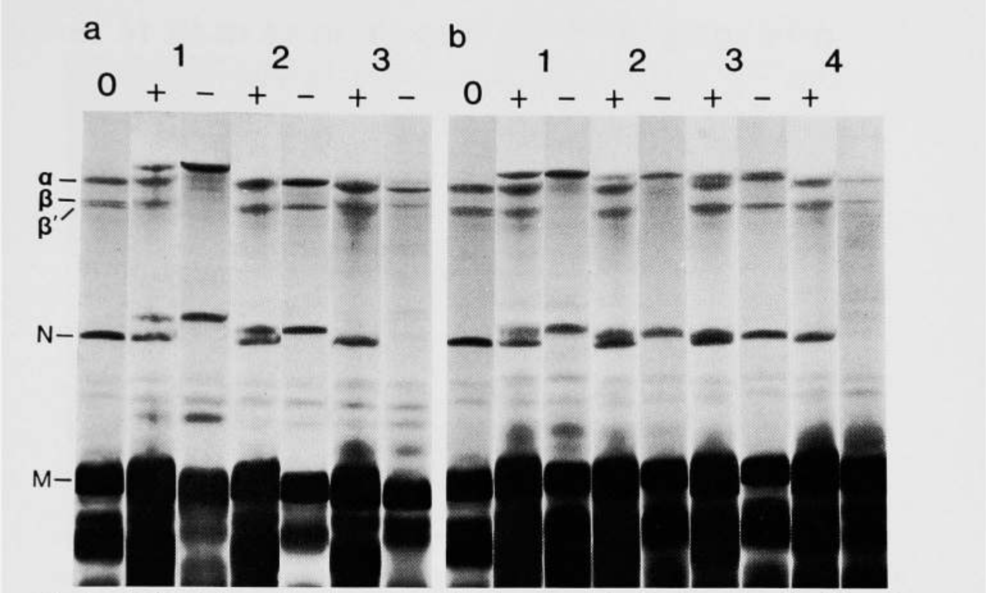

Fig. 1. SDS gel electrophoresis patterns of various types of striated muscles of rabbit and chicken. a: rabbit. lane 0, chicken breast muscle; 1, leg muscle; 2, psoas muscle; 3, heart. b: chicken. lane 0, breast muscle; 1, ALD; 2, leg muscle; 3, PLD; 4, heart. Each left lane (+), mixture with chicken breast muscle used as marker. Each right lane (−), without addition of chicken breast muscle. α, chicken breast muscle α-connectin; β, β-connectin; β′, β′-connectin; N, nebulin; M, myosin heavy chain.

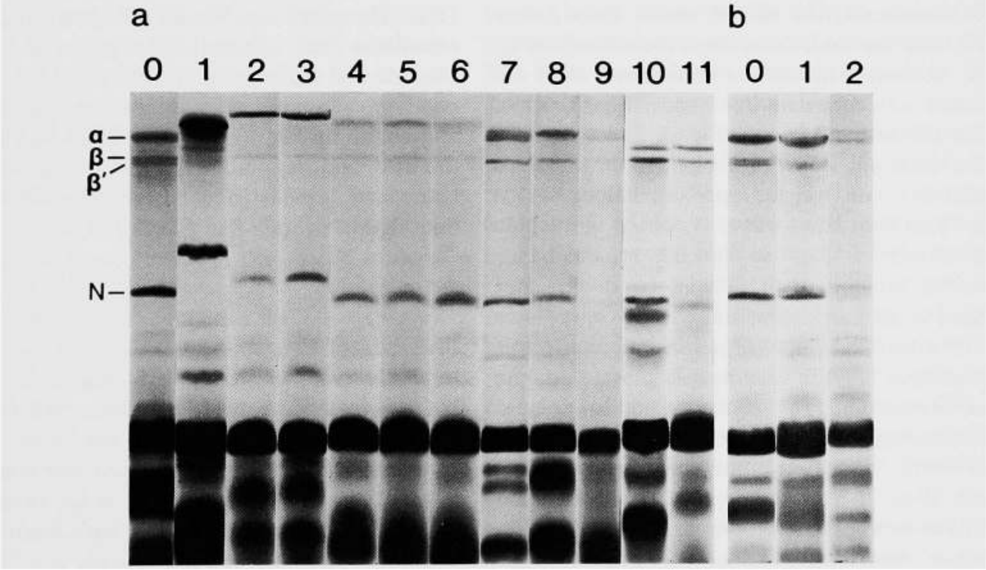

Fig. 2. SDS gel electrophoresis patterns of various types of vertebrate and prochordate striated muscles. a: lane 0, chicken breast; 1, snake skeletal; 2, turtle neck; 3, turtle fore-leg; 4, newt back; 5, newt hind-leg; 6, newt tail; 7, frog hind-leg; 8, frog fore-leg; 9, frog heart; 10, carp skeletal; 11, goldfish skeletal. b: lane 0, chicken breast; 1, chicken plus *Amphioxus*; 2, *Amphioxus* skeletal muscle. Abbreviations, as in Fig. 1.

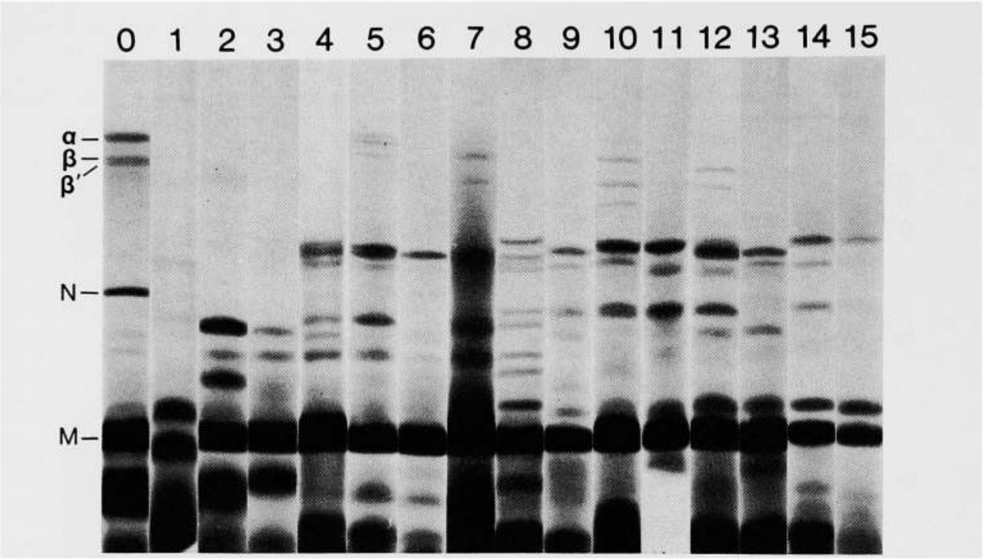

Fig. 3. SDS gel electrophoresis patterns of various types of invertebrate muscles. Lane 0, chicken breast muscle; 1, *C. elegans* (whole); 2, scallop slow adductor; 3, scallop fast adductor; 4, shrimp tail; 5, crayfish claw; 6, crayfish tail; 7, crab claw; 8, cockroach leg; 9, cricket leg; 10, locust leg; 11, water beetle leg; 12, cicada leg; 13, cicada thorax; 14, beetle thorax; 15, beetle leg. Abbreviations, as in Fig. 1.

tained three bands: the first was slower in mobility than α-connectin, the second slower than β-connectin, and the third faster than β-connectin (Fig. 3, 1). Adductor muscles of scallop and clam did not show any connectin-like bands (Fig. 3, 2; 3). A top, diffuse band seen in Fig. 3, 2, corresponds to the positions of a proteolytic product of β-connectin (chain weight, approximately 1.8×10^6 (*18*)). This faint band was also present in a whole body extract of slug. In annelid, protein bands slower in mobility than nebulin band were not detected at all (earthworm and water worm).

In arthropods, the situation was confusing. For example, crayfish claw muscle showed doublet band corresponding to α-connectin and lower band corresponding to β-connectin (Fig. 3, 5). On the other hand, there were not such bands in tail muscle (Fig. 3, 6). Shrimp tail muscle also did not have any connectin-like bands (Fig. 3, 4). However, claw muscles of several species of crab had connectin-like bands (Fig. 3, 7).

In insect muscle, in most of the species examined, several bands corresponding to α- and β-connectins were clearly detected in leg muscles, but not in thoracic muscles (locust (Fig. 3, 10), cicada (Fig. 3, 12; 13), mantis, and beetle (Fig. 3, 11)). However, one species of horn beetle (*Serrognathus*) had connectin-like proteins both in thoracic and leg muscles (Fig. 3, 14; 15). On the contrary, in some insects, cricket, and cockroach, any connectin-like bands were not found both in thoracic and leg muscles (Fig. 3, 8; 9). The largest-size protein band moved somewhat slower than that of nebulin-like protein.

DISCUSSION

It is evident that connectin filaments are present in all the types of striated muscles of vertebrates, but not in smooth muscles (*4*, *6*). We have examined non-muscle tissues, brain, liver, spleen, pancreas, kidney, lung, of chicken and connectin-like proteins were not detected at all in SDS gel electrophoresis in confirmation with immunofluorescent observations (*4*).

Literature has already accumulated evidence for the presence of connectin in a variety of vertebrate skeletal muscles: bovine (*6*), sheep (*7*), rat (*8*), chicken (*9*), frog (*10*), tadpole (*13*), carp (*11*), and rock fish (*13*). Furthermore, native connectin