Cellular localisation of NaK-ATPase isoforms in human skeletal muscle is muscle fibre-type specific

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The six isoforms of Na^+,K^+-ATPase (NKA) expressed in skeletal muscle have been detected in both the sarcolemmal and t-tubular systems of muscle cells using various techniques, however this has mostly been investigated in animal muscle. The aim of this study was to determine localisation patterns of NKA isoforms (α_1-$_3$ and β_1-$_3$) in human skeletal muscle, as well as examining for fibre-type specific distribution.

A *vastus lateralis* muscle biopsy was taken from seven healthy, young adults. Isoform localisation in the plasma membrane (PM) and intracellular (IC) regions, defined as all areas/structures within the plasma membrane envelope including the t-tubules, was investigated *via* immunofluorescence microscopy.

The fibre-type distribution was approximately 55% type I and 45% type II fibres for each NKA isoform analysed. The density of NKA α_1 was 24% higher in type II compared to type I fibres (p<0.01). The NKA α_2 density was over 2-fold greater in PM compared to IC (p<0.05), with no difference between fibre types. NKA α_3 was 63% greater in type I than type II fibres (p<0.05). The density of NKA β_1 was 58% greater in the PM (p<0.05), and NKA β_2 was 25% greater in the PM compared to IC (p<0.05). Co-localisation analysis of NKA β_2 with nuclei found a strong correlation (0.69), and showed 65% of the NKA β_2 co-localized with nuclei. The density of NKA β_3 was 21% greater in the PM compared to IC (p<0.01). These results demonstrate a higher density of NKA α_2, β_1 and β_3 in the PM compared to the IC region, and a higher density of NKA α_1 in type II fibres and α_3 in type I fibres.