

Prof. Giorgio Sartor

I glucidi

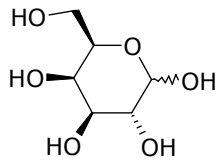
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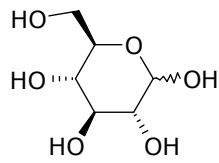
Glicosidasi

- Così come per le proteine anche i polimeri glucidici vengono scissi in monomeri attraverso l'idrolisi di un legame glicosidico.
- Diversi sono i monomeri coinvolti nella formazione dei polisaccaridi di origine algale marina:
 - fucoso,
 - glucoso,
 - galattoso,
 - mannosio,
 - xylosio,
 - ramnosio

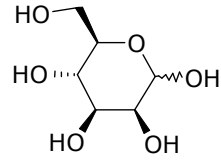
Monomeri



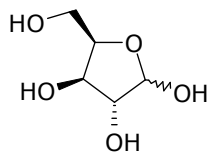
Galattoso



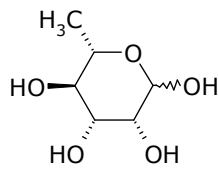
Glucoso



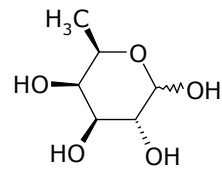
Mannoso



Xiloso



Ramnoso



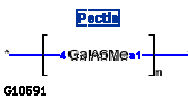
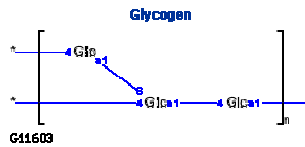
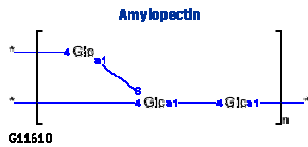
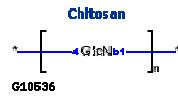
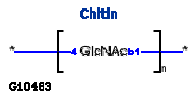
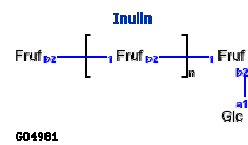
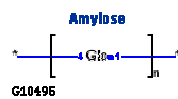
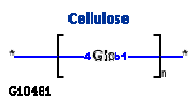
Fucoso

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Omopolisaccaridi

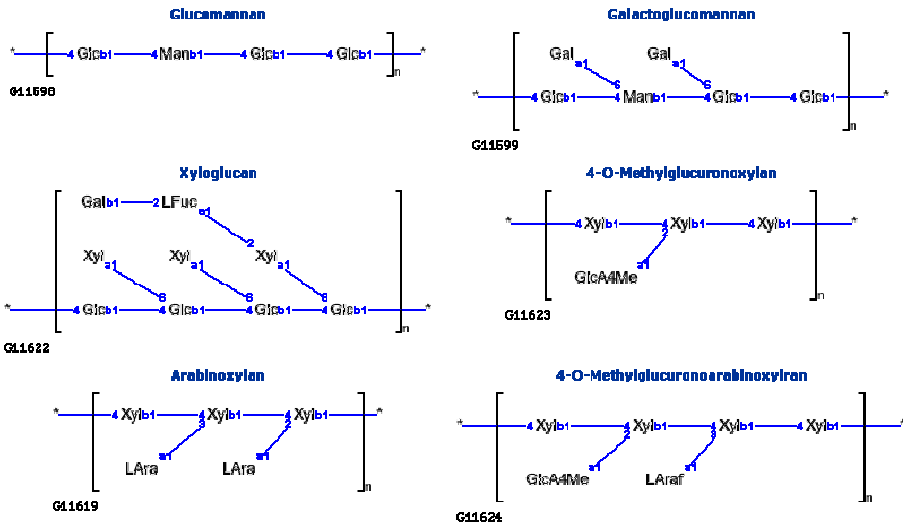


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Eteropolisaccaridi

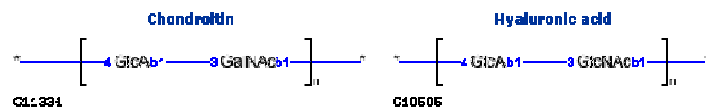


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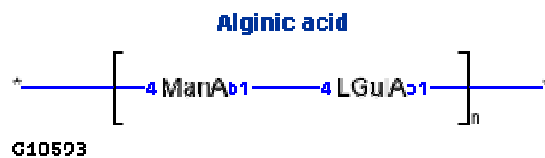
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- Glucosaminoglicani



- Alginati



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Fucoidan hydrolase and glycosidase activities in marine invertebrates

COELENTERATA			MOLLUSCA	
Anthozoa			Monoplacophora	
<i>Actinia</i> sp.	DT		<i>Onchidiopsis</i> sp.	HP
<i>Cnidopus japonicus</i>	all		<i>Tritia tratercula</i>	HP
<i>Anthopleura orientalis</i>	all		<i>Plicifucus plicatus</i>	HP
<i>Tialia fellina</i>	all		<i>Neptunea bulbacea</i>	HP
			<i>Neptunea lyrata</i>	HP
ANNELIDA			<i>Astarte borealis</i>	HP
Polichaeta			<i>Lusiovoluropsis</i> sp.	HP
Palynoidea	all		Bivalvia	
Sabelidae	all		<i>Cyclocardia rjabini</i>	HP
Sabelidae	all		<i>Modiolus difficilis</i>	CS
<i>Tubulanus punctatus</i>	all			HP
<i>Chaetopterus cautus</i>	all		ECHINODERMATA	
<i>Eudistylia polymorpha (Bispira)</i>	all		Ophiuroidea	
<i>Sipunculida phascosoma</i>	all		<i>Ophiura sarsi</i>	DT
			Echinoidea	
NEMERTINI			<i>Strongylocentrotus pallidus</i>	DT
Nemertini			Asteroidea	
<i>Collarenemertes bimaculata</i>	proboscis		<i>Leptosteria arctica</i>	DT
			<i>Distolasterias aligans</i>	DT
ARTHROPODA			<i>Hencricia</i> sp.	DT
Crustacea			Crinodea	DT
<i>Pandalus hypsiuotus</i>	HP			
<i>Chiohoecetes opilio elongatus</i>	HP			
<i>Pagurus beringanus</i>	all			

** Specific activity was expressed in nmol of p -nitrophenol/h per mg protein. Designations: DT, digestive tract; HP, hepatopancreas; CS, crystalline style;

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Fucoidan hydrolase and glycosidase activity in marine invertebrates

CNIDARIA					ECHINODERMATA	
Anthozoa					Holothuroidea	
<i>Metridium</i> sp.	All	Bivalvia			<i>Eupentacta fraudatrix</i>	All
SIPUNCULA		<i>Crassostrea gigas</i>	Hp		<i>Apostichopus japonicus</i>	All
Phascosomatidae		<i>Crenomytilus grayanus</i>	Hp		Echinoidea	
<i>Phascosoma agassizii</i>	All	<i>Glycymeris yessoensis</i>	Hp		<i>Strongylocentrotus nudus</i>	Dt
ARTHROPODA		<i>Spisula sachalinensis</i>	Hp		<i>S. intermedius</i>	Dt
Crustacea		<i>Mactra chinensis</i>	Hp		<i>Scaphechinus mirabilis</i>	Dt
<i>Balanus rostratus</i>	All		Crs		<i>S. griseus</i>	Dt
<i>Pagurus</i> sp.	All	<i>Mercenaria stimpsoni</i>	Hp		<i>Echinocardium cordatum</i>	Dt
<i>Cancer amphioetus</i>	Hp		Crs		Asteroidea	
<i>Hemigrapsus sanguineus</i>	Hp	<i>Peronidia venulosa</i>	Hp		<i>Asterias amurensis</i>	Dt
MOLLUSCA			Crs		<i>Lysastrosoma anthosticta</i>	Dt
Polyplacophora		<i>Mizuhopecten yessoensis</i>	Hp		<i>Patiria pectinifera</i>	Dt
<i>Lepidozona albrechti</i>	Hp		Crs		<i>Distolasterias nipon</i>	Dt
Gastropoda			Crs		CHORDATA	
<i>Lottia</i> spp.	All				Ascidacea	
<i>Littorina brevicula</i>	Hp				<i>Botryllus tuberatus</i>	All
<i>L. squalida</i>	Hp					
<i>L. sitkana</i>	Hp					
<i>Acmaea pallida</i>	All					
<i>Nusella heyseana</i>	Hp					

Dt—digestive tract; hp—hepatopancreas; Crs—crystalline style;

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Glicosidasi

O-GLYCOSYLHYDROLASES OF MARINE INVERTEBRATES

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Table 2. O-Glycosylhydrolases from hepatopancreas of *L. kurila*

Enzyme	Substrate	Activity, nmol/h per mg protein
Fucoidan hydrolase	fucoidan from <i>F. evanescens</i>	71
1,3- β -D-Glucanase	laminaran from <i>L. cichorioides</i>	35 714
Amylase	amylopectin	11 309
Cellulase	CM-cellulose	15 550
Agarase	agar (galactoglycan)	1237
Pustulanase	1,6- β -D-glucan	1524
β -D-Galactosidase	<i>p</i> -Nph- β -D-galactopyranoside	11 103
β -D-Glucosidase	<i>p</i> -Nph- β -D-glucopyranoside	11 401
α -D-Mannosidase	<i>p</i> -Nph- α -D-mannopyranoside	3447
Arylsulfatase	<i>p</i> -Nph-sulfate	12 000
α -L-Fucosidase	<i>p</i> -Nph- α -L-fucopyranoside	4370

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Glicosidasi (EC 3.2.1.-)

- **1. Ossidoreduttasi**
- **2. Transferasi**
- **3. Idrolasi**
 - 3.1 Agisce su legami esterei
 - 3.2 Glicosilasi
 - **3.2.1 Glicosidasi, idrolizzano composti O- e S-glicosilici**
 - 3.2.2 Idrolizzano composti N-glicosilici
 - 3.2.3 sottoclasse cancellata (Idrolizzano composti S-glicosilici)
 - 3.3 Agisce su legami etere
 - 3.4 Agisce su legami peptidici (peptidasi)
 - 3.5 Agisce su legami C-N diversi da legame peptidico
 - 3.6 Agisce su legami anidride
 - 3.7 Agisce su legami C-C
 - 3.8 Agisce su legami alide
 - 3.9 Agisce su legami P-N
 - 3.10 Agisce su legami S-N
 - 3.11 Agisce su legami C-P
 - 3.12 Agisce su legami S-S
 - 3.13 Agisce su legami C-S
- **4. Liasi**
- **5. Isomerasi**
- **6. Ligasi**

EC 3.2.1.1 - EC 3.2.1.165

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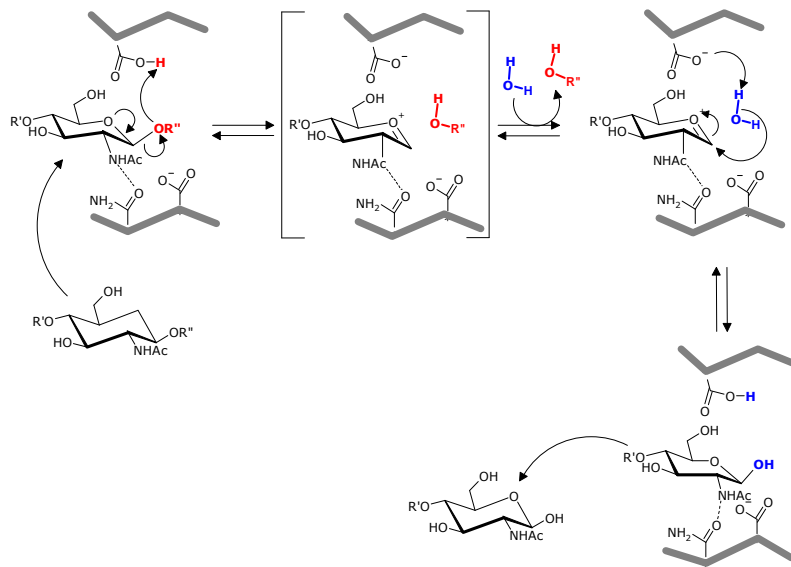
Meccanismi catalitici

- Le glicosidasi agiscono con idrolisi del legame glicosidico con due prodotti principali:
 - Monomeri con medesima configurazione del carbonio anomero
 - Intermedio ione ossonio (lisozima)
 - Intermedio covalente (β -1,4-glicosidasi)
 - Monomeri con inversione della configurazione del carbonio anomero
 - Stato di transizione ione ossicarbene

Meccanismi catalitici

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 - Stato di transizione ione ossicarbene

Intermedio ione ossonio

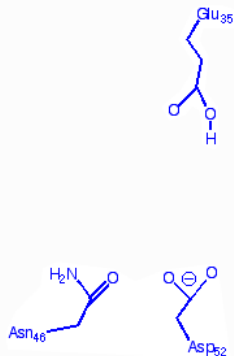


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Lisozima

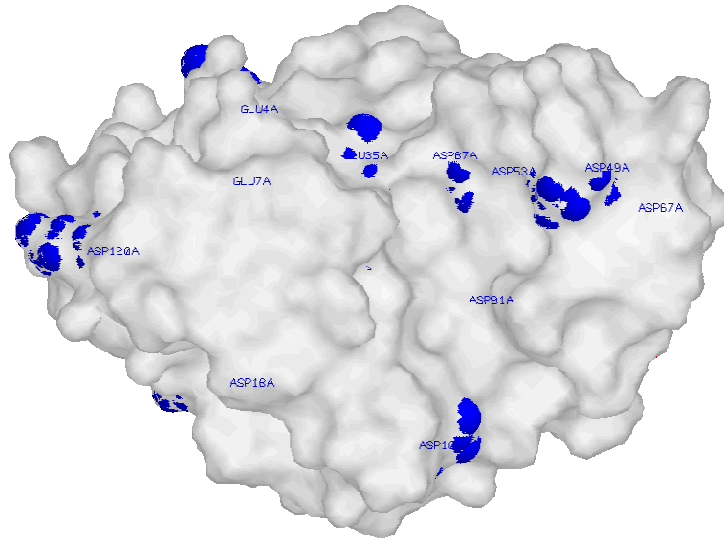


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Lisozima (EC 3.2.1.17)

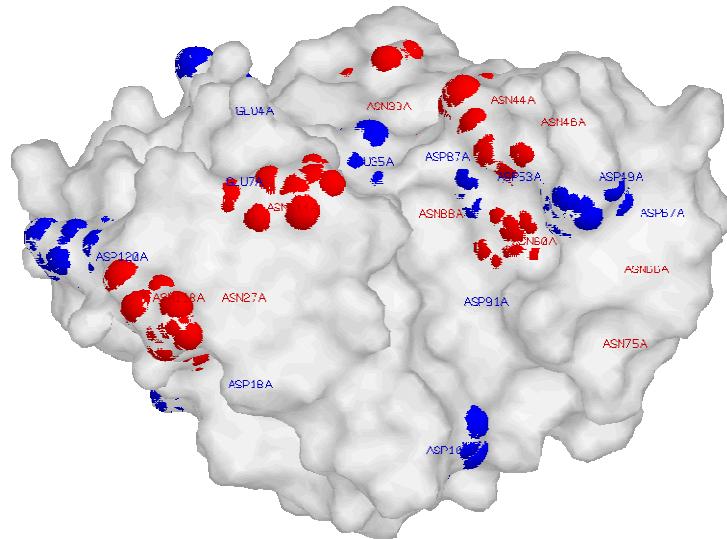


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Lisozima (EC 3.2.1.17)

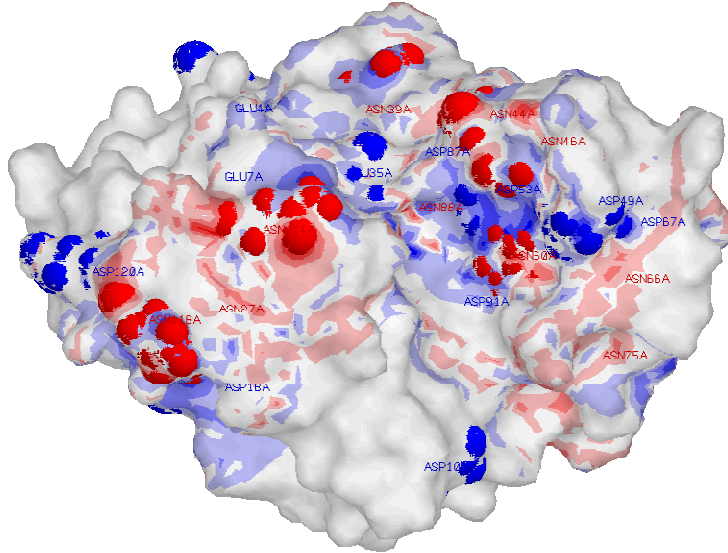


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Lisozima (EC 3.2.1.17)

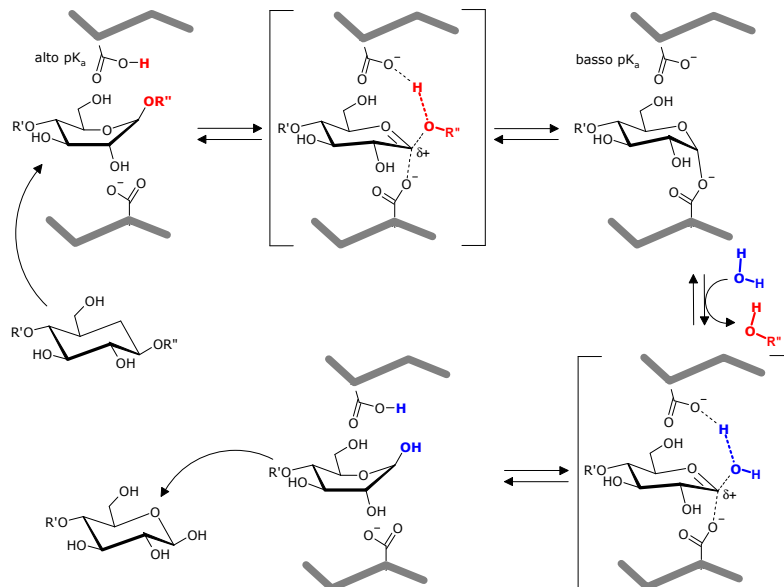


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Intermedio covalente

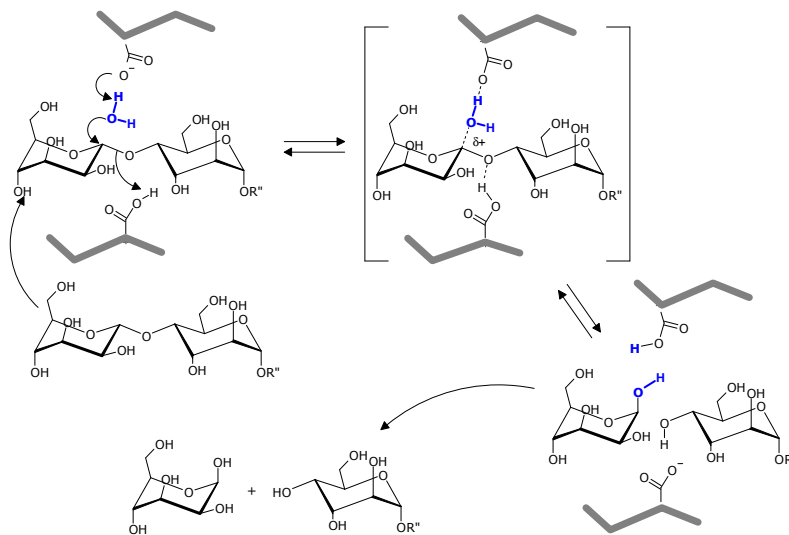


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Stato di transizione ione ossicarbene

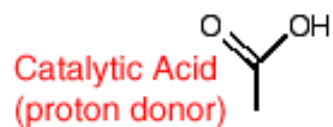
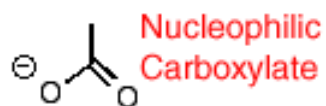


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Ritenzione della configurazione

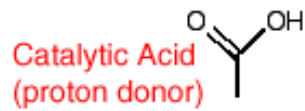
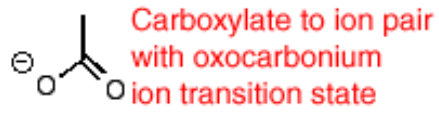


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Ritenzione della configurazione



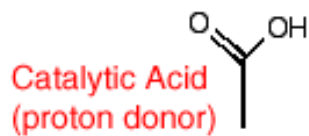
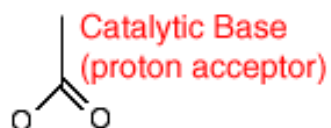
- Senza formazione di un intermedio covalente

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Inversione della configurazione

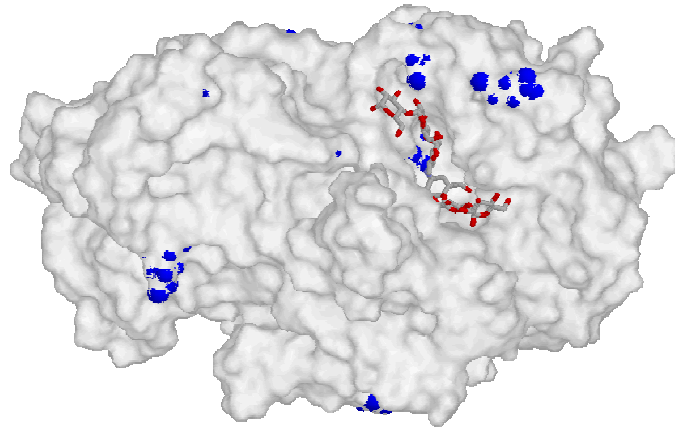


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GLicogenasi (EC 3.2.1.1)

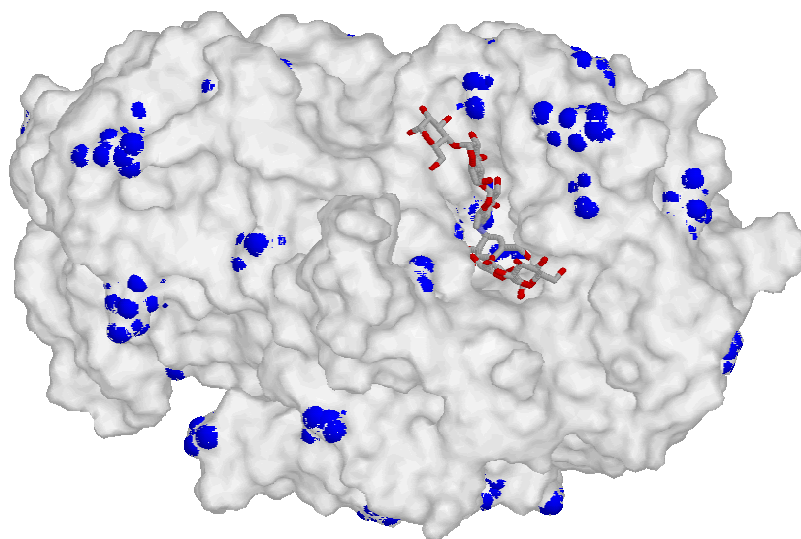


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GLicogenasi (EC 3.2.1.1)

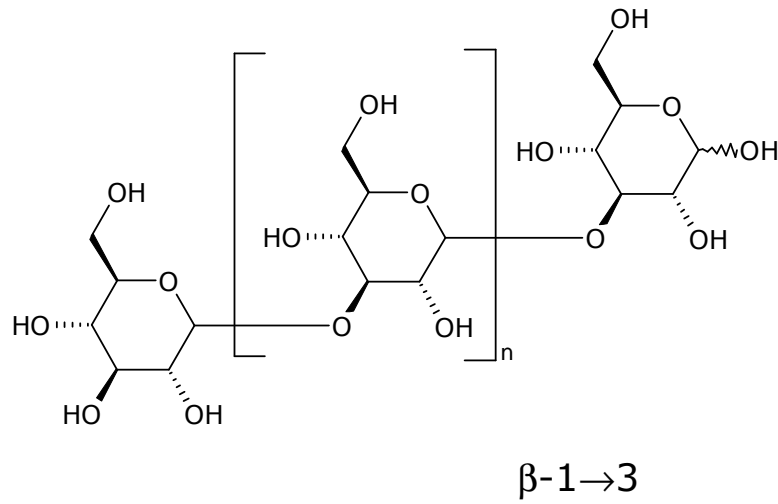


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Laminarina

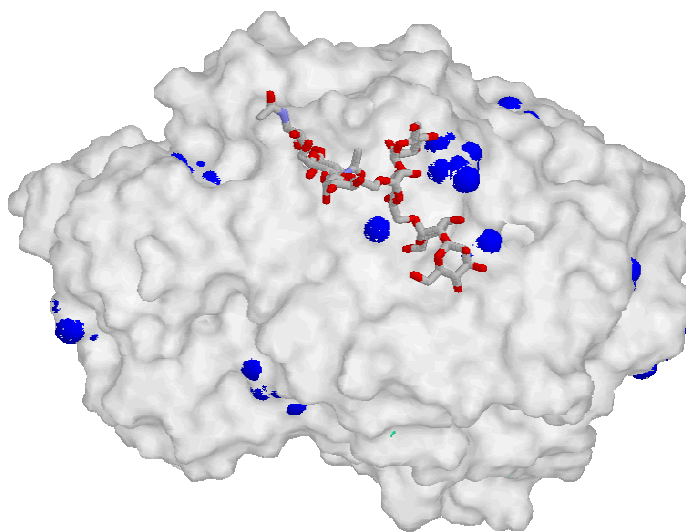


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Laminaranasi - EC 3.2.1.6



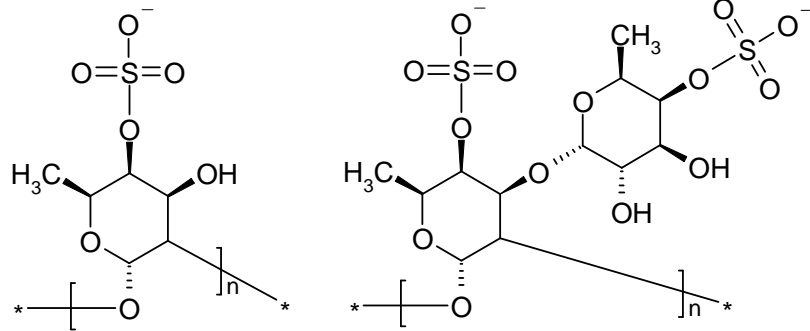
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Fucoidan

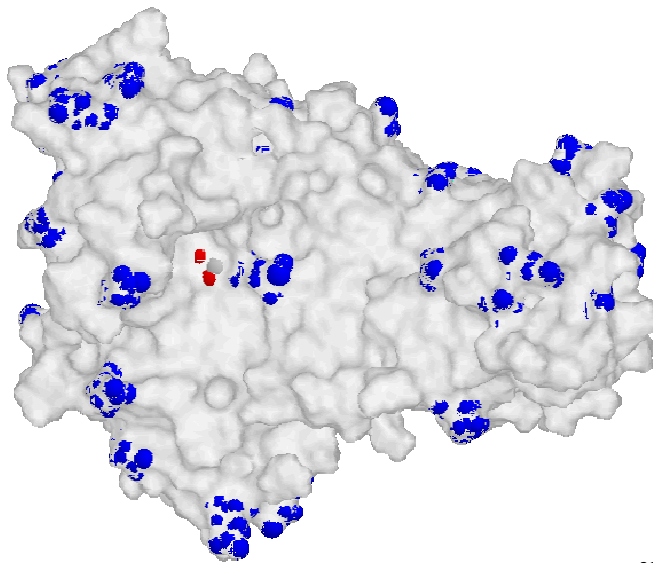


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α-L-fucosidasi - EC 3.2.1.44



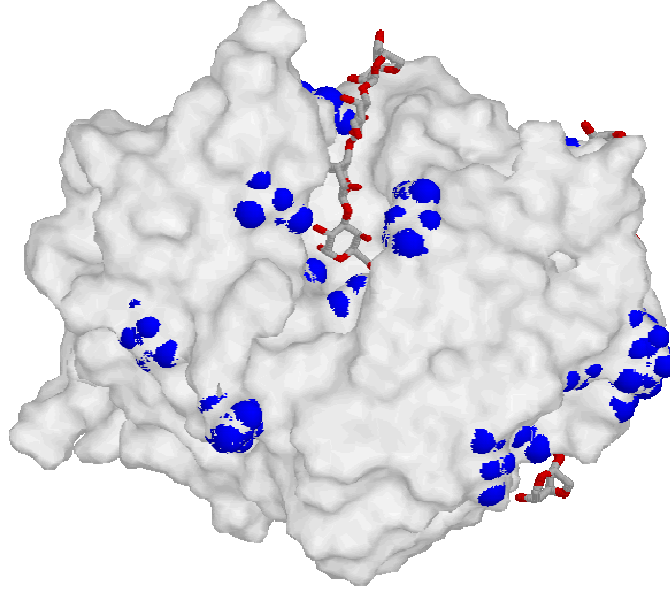
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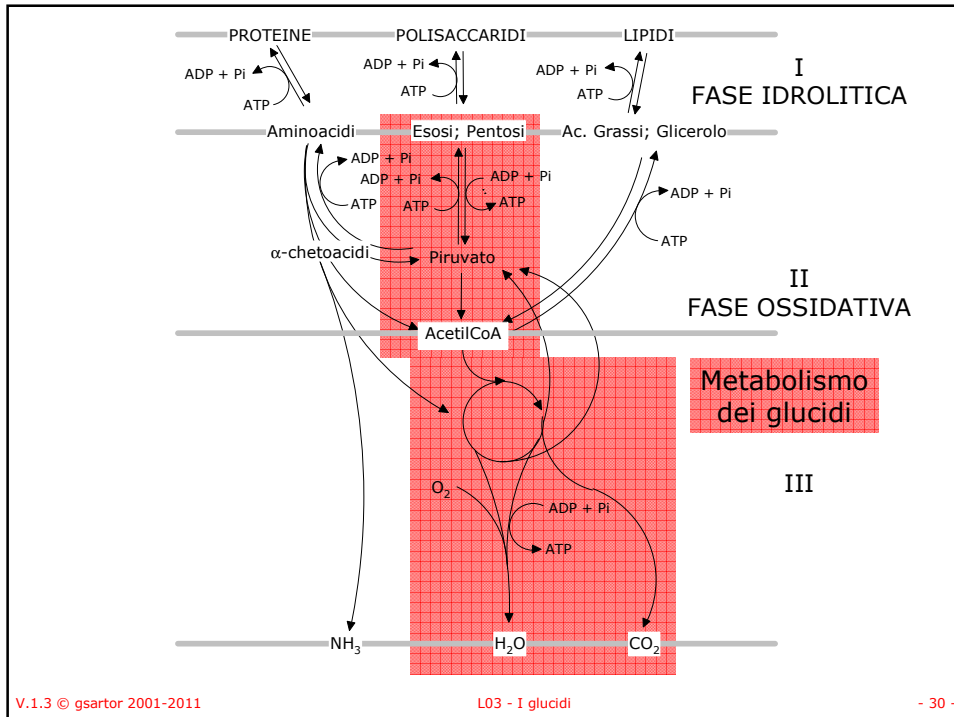
Agarasi (EC 3.2.1.81)



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