaluronidase enzyme production from marine *S. aureus* CASMTK1.

Effect of pH	Enzyme Activity
4	93
5	102.5
6	80
7	72.5
8	65
Effect of Salinity	Enzyme Activity
25	62.8
30	78.4
35	91.3
40	86.1
45	54.6
Effect of Incubation Period	Enzyme Activity
24	63.2
48	69.3
72	84.6
96	98.1
120	83.9
Effect of Temperature	Enzyme Activity
25	63.2
30	71.6
35	86.8
40	95.5
45	81.3
Effect of Carbon Sources	Enzyme Activity
Maltose	77.5
Fructose	82.5
Lactose	60
Starch	92.5
Cellulose	52.5
Effect of Inorganic Nitrogen Sources	Enzyme Activity
A. acetate	35
A. nitrate	62.5
A. Suphate	95
S. nitrate	57.5
Urea	86.7

Supplementary Table S2. FTIR band assignments of hyaluronidase in the region of 500–4000 cm⁻¹.

S. No.	Wavenumber (cm ⁻¹)	Band Assignments
1	888	C-H Plane bending
2	932	O-H bend
3	1041	CO-O-CO Stretching
4	1075	C-O Stretching
5	1118	C-O Stretching
6	1238	C-N Stretching
7	1307	C-O Stretching
8	1402	S=O Stretching
9	1447	C-H bending
10	1545	N-O Bending
11	1659	N-H Bending
12	2101	N=C=S Stretching
13	2849	C-H Stretching
14	2871	C-H Stretching
15	2926	C-H Stretching
16	2959	C-H Stretching
17	3435	O-H Stretching, H-bonded

Supplementary Table S3. FT-Raman band assignments of hyaluronidase in the region of 500–3000 cm⁻¹.

S. No.	Wavenumber (cm⁻¹)	Band Assignments
1	452	C-N-C Bend
2	616	C=O Plane bend
3	760	C-Cl Stretch
4	909	CH ₂ Plane
5	985	CH ₂ Plane
6	1057	S=O Stretch
7	1184	C-O Stretch
8	1293	C-F Stretch
9	1399	COO ⁻ Carboxylic acid
10	1466	CH ₂ Vibrations
11	1707	C=O Stretch
12	1996	Benzene Ring
13	2091	C≡ Stretch
14	2763	NH Stretching
15	2815	CH Stretching
16	2950	CH Stretching
17	3050	H bonded, OH Stretch