Muscle Biopsy Reporting

To the Editor.—We wish to congratulate the authors for the excellent initiative for providing common data elements for muscle biopsy reporting.¹ The article provides very useful information for both experienced and new myopathologists. We agree that this is the first step to develop a uniform prospective reporting tool to facilitate the comparison of results across studies.

We would like to pose 2 questions to the authors. First: Could we use the old type 2 fiber predominance criteria above 80% instead of the new 55%?² Second: Should we incorporate telethonin immunohistochemistry or immunofluorescence to the investigation panel? Even though limb girdle muscular dystrophy type 2G (LGMD2G) was first described in Brazil, cases have been reported of patients of Indian, Moldavian, Portuguese, Chinese, and Australian origins, either as limb girdle muscular dystrophy or as congenital muscular dystrophy.³⁻⁵ Therefore, it is possible that telethoninopathy is underdiagnosed worldwide. A simple immunohistochemical or immunofluorescence method may guide appropriate molecular studies.⁶⁻⁸

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In Reply.—I would like to thank the authors of this letter for their interest in our work,¹ and I am glad that they found the work to be valuable. In reference to their specific queries:

1. I certainly support a definition of fiber-type predominance that reflects a departure from the normal range within a given muscle, and a brief discussion among the authors of our article has yielded a potentially useful guideline for the assessment of fiber-type predominance.¹ Johnson et al² published an excellent assessment of fiber-type distributions across human muscles. Table 4 of this article defines mean fiber-type percentages in 50 different human muscle areas, and we would propose that fiber-type predominance corresponds to a fiber-type distribution in excess of 20% higher than the mean for a given muscle. In terms of some of the more frequently biopsied muscles, type 2 fiber predominance would then be defined as approximately more than 55% in the biceps femoris, more than 70% in the biceps brachii, more than 73% in the vastus lateralis, and more than 59% in the deltoid. This more flexible guideline for the definition of fiber-type predominance may offer broader applicability, and we completely agree that our initial definition of 55% as the threshold for type 2 fiber predominance was too low for most muscle types.

2. With respect to the integration of telethonin into the investigation panel, I would fully support the integration of any diagnostically useful antibodies into this type of reporting form. The reporting form generated for the National Institute of Neurological Disorders and Stroke Common Data Elements program and for this publication is meant to be an evolving resource, and it is meant to be a starting resource that can be tailored to an individual diagnostician’s needs. I encourage any diagnosticians who would like a copy of our form in Microsoft Word format to contact me via email (mlawlor@mcw.edu) and I will be happy to share it. I look forward to continuing to learn more about telethoninopathy and the usefulness of anti-telethonin antibodies in its diagnosis.

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A Minimum-Requirement Model to Start Up a Histology Laboratory in a Developing Country

To the Editor.—Despite the rapid advancement of technology used in pathology laboratories in developed countries, which often includes cutting-edge diagnostic techniques for precision medicine, a large gap in the availability and quality of health care services worldwide still exists, where large subsets of the population remain underserved, including large geographic areas in Africa, Central and South America, Asia, the Middle East, and even Eastern Europe.

Many of these countries still have limited or no access to basic diagnostic methodologies, which restricts the possibility to screen and diagnose common preventable conditions, with cervical squamous and glandular lesions being one of the most common and striking examples. These limitations arise largely owing to the lack of basic histology laboratories, equipped with minimal necessary armamentarium of technical resources, along with other barriers. With this letter, we aim to offer a model of an optimally equipped and functional histology laboratory for developing countries at a minimal cost.

The components of a basic histology laboratory should include the following: equipment, reagents, and supplies/consumables; these are necessary for the performance of at least routine procedures.
hematoxylin-eosin staining, as well as limited special staining. For a low-volume, minimum-cost, basic laboratory in underserved communities, we have constructed a general list of resources for start-up, excluding indirect costs and labor (see Table). The equipment required for this undertaking handles a much lower volume and entails a significantly smaller cost than a fully equipped histology laboratory. It is also important to take into consideration that the use of preowned and refurbished equipment is a viable possibility when funding is limited.

We believe and hope that the funding for such a cost-efficient histology laboratory can be possibly obtained through grants for developing countries supported by nongovernmental organizations and donors with a passion for pioneering medical initiatives.

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We would like to thank Ms. Rita Balian, BA, the founder and co-president of the Armenian American Wellness Center in Yerevan, Armenia, for her initiative and inspiration.

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**Minimum Required Equipment and Reagents/Supplies Necessary to Start Up a Low-Cost, Low-Volume Histology Laboratory in a Developing Country**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Price, $</th>
<th>Reagents/Supplies</th>
<th>Price, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tissue processor</td>
<td>30 000–35 000</td>
<td>Formalin, 10% phosphate buffered</td>
<td>35–40/20 gal</td>
</tr>
<tr>
<td>Embedding station</td>
<td>8500–10 000</td>
<td>Ethyl alcohol, 95% and 100%</td>
<td>35–45/gal</td>
</tr>
<tr>
<td>Rotary microtome</td>
<td>10 000–12 000</td>
<td>Xylene</td>
<td>35–40/gal</td>
</tr>
<tr>
<td>Water bath for paraffin</td>
<td>800–1000</td>
<td>Paraffin</td>
<td>90–95/kg</td>
</tr>
<tr>
<td>Slide warmer</td>
<td>300–500</td>
<td>Stains (hematoxylin, eosin, PAS, PAS-D, Trichrome mixes, etc)</td>
<td>130–250 per stain kit</td>
</tr>
<tr>
<td>Microscopes</td>
<td>8000–9000</td>
<td>Supplies/consumables (slides, coverslips, mounting medium, microtome blades, etc)</td>
<td>2000</td>
</tr>
<tr>
<td>Total</td>
<td>57 600–67 500</td>
<td></td>
<td>2500 for minimum volume, H&amp;E only</td>
</tr>
</tbody>
</table>

**Grand total**

60K–70K

Abbreviations: H&E, hematoxylin-eosin stain; PAS, periodic acid-Schiff; PAS-D, periodic acid-Schiff–diastase.