# Influence of $^{14}N$ nuclei on proton relaxation in muscle tissue

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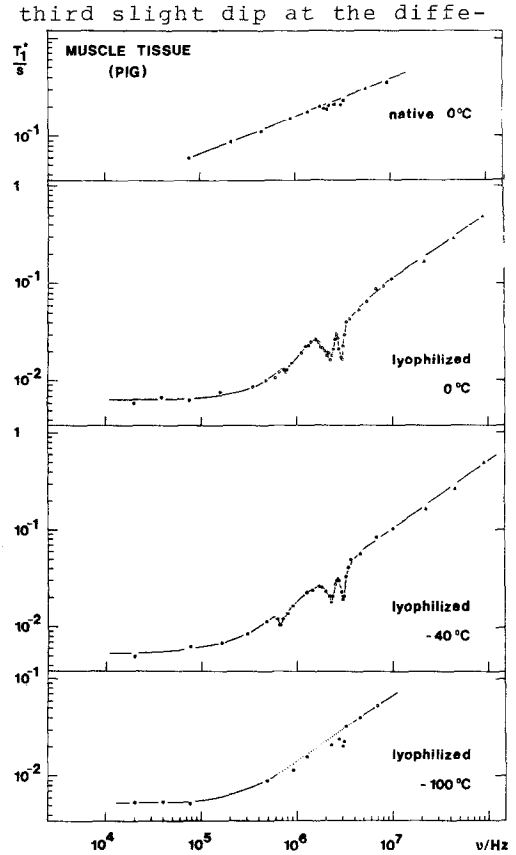
I. Introduction: The unambiguous evidence that many slowly relaxing nuclei can be relaxed by a few NH protons could recently be shown by the detection of quadrupolar dips in the proton relaxation dispersion of the hydrated and lyophilized globular protein bovine serum albumin (1).

These dips arise by the transfer of magnetization from the protons to the quadrupole nuclei, which are strongly coupled to the lattice. A detailed theory describing the relaxation of a dipole nucleus coupled to a quadrupole nucleus will be published elsewhere (2).

In this work it should be shown that even in muscle tissue the $^{14}N$ nuclei are able to act as relaxation sinks for the protons.

II. Experiments: The longitudinal proton relaxation time $T_1^*$ was measured by the aid of the field cycling technique (3). Muscle tissue (pig) was measured 5 hours after slaugthering. Another sample of the same muscle was quickly freezed in liquid nitrogen and then dried in vacuum.

At 0 °C and -40 °C the lyophilized sample shows two marked dips as 2,5 MHz and 3 MHz and a third slight dip at the difference frequencey. The disappearence of the dips at low temperature (-100 °C) can be explained by the fact, that the mobile side chains of the proteins now become more efficient in the low frequency range where the $^{14}N$-dips occur. In native muscle tissue, containing 80 % water, no or only very weak dips are visible. This is probably the consequence of the broad distribution of correlation times which far exceeds the range in which quadrupole dips principally can be observed (2). Nevertheless the $^{14}N^1H$-centers are able to account for the relaxation of the total system at frequencies below about 10 MHz.




1) Kimmich, R., Winter, F., (1980) Bulletin of Magn. Resonance, 2, 349.
2) Winter, F., Kimmich, R., Mol. Phys., in press.
3) Kimmich, R., (1980), Bull. Magn. Reson., 1, 195.