Vol. 268: 141–149, 2004 | MARINE ECOLOGY PROGRESS SERIES
Mar Ecol Prog Ser | Published March 9

Binding of glycolytic enzymes in adductor muscle of Iceland scallop *Chlamys islandica* is altered by reproductive status

Katherina Brokordt[1,2], Helga Guderley[1,*]

[1]Département de Biologie and Quebec–Océan (Le Groupe Interinstitutionnel de Recherches Océanographique du Québec), Université Laval, Quebec City, Quebec G1K 7P4, Canada

[2]*Present address:* Departamento de Ecología, Pontificia Universidad Católica de Chile, Alameda 340, Santiago, Chile

ABSTRACT: During gonad growth and spawning by the Iceland scallop *Chlamys islandica*, muscle glycogen levels decrease in parallel with the activities of several glycolytic enzymes, including glycogen phosphorylase (GP), pyruvate kinase (PK) and octopine dehydrogenase (ODH), even though muscle protein concentrations remain unchanged. These parallel changes suggested that binding of glycolytic enzymes to glycogen influences their activities. Decreases in the amount of glycogen in the muscle would reduce the number of binding sites for these enzymes and decrease measurable activities or accelerate their degradation. We tested this hypothesis by evaluating the impact of reproductive status on the activity and intracellular distribution of GP, PK and ODH in adductor muscle of inactive Iceland scallops. Glycogen, but not protein, levels decreased markedly during gonad maturation and spawning. GP and ODH activities decreased in parallel with glycogen, while PK activity did not change. GP showed the highest binding both to glycogen (9 to 19.5% of activity bound) and to the particulate fraction (37 to 53%). As the units of GP bound per mg glycogen did not change with maturation and spawning, the total units of GP bound to glycogen decreased with maturation and spawning in females and males. For the enzymes measured, more activity was bound to the particulate fraction than to glycogen. The units of ODH bound to glycogen and to the particulate fraction decreased during maturation and spawning in females. Within a reproductive state and within a cellular fraction, the relative activities of the glycolytic enzymes (ODH/GP and PK/GP) were quite similar, suggesting conservation of the stoichiometry of glycolytic enzyme capacities in a given cellular fraction. Enzyme-binding to the particulate fraction of scallop adductor muscle shifts with long-term physiological change. Our results are compatible with the interpretation that the intracellular localization of enzymes influences their rates of synthesis and degradation.

KEY WORDS: Enzyme-binding · Glycogen · Glycogen particles · Glycolytic enzymes · Scallops · Reproduction · Reproductive cost · *Chlamys islandica*