

# COMPOSITION OF PROTEIN FRACTIONS FROM VARIOUS PARTS OF THE RABBIT MYOCARDIUM

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The composition of the protein fractions of the ventricles and atria of rabbits is described in detail.

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The composition of the protein fractions of the myocardium as a whole was studied previously by I. I. Ivanov and co-workers [1, 2], who concluded that there are considerable differences between the protein fractions of the myocardium and those of the skeletal and smooth muscles. However, functionally and anatomically, the myocardium is nonhomogeneous. The main load on the heart falls on the well developed muscle of the ventricles, and the atrial muscle is much less well developed. Bearing in mind the correlation between the function of muscles and the fractional composition of muscle tissue, it was natural to suppose that differences would be found in the composition of the protein fraction in different parts of the heart. Helander [4], for instance, when studying the content of individual protein fractions in different parts of the bovine myocardium, found that the content of myofibrillary proteins in the muscle of the auricles accounts for 27-29% of the total nitrogen of the tissue, compared with 41-43% in the muscle of the ventricles. Conversely, the content of the stroma proteins is greater (44-45%) in the auricles than in the ventricles (25-29%). Reports of a higher content of myofibrillary proteins in the muscle of the ventricles than of the atria may be found in papers by Kovats [5] and Bogatski [3].

However, we were unable to find any data relating to the content of all the protein fractions now known (sarcoplasmic proteins, actomyosin, fraction T, stroma, total nitrogen, protein and nonprotein nitrogen) in different parts of the myocardium.

The present investigation was undertaken to study this problem.

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TABLE 1. Composition of Protein Fractions of Different Portions of the Myocardium of an Adult Rabbit (in mg Nitrogen/g Fresh Tissue and in Ratio: N of Fraction/Total Tissue)

Fraction	Left ventricle		Atrium		Myocardium as a whole [1, 2]*	
	mg	%	mg	%	mg	%
Total N	27,61	100	22,71	100,0	25,86	100
Nonprotein N	2,82	10,2	1,74	7,7	2,23	8,6
Protein N	24,99	89,8	21,11	92,3	23,63	91,4
Nitrogen of sarcoplasmic proteins	11,23	40,7	6,14	27,0	8,85	34,2
N of myofibrillary proteins	8,4	30,4	5,66	24,9	7,32	28,0
N of proteins of actomyosin complex AM	6,1	22,1	3,5	15,8	4,40	17,8
N of proteins of fraction T	2,3	8,3	2,16	9,1	2,92	11,2
Ratio AM/T	2,60	—	1,6	—	1,5	—
N of stroma proteins	5,36	19,5	9,31	41,1	7,30	28,2
Sum of N of all fractions	27,81	100,8	22,85	100,7	25,70	99,0

\*Tissue minced by cutting into sections 20-40  $\mu$  thick on a freezing microtome.

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## EXPERIMENTAL METHOD

Six rabbits weighing 2-3 kg were sacrificed by decapitation. After the blood had escaped the thorax was opened and the heart removed. The large vessels were severed where they join the heart and the pericardium was removed. The muscle proteins of the left ventricle and both atria with the auricles were fractionated separately by the method of I. I. Ivanov and co-workers [1, 2]. The muscle tissue was ground with quartz sand and not cut into sections on a freezing microtome. This is very important, because the method of mincing the tissue has a significant effect on the yield of the individual fractions, especially the myofibrillary proteins.

## EXPERIMENTAL RESULTS

The results obtained are given in Table 1, in which the data obtained by I. I. Ivanov and co-workers [1, 2] for the composition of the protein fractions of the myocardium as a whole are also given for comparison.

The protein nitrogen can be seen to be much higher in the ventricles than in the atria.\*

The nitrogen content of the individual protein fractions expressed in mg/g tissue and as a percentage of the total tissue nitrogen in the left ventricle and atria likewise differed. The higher content of myofibrillary proteins in the muscle of the left ventricle was due to their high content of proteins of the actomyosin complex. A marked difference was observed in the content of sarcoplasmic proteins, which was 80% higher in the muscle of the left ventricle than in that of the auricles. It may be supposed that the difference between the protein compositions of the atrial and ventricular tissues is due to differences in the functions of these portions of the heart. This is further evidence of the existence of a definite correlation between the composition of a tissue and its function.

The composition of the protein fractions of the ventricular and auricular muscles differed slightly from that in the myocardium as a whole. In particular, the content of myofibrillary proteins in the ventricular muscle was greater, and that in the atria was smaller, than in the whole myocardium. This evidently accounts to some extent for the discrepancy between data published in the literature, reflecting the composition of protein fractions from different parts of the myocardium.

## LITERATURE CITED

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\*In our experiments the chief muscle component of the atria was the auricular tissue, for the muscular wall of the atria is poorly developed in rabbits.