

T1 and T2 relaxation in various structures: fat and water



Ask Mish

FAT molecule: fixed, low E

WATER molecule: free flow, high E

- Various tissues have different T1 and T2
- If we compare FAT and WATER we will find a different T1 and T2 for p+ in these two. In water, p+ are associated with free flowing molecules while in fat, p+ are in fixed positions in the structure of these energy storing molecules.
- In fat, being a very fixed structure, with low E the absorbed energy is given back quickly (T1) and the p+ interaction w/each other is strong producing a quick out of phase (T2) so both relaxation times will be very short (yellow line on the 2 graphs below). Because the energy is given back quickly, the transversal magnetization disappear and so does the signal which becomes very weak. By convention the weak signal appears dark grey or black on MRI image.
- Water, which is a free flowing molecule, needing high E, hold on the energy maintaining the p+ precessing in phase, long T2 and also maintaining the transversal magnetization, long T1, which produces a STRONG SIGNAL. By convention the strong signal appears white on MRI.

