Surface Areas and Recommended Medium Volumes for Corning® Cell Culture Vessels

Application Note

CORNING

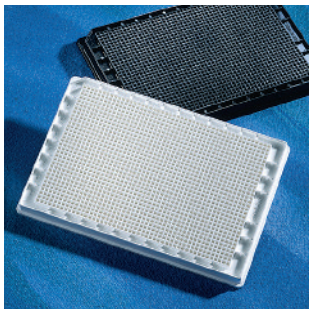
Introduction

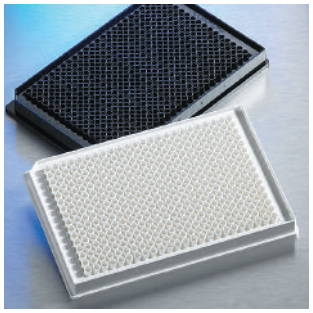
This guide gives the recommended medium volumes, approximate growth surface areas and average cell yields for Corning disposable cell culture vessels.

Approximate growth surface areas are based on calculations made from engineering drawings. These calculations do not take into consideration minor variations that can occur in products during molding or the ability of many cell lines to grow up the sides of the vessels which can considerably increase the available surface area. For critical work, we suggest that you fix and stain cultures and then carefully calculate the actual growth surface area.

In general, at least 1 x 10^5 cells/cm^2 can be produced when growing cells as attached monolayers in culture. The average cell yields used here are based on this number. Actual cell yields can easily be several times higher or lower than this depending on the cell line and culture conditions.

Maintaining optimal cell to medium ratios is important for obtaining good cell growth. As a starting point, we recommend 0.2 mL to 0.3 mL medium for each square centimeter of culture vessel growth surface area; most of the recommended medium volume levels used in the tables below are based on this ratio. Medium volume recommendations for microplates and Transwell® inserts are higher due to meniscus effects associated with very small spaces and a higher rate of evaporation. Using more medium may reduce the need for feeding the cultures, but, due to the increased medium depth and the static nature of the environment, it will also slow the diffusion of oxygen to the cells.





Corning® Microplates

Microplate	Well Diameter (Bottom) (mm)	Single Well Only: Approx. Growth Area (cm^2)	Average Cell Yield	Total Well Volume (µL)	Working Volume (µL)
Corning 1536 Well Microplates					
Low Volume	1.2	0.011	1.2×10^3	2.3	1 – 1.5
Clear Flat Bottom	1.63*	0.025	2.5×10^3	12.5	5 – 10
Solid Flat Bottom	1.53*	0.023	2.3×10^3	12.5	5 – 10
Corning 384 Well Microplates					
Standard	2.7 x 2.7*	0.056	5.6×10^3	112	25 – 50
Low Volume	2.0	0.031	3.1×10^3	50	5 – 40
Corning 96 Well Microplates					
Flat Bottom	6.4	0.32	3.2×10^4	360	100 – 200
Round Bottom	6.4	NA**	NA**	330	100 – 200
V Bottom	6.4	0.38	3.8×10^4	320	100 – 200
Half Area	4.5	0.16	1.6×10^4	190	50 – 100

*Square wells.
*Because these wells are round, the surface area available for cell attachment is dependent on the medium volume used.

Multiple Well Plates

Plate	Well Diameter (Bottom) (mm)	Single Well Only: Approx. Growth Area (cm^2)	Average Cell Yield	Total Well Volume (mL)	Working Volume (mL)
6 well	34.8	9.5	9.5×10^5	16.8	1.9 – 2.9
12 well	22.1	3.8	3.8×10^5	6.9	0.76 – 1.14
24 well	15.6	1.9	1.9×10^5	3.4	0.38 – 0.57
48 well	11.0	0.95	9.5×10^4	1.6	0.19 – 0.285

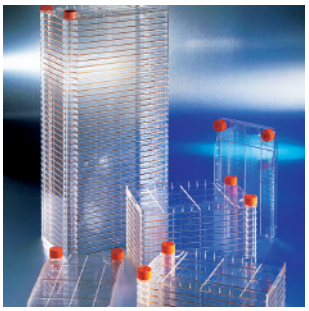
Transwell® Permeable Supports

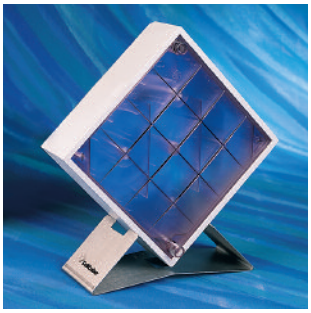
Transwell Insert Format	Transwell Insert Diameter (mm)	Approx. Growth Area (cm^2)	Average Cell Yield	Recommended Volume (mL): Well	Recommended Volume (mL): Insert
96 well	4.26 mm	0.143 cm^2	1.4×10^4	0.235	0.075
24 well	6.5 mm	0.33 cm^2	3.3×10^4	0.6	0.1
12 well	12 mm	1.12 cm^2	1.12×10^5	1.5	0.5
6 well	24 mm	4.67 cm^2	4.67×10^5	2.6	1.5
100 mm dish	75 mm	44 cm^2	4.4×10^6	13.0	9.0

Corning Dishes

Dish	Approx. Growth Area (cm^2)	Average Cell Yield	Recommended Volume (mL)
35 mm*	9	9.0×10^5	1.8 – 2.7
60 mm*	21	2.1×10^6	4.2 – 6.3
100 mm*	55	5.5×10^6	11 – 16.5
150 mm*	152	1.52×10^7	30.4 – 45.6
245 mm†	500	5.0×10^7	100 – 150

*Not actual bottom diameters.
†Dish is square.





Corning® Flasks

Flask	Approx. Growth Area (cm^2)	Average Cell Yield	Recommended Medium Volume (mL)	Approx. Total Flask Volume (mL)
25 cm^2	25	2.5×10^6	5 – 7.5	50 triangular, 70 rectangular
75 cm^2	75	7.5×10^6	15 – 22.5	290 rectangular, 300 triangular
RoboFlask™	92.6	9.26×10^6	18 – 27	116
Low profile	100	1.0×10^7	20 – 30	225
150 cm^2	150	1.5×10^7	30 – 45	600
162 cm^2	162	1.6×10^7	32 – 48	720
175 cm^2	175	1.75×10^7	35 – 52.5	790
225 cm^2	225	2.25×10^7	45 – 67.5	900 rectangular, 1000 traditional
235 cm^2	235	2.35×10^7	47 – 70.5	900
HYPER*Flask*®	1720	1.72×10^8	560 – 565	560 – 565

Corning Stacked Chambers

Chamber Size	Approximate Growth Area (cm^2)	Average Cell Yield	Recommended Medium Volume (mL)
CellSTACK® Chambers			
1 layer	636	6.36×10^7	127 – 191
2 layer	1,272	1.27×10^8	254 – 382
5 layer	3,180	3.18×10^8	636 – 954
10 layer	6,360	6.36×10^8	1,272 – 1,908
40 layer	25,440	2.54×10^9	5,088 – 7,632
HYPER*Stack*® Chambers			
12 layer	6,000	6.0×10^8	1,300
36 layer	18,000	1.8×10^9	3,900
120 layer	60,000	6.0×10^9	13,000

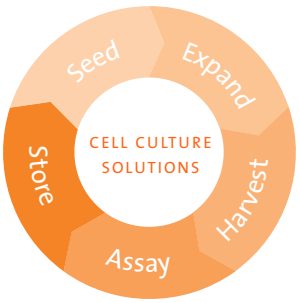
Corning Roller Bottles

Roller Bottle	Approximate Growth Area (cm^2)	Average Cell Yield	Recommended Medium Volume (mL)
490 cm^2	490	4.9×10^7	100 – 150
850 cm^2	850	8.5×10^7	170 – 255
1700 cm^2 ESRB	1,700	1.7×10^8	340 – 510
1750 cm^2	1,750	1.75×10^8	350 – 525

Corning CellCube® Systems

CellCube Module	Approximate Growth Area (cm^2)	Average Cell Yield	Recommended Medium Volume (mL)
10 Stack	8,500	8.5×10^8	NA*
25 Stack	21,250	2.13×10^9	NA*
50 Stack	42,500	4.25×10^9	NA*
100 Stack	85,000	8.5×10^9	NA*

*Not applicable; these systems are perfused with medium from a reservoir.



Beginning-to-end Solutions for Cell Culture

At Corning, cells are in our culture. In our continuous efforts to improve efficiencies and develop new tools and technologies for life science researchers, we have scientists working in Corning R&D labs across the globe, doing what you do every day. From seeding starter cultures to expanding cells for assays, our technical experts understand your challenges and your increased need for more reliable cells and cellular material.

It is this expertise, plus a 160 year history of Corning innovation and manufacturing excellence, that puts us in a unique position to offer a beginning-to-end portfolio of high-quality, reliable cell culture consumables.

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