University of Nebraska Medical Center

DCD Heart Transplantation – from Bench to Bedside

Marian Urban MD, PhD

3/8/2024

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University of Nebraska Medical Center

DCD Heart Transplantation

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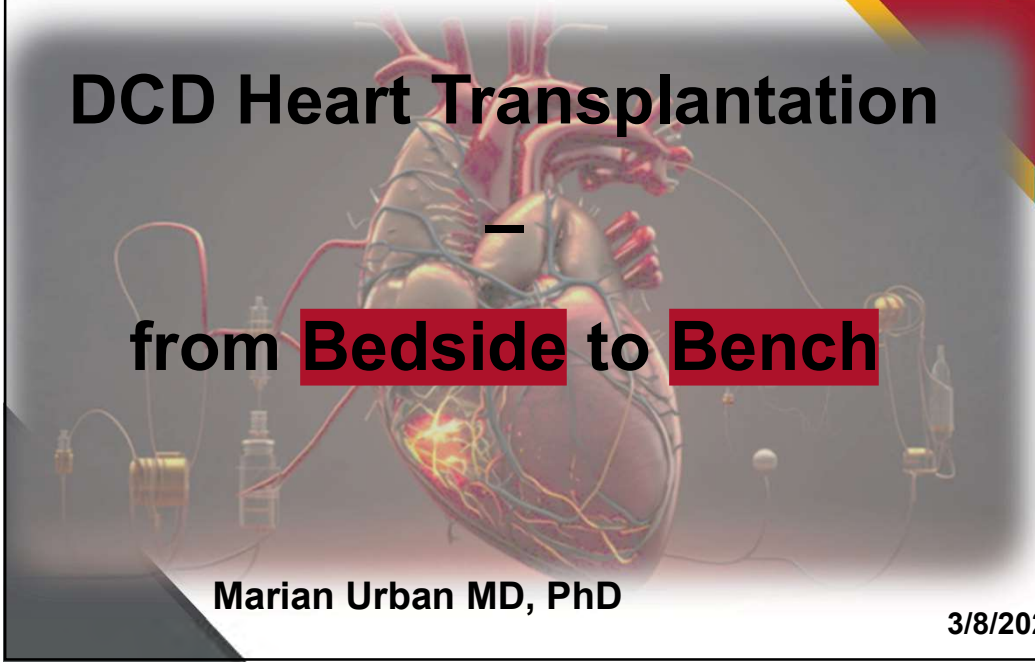
from Bedside to Bench



Marian Urban MD, PhD

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Questions

1) Does DCD heart transplantation work

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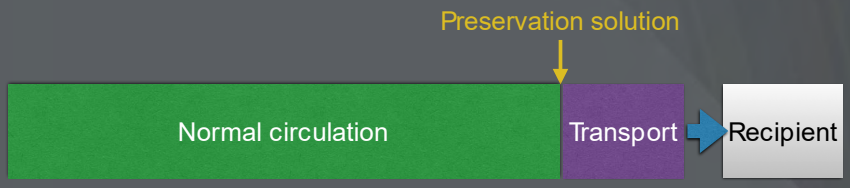
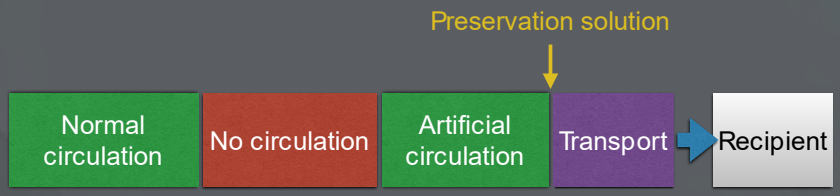
Background

Donation After Brain Death



Donation After Circulatory Death



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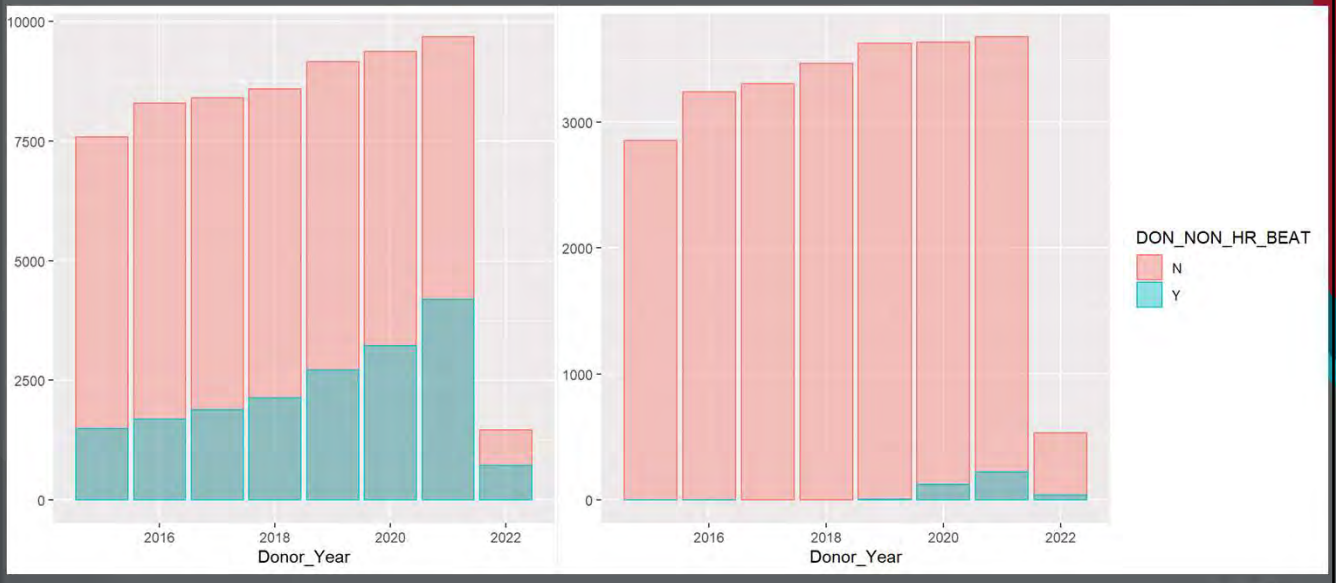

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Questions

1) Does DCD heart transplantation work?
2) What are the parameters under which the DCD heart transplantation works? Do DCD heart grafts need to be resuscitated?

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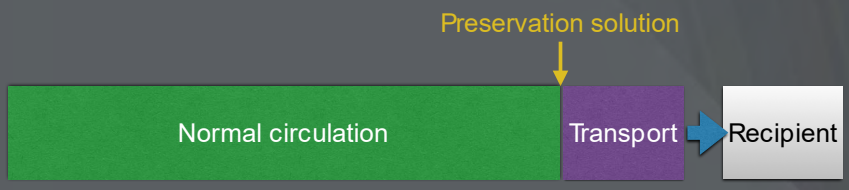
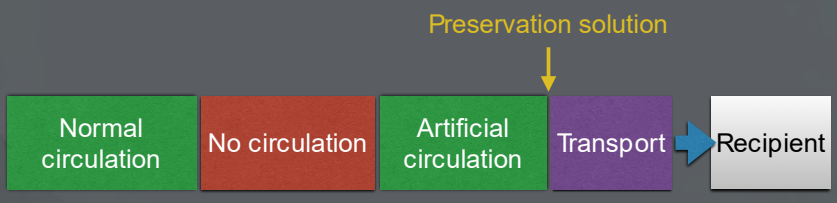
Background

Donation After Brain Death



Donation After Circulatory Death



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TIME	HEART RATE/ RHYTHM	BLOOD PRESSURE/MAP	RR/SaO2
2117	SR	114/64	11
2118	95	SR	101/69
2119	106	ST	113/85
2120	104	ST	119/67
2121	116	ST	125/81
2122	107	ST	125/82
2123	107	ST	134/61
2124	107	ST	123/69
2125	114	ST	121/69
2126	105	ST	123/81
2127	105	ST	113/67
2128	104	ST	117/67
2129	104	ST	117/68
2130	106	ST	118/81
2131	106	ST	113/68
2132	105	ST	115/82
2133	106	ST	119/68
2134	112	ST	131/103
2135	113	ST	149/74
2136	117	ST	173/90
2137	123	ST	170/88
2138	123	ST	160/79
2139	116	ST	160/80
2140	116	ST	148/67
2141	112	ST	131/66
2142	109	ST	138/60
2143	109	ST	123/59
2144	107	ST	118/62
2145	108	ST	117/65
2146	104	ST	127/62
2147	112	ST	134/66
2148	119	ST	148/72
2149	111	ST	133/68
2150	115	ST	134/65
2151	120	ST	102/64
2152	122	ST	145/67
2153	118	ST	140/100
2154	114	ST	143/67

TIME	HEART RATE/ RHYTHM	BLOOD PRESSURE/MAP	RR/SaO2
2155	114	ST	137/105
2156	121	ST	145/79
2157	123	ST	137/91
2158	131	ST	181/90
2159	126	ST	160/87
2200	124	ST	141/64
2201	112	ST	130/68
2202	119	ST	148/70
2203	116	ST	146/71
2204	117	ST	151/74
2205	122	ST	142/80
2206	123	ST	140/77
2207	124	ST	148/79
2208	123	ST	153/75
2209	123	ST	155/74
2210	121	ST	143/70
2211	120	ST	144/64
2212	118	ST	141/67
2213	117	ST	141/67
2214	118	ST	133/67
2215	120	ST	136/105
2216	119	ST	129/102
2217	117	ST	124/104
2218	117	ST	136/103
2219	118	ST	131/104
2220	118	ST	131/103
2221	118	ST	124/102
2222	118	ST	123/102
2223	120	ST	123/102
2224	120	ST	118/100
2225	120	ST	129/102
2226	120	ST	124/101
2227	118	ST	124/101
2228	115	ST	116/101
2229	115	ST	125/102
2230	118	ST	126/100
2231	115	ST	129/101
2232	115	ST	125/102

TIME	HEART RATE/ RHYTHM	BLOOD PRESSURE/MAP	RR/SaO2
2233	121	ST	140/70
2234	123	ST	139/108
2235	123	ST	141/108
2236	123	ST	139/108
2237	126	ST	140/107
2238	124	ST	137/107
2239	124	ST	137/104
2240	124	ST	135/105
2241	123	ST	131/102
2242	123	ST	131/103
2243	123	ST	129/103
2244	123	ST	132/104
2245	123	ST	134/104
2246	123	ST	130/104
2247	123	ST	130/104
2248	125	ST	131/107
2249	125	ST	126/107
2250	125	ST	131/105
2251	128	ST	130/105
2252	128	ST	129/105
2253	128	ST	124/103
2254	128	ST	126/103
2255	128	ST	122/102
2256	128	ST	123/103
2257	128	ST	121/101
2258	126	ST	119/101
2259	126	ST	118/101
2300	126	ST	114/59
2301	126	ST	113/100
2302	126	ST	110/100
2303	126	ST	110/100
2304	125	ST	118/100
2305	128	ST	117/101
2306	128	ST	124/107
2307	128	ST	110/104
2308	126	ST	113/99
2309	125	ST	102/95
2310	117	ST	137/67

TIME	HEART RATE/ RHYTHM	BLOOD PRESSURE/MAP	RR/SaO2
2311	112	ST	81/44
2312	110	ST	78/42
2313	106	ST	74/49
2314	105	SR	107/58
2315	58	SB	57/30
2316	58	SB	53/28
2317	53	SB	50/27
2318	50	SB	46/25
2319	47	SB	38/23
2320	28	SB	28/21
2321	24	SB	23/19
2322	18	SB	14/12
2323	0	asystole	—

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DCD Grid

e/Time	Heart Rate	Blood Pressure	MAP	O2 Sat
06:37	91	113 / 71	85	97
06:38	91	114 / 72	86	97
06:39	94	113 / 72	86	97
06:40	99	112 / 71	85	95
06:41	101	100 / 52	68	93
06:42	104	103 / 61	75	77
06:43	102	88 / 48	61	56
06:44	84	55 / 27	36	51
06:45	54	43 / 21	28	47
06:46	46	40 / 23	29	48
06:47	50	61 / 53	56	46
06:48	43	70 / 56	61	47
06:49	54	83 / 59	67	44
06:50	57	85 / 59	68	43
06:51	35	91 / 56	68	44
06:52	35	87 / 55	66	43
06:53	39	50 / 50	50	43
06:54	28	47 / 40	42	47
06:55	25	28 / 28	28	0
06:56	19	28 / 28	28	0
06:57	0	0 / 0	0	0
07:01		/	0	
08:32		/	0	

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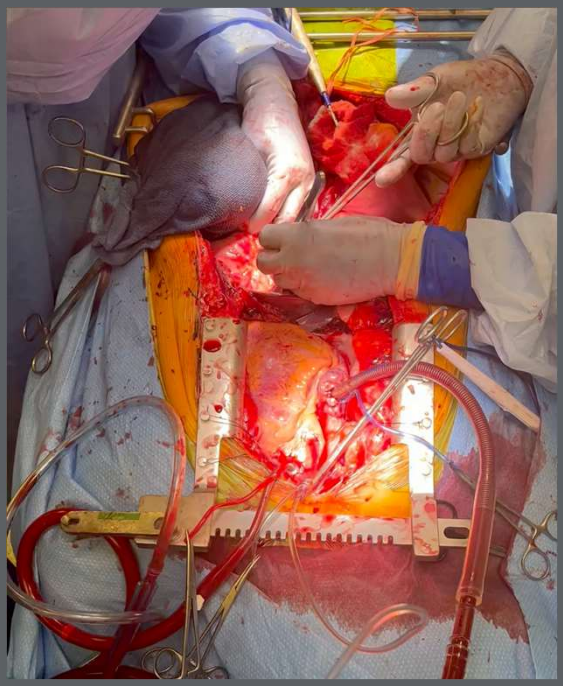

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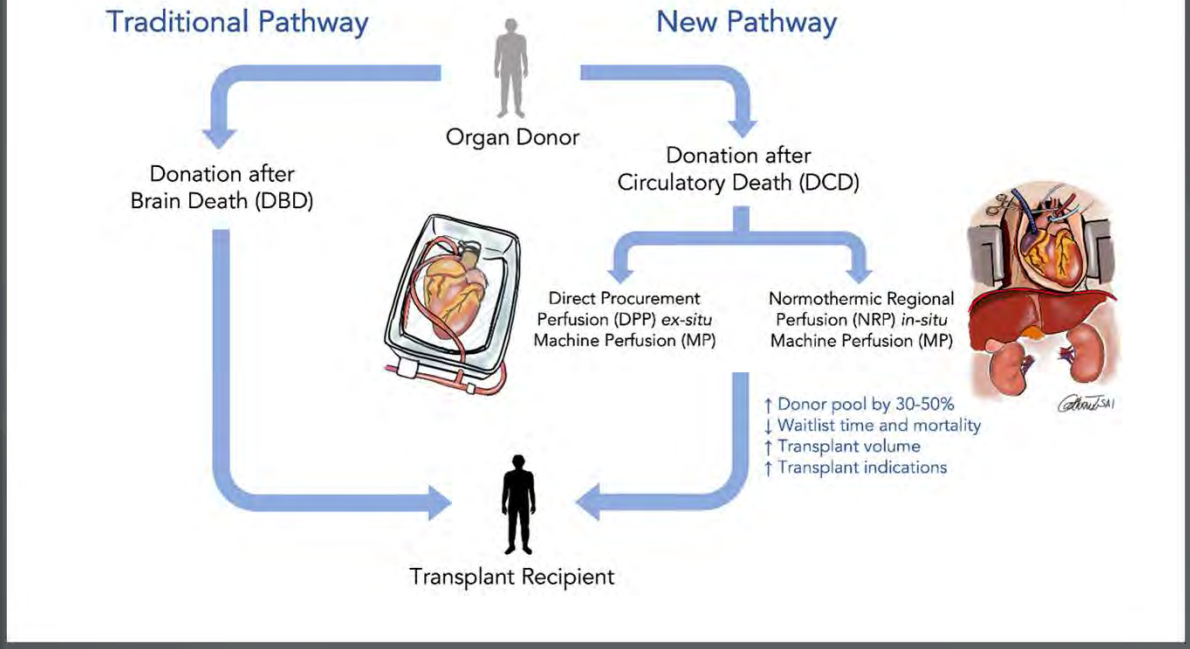

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Questions

1) Does DCD heart transplantation work?
2) What are the parameters under which the DCD heart transplantation works? Do DCD heart grafts need to be resuscitated?
3) What is the best procurement technique?

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Transport/ Storage

Preserve the organ during transport from a recovery hospital to an implant center

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Ischemic heart preservation

Static cold storage with ice

Controlled static cold storage

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Non - Ischemic heart preservation

Normothermic

Trans-medics

Hypothermic

XVIVO

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Questions

1) Does DCD heart transplantation work
2) What are the parameters under which the DCD heart transplantation would work. Do DCD heart grafts need to be resuscitated
3) What is the best procurement technique?
4) What is the optimal transport method of DCD grafts?

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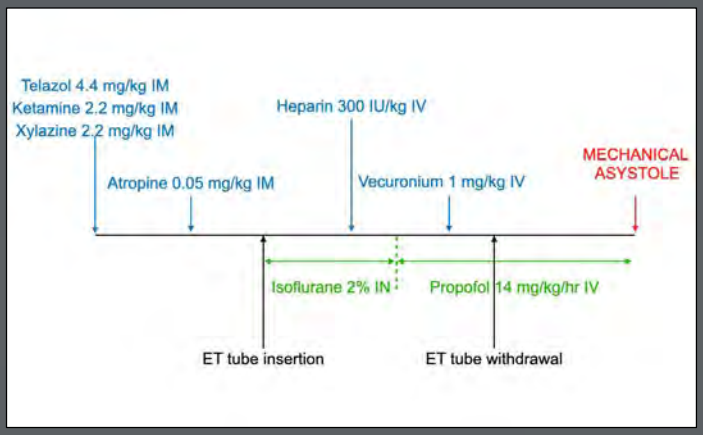
Methods

Porcine model of hypoxic cardiac arrest



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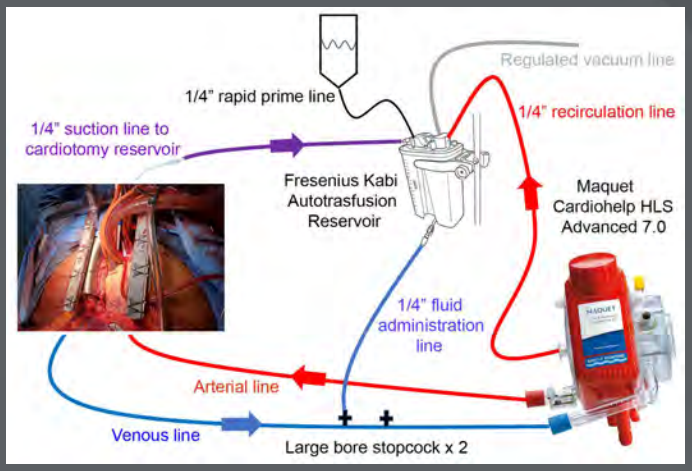
Methods

In-situ DCD heart reanimation



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Methods

Ex-situ DCD heart reanimation

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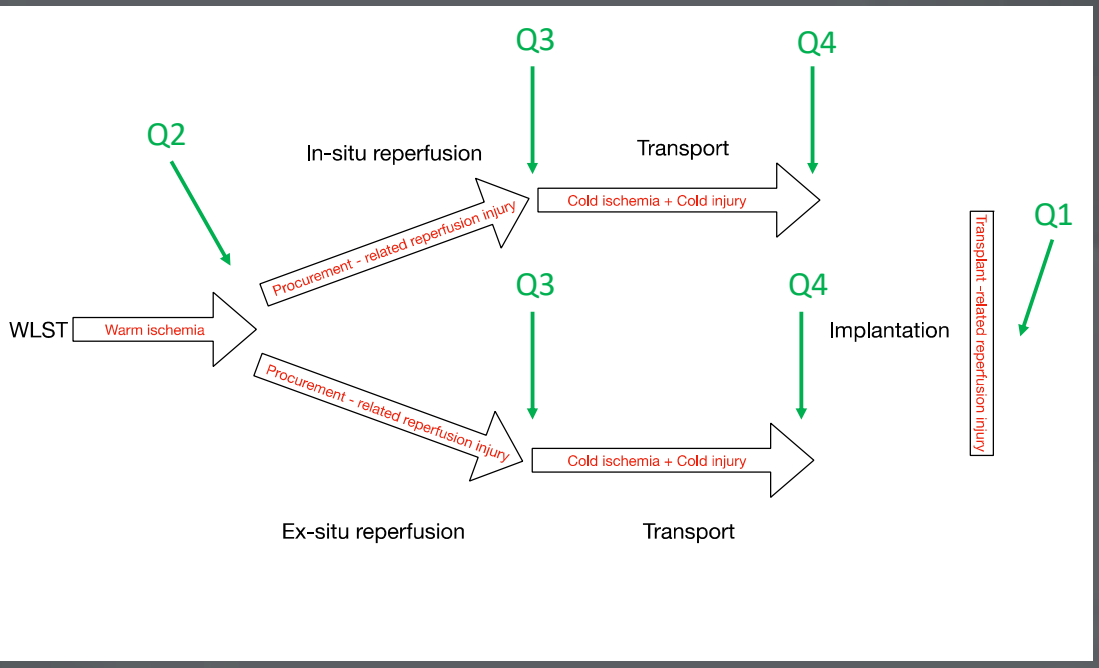

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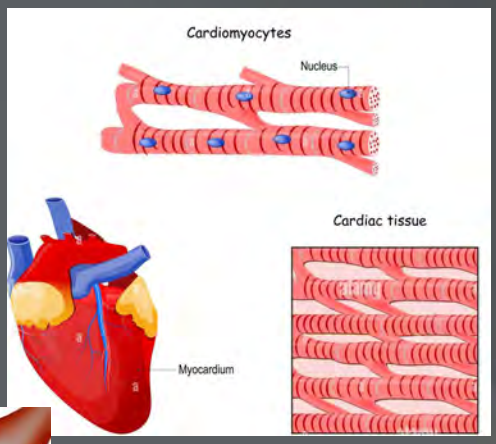
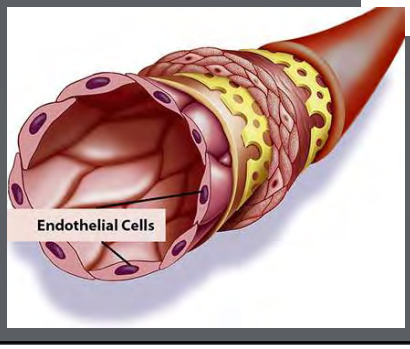
Graft function

1) Happy functioning cardiomyocyte

2) Endothelium





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Methods

1. Cell morphology and structure
2. Cell function
3. Cell energetics

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