BIOLOGICAL HANDBOOKS

Biology Data Book

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VOLUME I

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7. DIMENSIONS OF VERTEBRATE CELLS

The precise measurement of cellular dimensions has not been an active research area in recent years. In part, this arises from some of the inherent uncertainties involved in measuring cells: agonal changes with accompanying shrinkage and distortion, or expansion of fixed cells; cells that do not have the morphology of regular geometric solids; the problem of detection and measurement of microvilli and other projections of the cell surface not well-resolved by the light microscope; and artifacts produced by the phase or differential interference (Nomarski) light microscope. The examination of living cells usually requires strict control of the osmotic environment. Biological problems arise from differences in age, sex, metabolism, and nutrition that affect many types of cells [ref. 8]. Electronic methods of measuring with Coulter or Cytograf-type machines usually assume cells of a smooth, regular shape with consistent conductivity or refractive index. Transmission light microscopy is both arduous and subject to operator error. The data represent an effort to sample selectively the literature for recent information. The values should be accepted only after judicious consideration of the points raised above.

Method: TLM & M = transmitted light microscope with optical micrometer; PLIM = polarized light interference microscope. **Value:** Where two values are separated by "X," the first is for the long axis and the second is for the short axis of the cell. Data in brackets refer to the column heading in brackets. Values in parentheses are ranges, estimate "c" (*see* Introduction).

	Tissue	Species [Specification]	Osmotic Environment [Fixative]	Method	Value	Reference
			Diameter			
1	Erythrocytes	*Clupea harengus*	[Dried]	TLM & M	10 μ X 6.7 μ	11
2	Thymocytes	*Mus* sp. [C57BL/6 Jax]	Saline-phosphate, pH 7.2	Coulter	8.3 μ 1/	9
3					5.9 μ 2/	
4					9.0 μ 3/	
5			[Zenker's solution]	TLM & M	7.5 μ 1/	9
6					6.3 μ 2/	
7	Ehrlich ascites cells	*Mus* sp. [White]	310 mosmolar	TLM & M	15.9 ± 1.4 μ	7
8			103 mosmolar	TLM & M	19.6 ± 2.3 μ	7
9		[Tissue culture]	Hank's saline	TLM & M	18.49 μ	4
10	Oocytes	*Mus* sp. [Swiss; ♀]	310 mosmolar	TLM & M	74.8 μ	5

1/ Whole population. 2/ "Small" population. 3/ "Large" population.

continued

	Tissue	Species [Specification]	Osmotic Environment [Fixative]	Method	Value	Reference
11	Superovulated	*Mus* sp. [Swiss; ♀]	0.9% saline	PLIM	75.9 μ X 74.1 μ	1
	Breast cancer					
12	Ductal	*Homo sapiens* [♀]	[Ethanol]	TLM & M	15.6 ± 6.4 μ	2
13	Lobular	*Homo sapiens* [♀]	[Ethanol]	TLM & M	12.4 ± 1.8 μ	2
	Skin: stratum corneum					
	Scalp	*Homo sapiens*				
14		[5 & 6 mo old; 2♂, 2♀]	.....	TLM & M	36.9 ± ∿2-3 μ X 24.5 ± ∿2-3 μ	8
15		[21-31 yr old; 4♂]	.....	TLM & M	36.2 ± ∿3 μ X 30.8 ± ∿3 μ	8
16		[24-31 yr old; 3♀]	.....	TLM & M	41.0 ± ∿2-3 μ X 33.6 ± ∿2-3 μ	8
	Upper arm	*Homo sapiens*				
17		[5 & 6 mo old; 2♂, 2♀]	.....	TLM & M	36.9 ± ∿2-3 μ X 30.3 ± ∿2-3 μ	8
18		[21-31 yr old; 4♂]	.....	TLM & M	40.4 ± ∿3 μ X 33.2 ± ∿3 μ	8
19		[24-31 yr old; 3♀]	.....	TLM & M	40.8 ± ∿2-3 μ X 34.6 ± ∿2-3 μ	8
	Heel	*Homo sapiens*				
20		[5 & 6 mo old; 2♂, 2♀]	.....	TLM & M	31.7 ± ∿2-3 μ X 24.9 ± ∿2-3 μ	8
21		[21-31 yr old; 4♂]	.....	TLM & M	39.9 ± ∿3 μ X 25.8 ± ∿3 μ	8
22		[24-31 yr old; 3♀]	.....	TLM & M	39.8 ± ∿2-3 μ X 29.4 ± ∿2-3 μ	8
23	Fat cells (adipocytes)	*Homo sapiens*	Krebs-Ringer + 4% albumin	TLM & M	94.0 μ	10
			Volume			
24	Hepatocytes, disaggregated	*Rattus* sp.	0.9% saline	PLIM, from diameter	10,000[4/] (5,000-35,000) μ^3	3
25	Jejunum: crypt cells	*Mus* sp. [BALB/c]	[Zenker's solution]	TLM & M, as a cylinder	660,000 ± 10,000 μ^3	6
26	Thymocytes	*Mus* sp. [C57BL/Jax]	Phosphate-buffered saline, pH 7.2	Coulter volumetric	310.8 ± 7 μ^3 [1/]	9
27					104.9 ± 2 μ^3 [2/]	
28					375.1 ± 7 μ^3 [3/]	
29			[Zenker's solution]	TLM & M, from diameter	234.7 ± 15 μ^3 [1/]	9
30					141.5 ± 3 μ^3 [2/]	
31					354.0 ± 34 μ^3 [3/]	
32	Ehrlich ascites cells	*Mus* sp. [Tissue culture]	Hank's saline, 300 mosmolar	TLM & M, from diameter	2618 μ^3	4
33				Coulter	2704 μ^3	4
34	Oocytes	*Mus* sp. [Swiss; ♀]	0.9% saline	PLIM, from diameter	189,500 ± 2200 μ^3	1
35	Ova, fertilized	*Mus* sp. [Swiss; ♀]	0.9% saline	PLIM, from diameter	165,000 ± 2400 μ^3	1

[1/] Whole population. [2/] "Small" population. [3/] "Large" population. [4/] Mode.

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