

References (database v5.0, 21.08.2025)

References for the T1 and T2 relaxation times listed in our material properties database. Values for tissues of which the properties are not available in the literature are substituted with values from other tissues. In these cases, the tissue used for the value is listed instead of a reference. The rationale for each individual substitution is provided in the Rationale for Tissue Substitutions.

Tissue	1.5T, T1	1.5T, T2	3.0T, T1	3.0T, T2
Blood	Barth & Moser, 1997 Greenman et al., 2003 Rooney et al., 2007 Stanisz et al., 2005	Barth & Moser, 1997 Stanisz et al., 2005 Zhao et al., 2007	Greenman et al., 2003 Kawel et al., 2012 Kawel-Boehm et al., 2015 Lu et al., 2003 Lu et al., 2004 Stanisz et al., 2005	Stanisz et al., 2005
Blood Vessel Wall		Touissant et al., 1996	Coolen et al., 2015 Qui et al., 2018	Coolen et al., 2015 Qui et al., 2018
Bone Marrow (Red)	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004	Not in Database
Bone Marrow (Yellow)	Gold et al., 2004	Gold et al., 2004	Gold et al., 2004	Not in Database
Brain (Grey Matter)	Henderson et al., 1999 Kingsley et al., 1998 Rooney et al., 2007 Stanisz et al., 2005 Steen et al., 2000 Thayyil et al., 2012 Whittall et al., 1997 Wright et al., 2007	Peters et al., 2007 Stanisz et al., 2005 Thayyil et al., 2012 Whittall et al., 1997	Ethofer et al., 2003 Gelman et al., 2001 Lee et al., 2006 Wansapura et al., 1999 Wright et al., 2007	Gelman et al., 1999 Lee et al., 2006 Peters et al., 2007 Stanisz et al., 2005 Wansapura et al., 1999
Brain (White Matter)	Henderson et al., 1999 Kingsley et al., 1998 Rooney et al., 2007 Steen et al., 2000 Thayyil et al., 2012 Whittall et al., 1997 Wright et al., 2007	Peters et al., 2007 Stanisz et al., 2005 Thayyil et al., 2012 Whittall et al., 1997	Ethofer et al., 2003 Gelman et al., 2001 Lee et al., 2006 Wansapura et al., 1999 Wright et al., 2007	Gelman et al., 1999 Lee et al., 2006 Peters et al., 2007 Wansapura et al., 1999

Tissue	1.5T, T1	1.5T, T2	3.0T, T1	3.0T, T2
Breast Fat	Delile et al., 2005 Rakow-Penner et al., 2006	Rakow-Penner et al., 2006	Rakow-Penner et al., 2006	Rakow-Penner et al., 2006
Bronchi	Blood Vessel Wall	Blood Vessel Wall	Blood Vessel Wall	Not in Database
Cartilage	Gold et al., 2004 Stanisz et al., 2005	Dunn, 2004 Gold et al., 2004 Stanisz et al., 2005	Gold et al., 2004 Stanisz et al., 2005	Gold et al., 2004 Smith et al., 2001 Stanisz et al., 2005
Cerebrospinal Fluid	Henderson et al., 1999 Rooney et al., 2007	Not in Database	Not in Database	Not in Database
Cervix	Uterus	Uterus	Uterus	Uterus
Commissura Anterior	Brain (White Matter)	Brain (White Matter)	Brain (White Matter)	Brain (White Matter)
Commissura Posterior	Brain (White Matter)	Brain (White Matter)	Brain (White Matter)	Brain (White Matter)
Diaphragm	Muscle	Muscle	Muscle	Muscle
Ductus Deferens	Blood Vessel Wall	Blood Vessel Wall	Blood Vessel Wall	Not in Database
Extracellular Fluids	CSF			
Eye (Aqueous Humor)	CSF			
Eye (Choroid)	Blood	Blood	Blood	Blood
Eye (Choroid)	Muscle	Muscle	Muscle	Muscle
Eye (Iris)	Muscle	Muscle	Muscle	Muscle
Eye (Retina)	Brain (Grey Matter)	Brain (Grey Matter)	Brain (Grey Matter)	Brain (Grey Matter)
Glandula Vesiculosa	Prostate	Prostate	Prostate	Prostate
Heart Lumen	Blood	Blood	Blood	Blood
Heart Muscle	Messroghli et al., 2004 Stanisz et al., 2005	Aherne et al., 1997 Stanisz et al., 2005	Kawel-Boehm et al., 2015 Kawel et al., 2012 Stanisz et al., 2005	Stanisz et al., 2005
Hippocampus	Brain (Grey Matter)	Brain (Grey Matter)	Lee et al., 2006	Lee et al., 2006
Hypothalamus	Brain (Grey Matter)	Brain (Grey Matter)	Brain (Grey Matter)	Brain (Grey Matter)
Intervertebral Disc	Cartilage	Kerttula et al., 2001 Marinelli et al., 2009	Cartilage	Cartilage

N/A: A value exists in the database for a certain tissue parameter but its reference is no longer traceable, **None:** The property is not existent for the tissue in question, **Not in Database:** Values for that property are not yet included in the material properties database.

Tissue	1.5T, T1	1.5T, T2	3.0T, T1	3.0T, T2
Kidney (Cortex)	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004
	Stanisz et al., 2005	Stanisz et al., 2005	Stanisz et al., 2005	Stanisz et al., 2005
Kidney (Medulla)	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004
Larynx	Cartilage	Cartilage	Cartilage	Cartilage
Liver	de Bazelaire et al., 2004	Cieszanowski et al., 2002	de Bazelaire et al., 2004	de Bazelaire et al., 2004
	de Certaines et al., 1993	de Bazelaire et al., 2004	Stanisz et al., 2005	Stanisz et al., 2005
	Heye et al., 2012	de Certaines et al., 1993		
	Messroghli et al., 2004	Heye et al., 2012		
	Stanisz et al., 2005	Stanisz et al., 2005		
Lung	Not in Database	Bergin et al., 1991	Not in Database	Not in Database
Medulla Oblongata	Kingsley et al., 1998	Not in Database	Lee et al., 2006	Lee et al., 2006
Meniscus	Cartilage	Cartilage	Cartilage	Cartilage
Midbrain	Pons	Not in Database	Pons	Pons
Muscle	de Bazelaire et al., 2004 Gold et al., 2004 Stanisz et al., 2005	de Bazelaire et al., 2004 Gold et al., 2004 Stanisz et al., 2005	de Bazelaire et al., 2004 Stanisz et al., 2005	de Bazelaire et al., 2004 Gold et al., 2004 Stanisz et al., 2005
Nerve	Kingsley et al., 1998 Stanisz et al., 2005 Steen et al., 2000	Stanisz et al., 2005	Stanisz et al., 2005	Stanisz et al., 2005
Pancreas	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004
Penis	Blood Vessel Wall	Blood Vessel Wall	Blood Vessel Wall	Not in Database
Placenta	Blood	Blood	Blood	Blood
Pons	Kingsley et al., 1998	Not in Database	Lee et al., 2006	Lee et al., 2006
Prostate	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004

N/A: A value exists in the database for a certain tissue parameter but its reference is no longer traceable, **None:** The property is not existent for the tissue in question, **Not in Database:** Values for that property are not yet included in the material properties database.

Tissue	1.5T, T1	1.5T, T2	3.0T, T1	3.0T, T2
Salivary Gland	Prostate	Prostate	Prostate	Prostate
SAT (Subcutaneous Fat)	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004
	Gold et al., 2004	Gold et al., 2004	Gold et al., 2004	Gold et al., 2004
Spinal Cord	Stanisz et al., 2005	Stanisz et al., 2005	Stanisz et al., 2005	Stanisz et al., 2005
Spleen	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004
Thalamus	Kingsley et al., 1998	Thayyil et al., 2012	Gelman et al., 2001	Lee et al., 2006
	Rooney et al., 2007	Whittall et al., 1997	Lee et al., 2006	
	Steen et al., 2000			
	Thayyil et al., 2012			
	Whittall et al., 1997			
Trachea	Cartilage	Cartilage	Cartilage	Cartilage
Ureter\Urethra	Blood Vessel Wall	Blood Vessel Wall	Blood Vessel Wall	Not in Database
Uterus	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004
Vagina	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004	de Bazelaire et al., 2004

N/A: A value exists in the database for a certain tissue parameter but its reference is no longer traceable, **None:** The property is not existent for the tissue in question, **Not in Database:** Values for that property are not yet included in the material properties database.