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Technical quality control in histopathology

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SUMMARY A pilot scheme for technical quality control in histopathology is described. The test material used and the methods of assessment and reporting are detailed. The scheme outlines not only interlaboratory comparison of technical performance but also provides a method of sharing uncommon material.

Quality control in chemical pathology, haematology, and clinical microbiology is current practice (British Medical Journal, 1977). The quality control of histopathology and cytology diagnosis is undertaken in different ways in different areas.

Technical quality control in histopathology can be of two types. Internal quality control is carried out in most departments, consisting of continuous checking of routinely stained sections for cutting artefacts and for adequacy of staining, and the inclusion of control slides with every batch subjected to special techniques.

External quality control is not current practice. It was decided to institute a pilot histopathology control scheme in Wales in order to assess its usefulness.

The scheme

SCOPE

Each histopathology department in Wales was invited to participate. Of the 21 departments invited, 17 accepted. Three departments missed the first month and three missed the first two months. Three departments withdrew from the scheme for various reasons after three, five, and six months respectively. Four departments declined the invitation. Each department was given a code number, known only to the organiser, and strict confidentiality was maintained.

MATERIAL

Each month all participating departments were sent a fixed block of tissue or a set of slides. The blocks for any one month were taken from the same specimen and were as closely similar as possible. When slides were sent, the sections were cut serially. The departments were asked to return a single stained and mounted section, either a haematoxylin and eosin or a special stain, sometimes both. The specimens sent are shown in Table 1.

ASSESSMENT

Four assessors reviewed each slide, two pathologists and two technicians. During the pilot scheme a total of six assessors were used.

Each assessor independently graded and scored each slide, using the following points system:

HS	Highly satisfactory	4
S	Satisfactory	3
S—	Adequate only	2
NS	Not satisfactory	1
—	No slide submitted	0

In addition the assessors were invited to comment on each slide.

REPORTING

A report was sent to each participating department each month. This showed each assessor's grading, the assessor's comments, the department's total score, and the mean.

Analysis

The time taken for the completed sections to be returned for assessment varied from two to 59 days with a mean of 15·6 days.

The time taken for the assessment to be completed varied from 14 to 45 days with a mean of 27·5 days.

MONTHLY ASSESSMENT

The results for each month are shown in Table 2. The results vary from month to month, depending on the technique and on the assessors. An analysis of the assessors is shown below.

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Table 1 *Control material*

Q Number	*Tissue*	*Presentation*	*Request*
1	Melanoma of intestine	Block in formol saline	(a) Haematoxylin and eosin (b) Melanin bleach H and E
2	Artery	Block in formol saline	(a) H and E (b) Elastic stain with van Gieson counter-stain
3	Liver	Paraffin section	Shikata method for Australia antigen
4	Lung	Block in formol saline	(a) Remove formalin pigment—H and E (b) Ziehl Neelsen with methylene blue counterstain
5	Liver	Two blocks in formol saline	(a) Frozen section for neutral fat (b) Paraffin section for reticulin
6	Kidney	Thin resin section	Methenamine silver for basement membranes
7	Ileum	Block in formol saline	(a) H and E (b) Masson Fontana for argentaffin cells (c) Diazo method for enterochromaffin
8	Lung	Block in corrosive formol	Phloxine-tartrazine for inclusion bodies
9	Thyroid	Block in formol saline	H and E
10	Spleen	Block in Zenker's fluid	(a) H and E (b) Giemsa
11	Uterus	Block in formol saline	(a) H and E (b) Haematoxylin and van Gieson
12	Rib	Block in buffered formalin	H and E

Table 2 *Monthly mean assessment*

Reference	*Description*	*Number Submitted*	*Mean assessment on slides submitted*
Q1a	Melanoma—H and E	9	9·9
Q1b	Melanoma—Bleach—H and E	9	8·8
Q2a	Artery—H and E	13	9·7
Q2b	Artery—Elastic	13	9·5
Q3	Liver section—Shikata orcein	16	7·6
Q4a	Lung—H and E (Remove formalin pigment)	14	9·6
Q4b	Lung—Ziehl Neelsen	14	8·1
Q5a	Liver—frozen—fat	9	9·4
Q5b	Liver—paraffin—reticulin	11	10·5
Q6	Kidney –resin section Methenamine silver	9	10·8
Q7a	Ileum—H and E	10	12·3
Q7b	Ileum—Masson Fontana	11	11·3
Q7c	Ileum—Diazo	11	12·4
Q8	Lung—Phloxine tartrazine	11	8·8
Q9	Thyroid—H and E	13	10·6
Q10a	Spleen—Zenker—H and E	11	9·3
Q10b	Spleen—Zenker—Giemsa	11	8·8
Q11a	Uterus—H and E	11	10·5
Q11b	Uterus—van Gieson	12	8·5
Q12	Rib—H and E	12	9·5

Table 3 *Annual performance*

	Assessment %	*Technical assessment only %*	*Slides*	
			Possible	*Actual*
	71·9	71·9	20	20
	66·0	66·0	18	18
	64·6	64·6	18	18
	55·6	55·6	20	20
	52·7	56·3	16	15
	52·3	59·8	16	14
	51·3	60·3	20	17
	51·3	60·3	20	17
	46·1	56·7	16	13
	42·5	56·7	20	15
	37·8	64·2	18	11
	37·2	62·0	20	12
	32·8	59·7	20	11
	22·8	45·6	20	10
Mean	48·92	59·98	—	—
Standard deviation	13·59	6·10	—	—

ANNUAL ASSESSMENT

The annual assessment was calculated in two ways Firstly, the score was calculated, including nil for non-submission, and, secondly, the score gained for submitted material only was calculated. These are shown in Table 3 with the possible number of units, the actual number submitted, the mean, and standard deviation. The departments are listed in order but are not identified.

ANALYSIS OF ASSESSORS

The total score given for each set of slides by each assessor is shown in Table 4. Some variability between assessors is to be expected. This fact can make comparison between different months difficult, but since each individual set of slides is assessed by the same assessors the variability is common for each set, so allowing comparison between departments for any one month, or longer period.

Discussion

Each laboratory deals with the control material in its own way. The material may be treated as a routine specimen or it may be treated individually by one technician. In some departments several slides are prepared, the best being submitted. One department had the material dealt with by each member of the staff, the best being submitted.

Table 4 *Assessors' monthly scores*

	Assessor						Mean	Slides assessed
	A	B	C	D	E	F		
Q1a	20	21	23	25			22·25	9
Q1b	13	21	22	24			20·00	9
Q2a	28	36	31	32			31·75	13
Q2b	29	34	32	29			31·00	13
Q3	31	35	28	28			30·50	16
Q4a	29	42	32	31			33·50	14
Q4b	26	32	28	30			29·00	14
Q5a	21	21		21		21	21·00	9
Q5b	28	33		27		28	29·00	11
Q6	23	23		25		24	24·25	9
Q7a	28			27	36	32	30·75	10
Q7b	24			27	30	31	28·00	11
Q7c	33			32	38	33	34·00	11
Q8	24			24	24	26	24·50	11
Q9	33			31	39	35	34·50	13
Q10a	25			23	28	28	26·00	11
Q10b	25			24	21	27	24·25	11
Q11a	23			24	36	31	28·50	11
Q11b	21			21	31	31	26·00	12
Q12	23			23	34	33	28·25	12
Mean 1st 6 mth	24·8	30	—	27·2	—	—		
Mean 2nd 6 mth	25·9	—	—	25·6	31·7	30·7		

The method of dealing with the material is of little importance to the organiser and assessors. Each department is given its monthly assessment together with the monthly mean, and the list of annual means is sent with the position of the laboratory indicated on the list. Each individual chief technician knows how the material was dealt with in his own laboratory and can make use of the results as he thinks fit. The important fact is that all the staff in the participating laboratories become more aware of quality control within their own departments and of the standards prevailing in the area of the scheme. This will encourage the staff to maintain high standards or to make efforts to raise low standards.

It is appreciated that the idea of the perfect haematoxylin and eosin varies considerably. The assessors take this into consideration, while paying particular attention to technical artefacts and nuclear differentiation. It is the intention that future assessors will be enrolled from all the participating departments. This will further involve the laboratories in the running of the scheme, and help to reduce the feeling of professional isolation that may occur in some small laboratories.

At the completion of 12 months the best slide of each set, as scored by the assessors, is used to compose a best set. This set is circulated to allow the departments to examine what, in the assessors' opinion, was the best submitted.

The prime result of the scheme is to make staff aware of quality control in their departments. In addition, control blocks of tissues are acquired, slides of less common material are seen, and advice on reagents can be obtained.

The idea of a national quality control scheme in histopathology is inviting but it is felt that this would present insurmountable problems. The ideal area covered by any one scheme would seem to be that of a Regional Health Authority.

This pilot scheme has been shown to be both workable and acceptable. It is to continue on a more permanent basis at the request of the participants.

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Reference

British Medical Journal (1977). Leading article. Quality control of laboratories—or of pathologists. *British Medical Journal*, **1**, 1180.

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