HISTO PROCEDURES: Examining Costs

Comparing surveyed data and standard wages, turnaround times and expenses can reveal the price of histology.

By René J. Buesa, HTL(ASCP)

Although any well run histology laboratory has a clear idea of its procedural costs, that information is seldom shared, nor has it been published elsewhere.

The only available information about costs was sent to 14 participants of an Internet survey conducted by Jackson Laboratory, Bar Harbor, ME, and even those figures were collected and reported as ranges for three routine procedures and two types of general special tests only.[1]

Because costs are essential for budget preparation, control and supplies management, the average productivity for 22 routine and 19 special tasks were used to calculate their costs, and are presented as material and labor components for each test, run or slide and even for whole sequential procedures.

The information used for the averages came from answers to a survey conducted between November 2005 and February 2006, including ▶

TABLE 1: COSTS OF ROUTINE PROCEDURES

Procedure	Time: Minutes Per Unit	Time: h/100 Units	*n* Labs	Cost Per Unit ($): Materials	Cost Per Unit ($): Labor	Cost Per Unit ($): Total
grossing	0.72	1.2		0.69	0.26	0.95
gross only (no other task)	0.50	0.8	17		0.18	0.87
cassetting	2.04	3.4		0.22	0.75	0.97
routine paraffin block	2.76	4.6	33	0.57	1.01	1.58
embedding	0.96	1.6	38	0.12	0.35	0.47
prepare blocks to section	0.36	0.6	33	< 0.005	0.09	0.09
label slides	0.36	0.6		< 0.005	0.09	0.10
trim blocks	0.54	0.9	36	0.04	0.20	0.24
section blocks	2.10	3.5	38	0.49	0.77	1.26
stain with H&E:						
■ manual	1.38	2.3	14	0.34	0.51	0.85
■ automated	0.60	1.0	32		0.15	0.49
cover-slip:						
■ manual	0.48	0.8	15	0.20	0.18	0.38
■ automated	0.18	0.3	33	0.09	0.05	0.14
grossing to slide:						
■ manual	8.94	14.9		2.11	3.20	5.31
■ manual + automated	7.86	13.1	33	2.00	2.71	4.71
cassette to slide:						
■ manual	8.22	13.7		1.42	2.95	4.36
■ manual + automated	7.14	11.9		1.31	2.45	3.76
processing:						
■ small biopsies	1.50	2.5		0.27	0.00	0.27
■ routine standard specimens	1.32	2.2				
■ large specimens	10.02	16.7	10			
micro steps:						
■ (Q5)	9.0	15.0		1.72	3.09	4.81
■ (Q10)	14.0	23.3		3.43	4.72	8.15

TABLES/COURTESY RENÉ J. BUESA

33 participating labs from the U.S. and 14 foreign countries.[2] Published data for general procedures from 12 labs and for electron microscopy from 13 additional labs also was included.[3,4]

Cost Calculation

The materials component of the cost was determined by calculating supply requirements for each procedure according with known standards of performance and competency descriptions, multiplied by current prices from suppliers' catalogs.[5]

The salary component was derived from the average productivity for each task expressed as time required (minutes/unit or hours/100 units), multiplied by a base salary of $15/hour for unlicensed tasks, $22/hour for routine licensed and $25/hour for special licensed tasks (**Table 1**).

Single task costs vary from $0.09 (preparing one block to section) to $1.26 (sectioning one block) and whole sequential procedures, such as grossing to cover-slipping (slides ready for the pathologist) cost $5/block with savings as high as about 15 percent when some tasks are automated.

The reagent cost for tissue processing was determined by the total number of cassettes processed, regardless of how much time or how many individual runs it took to get to any predetermined cutoff limit.

The time to process small biopsies was calculated for a short cycle (2.5 hours) and 100 cassettes/run.

Standard specimens were calculated with a general cycle (6.5 hours) for 300 cassettes/run, and large specimens at 100 cassettes/run during a 16.7 hour processing (long protocol). The two processing times influence turnaround time but have no salary value.

TABLE 2: COSTS OF SPECIAL PROCEDURES

Procedure	Time (hours) per Min. Per Unit	100 units, Run or Test	*n* Labs	Cost Per Unit ($) Materials	Labor	Total
frozen section (CPT 88331)	13.0	0.22 h/unit	40	0.70	4.84	5.54
decalcification (CPT 88331)		hours/100	10		0.73	
■ with RDO	2.0	3.3		0.62		1.35
■ with EDTA	2.0	3.3		4.68		5.41
HC organisms (CPT 88300/88312) (34 min/test with 10 slides/batch)	3.4	5.7	33	0.56 1.17 1.69	1.43	1.98 2.60 3.12
for tissue components (CPT 88313) (1 h/test with 10 slides/batch)	6.0	10.0		0.39 1.69 2.61	2.50	2.89 4.19 5.11
IHC: (CPT 88342) (slides/run) manual for		hours/run or test				
■ 1 slide	132.0	2.2			55.00	62.54
■ 30 slides	14.0	7.0	25	7.54	5.83	13.37
automated for						
■ 7 slides	28.0	3.3			11.79	19.33
■ 48 slides	6.0	4.8			2.50	10.04
Her 2 Neu: 12 slides	12.5	2.5	3	14.40	62.50	76.90
DIF (2-6 slides) (CPT 88346)	10.0	2.0	7	2.80	50.00	52.80
INDIF:						
■ (1 titer) (CPT 88347)	45.0	1.5		1.39	37.50	38.89
■ with additional titers	30.0	3.0		1.60	75.00	76.60
ISH and FISH	—	3.5	4	36.00	87.50	123.55
TEM (1 case/procedure)	—	13.2	17	22.10	330.00	352.10

CPT=current procedural terminology (CPT) code.

The time assigned for micro-steps (Q5 or Q10) requested in addition to the regular slides include printing the request, locating/pulling the block, numbering slides, sectioning to cover-slipping and forwarding the slides to the pathologist (**Table 2**).

Result quality should overrule any economic consideration.

Cheaper when automated and in large batches or runs, the most expensive individual procedure ($352/case) is the transmitted electron microscopy (TEM) test (this is one of the factors contributing to its decline). Nowadays TEM usage is almost exclusively limited to visualizing kidney glomerular damage, cross sectioning cilia axonemes and developing melanosomes, yielding its previous popularity and diagnostic usefulness to the ever-present immunohistochemistry (IHC) procedures.

Material costs for histochemistry (HC) tests vary from $0.39 to $0.56/slide when preparing the solutions in the laboratory, from $1.17 to $1.69/slide when using commercial solutions, and the cost rises from $1.69 to $2.61/slide when employing commercial kits.

Lab administrators/managers should consider these cost increments when deciding to switch from laboratory prepared solutions to commercial kits because there should be a balance between profitability reduction and cost increase because of alleged greater consistency.

The IHC detection system also influences the cost and can vary from $0.63/slide with a chain-polymer technology to $0.90/slide with the more conventional avidin-biotin complex for mouse antibodies, but in this case, result quality should overrule any economic consideration. If the washing buffers and the antigen retrieval solutions are prepared in the lab, the material costs/slide can be reduced from 5 to 8 percent.[6]

The time used for decals is independent of the method (acid with routine acid decalcification [RDO] or with a chelating agent like ethylenediaminetetraacetic acid [EDTA]) and refers to the actual handling of the spec-

TABLE 3: PROCEDURE COST VARIATIONS

Procedure	Material + Labor	*n* Labs	Reference (1) From	To	Average	Labs
paraffin block (gross to embedded)	1.92	38	0.50	5.50	2.36	
H&E slide (embedded to cover slip):						
■ all manual	3.67	14	0.75	6.50	1.94	12
■ automated staining and cover slipping	2.98	32	0.75	6.50	1.94	
■ average cost for manual and automated	3.33	32	0.75	6.50	1.94	
frozen section slide	5.54	40	1.25	3.75	2.85	11
HC slide for organisms and tissue components manual with:						
■ solutions made in the lab	2.44	33	1.25	8.75	4.58	12
■ commercial solutions	3.40	33	1.25	8.75	4.58	12
■ commercial staining kits	4.12	33	1.25	8.75	4.58	12
IHC slide:						
■ manual procedure (30 slides/run)	13.37	25	7.50	> 20.00	12.25	10
■ auto-stainer (48 slides/run)	10.04	25	7.50	> 20.00	12.25	10
■ average cost for manual and automated	11.71	25	7.50	> 20.00	12.25	10

Unit: U.S. Dollars

imens, not to the time required for the decalcification to take place.

Immunofluorescence, direct (DIF) or indirect (INDIF), are methodologically different, and INDIF costs are almost doubled when additional titers are needed for *Pemphigus vulgaris* positive cases.

For in situ hybridization (ISH) and fluorescence ISH (FISH), the 3.5 hours refer to the hands-on work/test before and after the actual hybridization step that usually takes place overnight (in the dark for FISH) during 14 to 18 hours at constant temperature (37° C).

Comparison

The Jackson Laboratory researchers presented data sent to Internet survey participants as ranges, and their averages were calculated using class midpoints, and include only three general routine procedures and data for HC and IHC, none of which specify the methodology.[1]

Six of the costs calculated from the productivity averages are lower, five are higher and all, except for frozen sections, are within the compared ranges.[1]

The average cost for all routine procedures from embedding to cover-slipping varies from $2.98 to $3.67/slide, depending if all tasks are manual or if some are automated, and both values are within the compared ranges **(Table 3)**.[1]

Average cost for HC when using all types of solutions ($3.32/slide) and for IHC ($11.71/slide) are both lower than the referenced averages and within their ranges.[1] ■

Conclusions

The data offer the following conclusions about histology costs:

- The total cost from grossing the specimen to the slide being ready for the pathologist varies from $5.31/block if all tasks are manual, to $4.71/block if some tasks are automated; equivalent to a 13 percent cost reduction.
- Depending on the targeted organism or tissue component and the solution source, histochemical procedures cost between $1.98 and $5.11/slide.
- IHC procedure costs vary between $10 and $13/slide, depending on the size of the run and the method used to complete it; with a 6 percent cost reduction if buffers and antigen retrieval solutions are prepared in the lab.

References

1. Bechtold L. Histology survey. Internet survey of 14 laboratories conducted by the Jackson Laboratory, Bar Harbor, ME, Feb. 21-27, 2006 and e-mailed to participants on March 24, 2006.
2. Buesa RJ. Productivity in the histology laboratory. Florida Society for Histotechnology (FSH) annual spring meeting, Deerfield Beach, May 6, 2006.
3. LaFriniere M, Lewis S, Sheppard B, Carson F. A report from the National Society of Histotechnology Productivity Task Force. *J Histotechnol* 2006;27(4):293-295.
4. ADASP. Association of Directors of Anatomic and Surgical Pathology Hotline Surveys. Turnaround times in diagnostic electron microscopy. Available at: www.adasp.org. Last accessed Jan. 5, 2006.
5. Buesa RJ. Histology laboratory standards operating procedure manual. MSMC Department of Pathology and Laboratory Medicine.
6. Buesa RJ. Histochemistry: A case of unappreciated beauty? *J Histotechnol* 2003;26(2):91-97.

René J. Buesa is a retired histology supervisor/manager living in Mirimar, FL.