Received: 11 March 2023 | Revised: 5 May 2023 | Accepted: 6 May 2023

DOI: 10.1002/ca.24063

EDUCATION

CLINICAL ANATOMY WILEY

A core syllabus for histology within the medical curriculum – The cardiovascular and lymphoid systems, the respiratory and digestive systems, and the integument

Dongmei Cui[1] | Bernard John Moxham[2]

[1]Department of Neurobiology & Anatomical Sciences, University of Mississippi Medical Center, Jackson, Mississippi, USA

[2]Cardiff School of Biosciences, Cardiff University, Cardiff, UK

Correspondence
Bernard John Moxham, Cardiff School of Biosciences, Cardiff University, Museum Avenue, Cardiff CF10 3AX, UK.
Email: moxham@cardiff.ac.uk

Abstract

Medical courses worldwide are undergoing significant curricular changes, including the teaching and learning of histology. In order to set international standards for the anatomical sciences, the International Federation of Associations of Anatomists (IFAA) is developing core anatomical syllabuses by means of Delphi panels. Already published is a core syllabus for the teaching of the cell and the basic tissues within medicine. Here, we record the deliberations of an IFAA Delphi panel commissioned to develop core subject matter for the teaching within a medical histology course of the cardiovascular and lymphatic circulatory system, the lymphoid, respiratory, and digestive systems, and the integument. The Delphi panel was comprised of academics from multiple countries who were required to review relevant histological topics/items by evaluating each topic as being either "Essential," "Important," "Acceptable," or "Not required." Topics that were rated by over 60% of the panelists as being "Essential" are reported in this paper as being core topics for the teaching of medical histology. Also reported are topics that, while not reaching the threshold for being designated as core material, may be recommended or not required within the curriculum.

KEYWORDS
core syllabus, Delphi panels, histology, medical education, teaching

1 | INTRODUCTION

The teaching of histology, or microscopic anatomy, to medical students provides knowledge, and understanding, of the normal structure of the human body and can be regarded as a prerequisite subject for the understanding of pathology. Furthermore, much anatomical research relies upon microscopy.

Despite histology once being regarded as a fundamental anatomical science within a healthcare profession that the public consider to be learnèd (Moxham et al., 2016), and despite medical students considering histology to be clinically important (Moxham et al., 2017), medical curriculum reviews have tended to take an instrumentalist approach that requires teaching only topics that fit a "just in time" rather than a "just in case" educational model (Moxham & Pais, 2017). As a consequence, the teaching of histology to medical students has undergone major changes. In 2018, McBride and Drake reported that, compared with a similar study by Drake et al., 2014, there had been a significant decrease in the total number of hours devoted to the

teaching of histology in US medical schools. They found that contact time for histology ranged between 0 and 124 h (average 51 h ± 30 SD) and that the average number of hours devoted to histology practicals was 22 h ± 17 SD. Additionally, only 2% of responding medical schools had stand-alone histology courses, with 51% of schools stating that histology was fully integrated within the medical course. The use of microscopes was said to be in sharp decline and there seemed to be little teaching from clinically qualified members of the faculty. Anecdotally, what was reported in the US appears to be happening in other parts of the world and, in contrast to the earlier model for medical education of preclinical and clinical curricula, marked diversity in pedagogic philosophies across the world means that there now exists no standard and transparent model that is universally accepted. These developments underpin the necessity of devising core syllabuses for histology that are independent of pedagogic philosophy, that do not dictate where in the medical course the subject should be taught, and that represent international standards to be maintained.

Presently, two approaches are being adopted to develop core syllabuses for the anatomical sciences. The Anatomical Society (AS, formally the Anatomical Society of Great Britain and Ireland) has published core syllabuses consisting of a series of "learning outcomes" for medicine, nursing, pharmacy and dentistry (Connelly et al., 2018; Finn et al., 2018; Matthan et al., 2020; Smith, Finn, Stewart, Atkinson, et al., 2016; Smith, Finn, Stewart, & McHanwell, 2016), taking a "broad brush" approach. The International Federation of Associations of Anatomists (IFAA), on the other hand, is publishing more specialized core syllabuses that provide lists of topics that are to be considered core, recommended or not required. To date, the IFAA have published syllabuses for head and neck anatomy for medicine (Tubbs et al., 2014, 2015), neuroanatomy for medicine (Moxham et al., 2015), embryology and teratology for medicine (Fakoya et al., 2017), specialized oral anatomy for dentistry (Moxham et al., 2018), musculoskeletal anatomy for medicine (Webb et al., 2019) and for physiotherapy (Woodley et al., 2022), thoracic anatomy for medicine (Moxham et al., 2020), and cell and basic tissue histology for medicine (Cui & Moxham, 2021). Both the AS and the IFAA are employing Delphi Panels to devise the syllabuses (see Moxham et al., 2014). Under the auspices of the IFAA, in this paper we report on the deliberations of a Delphi Panel upon core subject matter to be taught and learned within the medical curriculum for the cardiovascular, lymphoid, respiratory, and digestive systems, and the integument.

2 | METHODS

Members of the IFAA Delphi panel for this study were from 13 different countries and were either basic science teachers or clinical educators. There were in total 21 members in the panel: 2 from Austria; 1 from Australia; 1 from Canada; 1 from China; 1 from the Czech Republic; 1 from Greece; 2 from Germany; 1 from Hong Kong; 1 from Italy; 1 from Spain; 1 from Switzerland; 4 from the United State and 2 from the West Indies. More than 1/3 of members have both basic science (PhD) and medical (MD) degrees and backgrounds. Nearly 60% of the panelists have taught histology for more than 20 years. 26% of panelists have taught histology for between 11 and 20 years and 14% have taught histology for less than 10 years. Most of the panel members were either authors of textbooks and/or authors of papers related to histology. More than 50% of the panelists have reviewed manuscripts related to histology or have organized histology workshops.

The list of 177 histology topics/items in this survey relating to the cardiovascular, lymphoid, respiratory, and digestive systems, and the integument were initially generated from the most commonly used topics in medical education, from the contents of internationally recognized histology textbooks (Cui et al., 2011; Gartner & Hiatt, 2017; Junqueira & Carneiro, 2013; Meyer, 2014; Pawlina, 2019; Stevens and Lowe, 2015), and from the Federative International Programme for Anatomical Terminology (2008). The Delphi Panel method described by Moxham et al. (2014) was used to review the topics and involved two rounds of assessment (Figure 1). For *Round one*, a total number of 133 original items were sent to the panel members to review, each topic being rated according to four

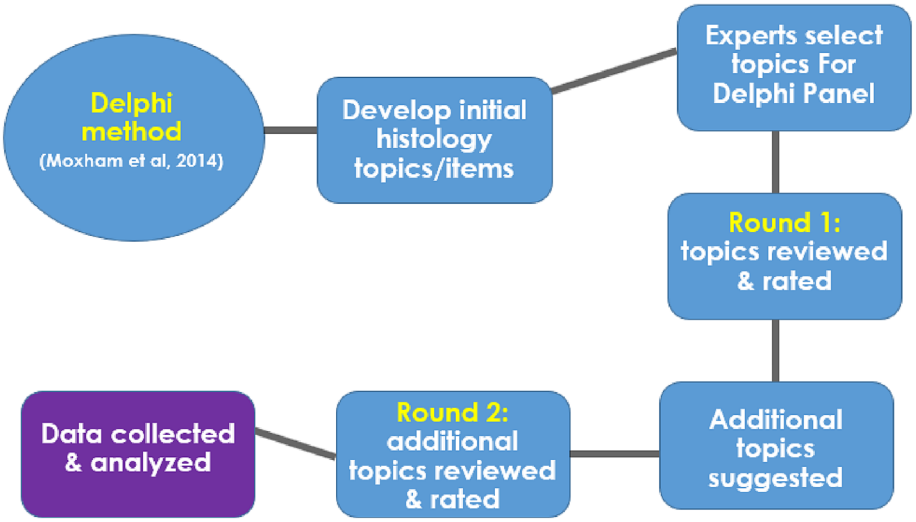

FIGURE 1 Flow chart to show the Delphi process used to develop stage 1 of a core histology syllabus for the medical curriculum.

categories: "Essential," "Important," "Acceptable," or "Not required." The panelists were also asked to provide comments for each topic and suggestions for any topics needed to be included but not included in the initial topic list. For *Round two*, additional 44 topics suggested by the panel members from Round one were reviewed and rated by each panelist. The data were collected and analyzed after two rounds of reviewing. The complete list of 177 topics comprised: 35 topics related to the cardiovascular and lymphatic circulatory system, 31 topics related to the lymphoid system, 24 topics related to the respiratory system, 35 topics related to the oral cavity and digestive tract, 29 topics related to the digestive glands and associated organs, and 23 topics related to the integument.

From the panelists' responses, every topic/item was analyzed by the project's coordinators and in accordance with general rules followed for other core syllabuses published through the IFAA. Where more than 60% of the panelists considered an item as being essential, this was categorized as being "core." Where between 30% and 59% of the panelists classified an item as being essential, the topic was designated as being "recommended." Classification of "just acceptable" or "not required" came when the panelists only recorded essential designations between 20% and 29% and less than 20% respectively.

3 | FINDINGS

Tables 1–6 provide the results from the Delphi Panel for the systems under consideration in this paper. Where topics were near borderlines (e.g., 59% or 60% "Essential"), this is indicated in the Tables by the two categories at the borderline being highlighted.

For the cardiovascular and lymphatic circulatory system (Table 1), all topics were considered to be "core" using the IFAA standard 60% threshold for categorizing "core" topics, excepting: the general organization of the pulmonary circulation system, the histology of the cardiac fibrous skeleton, vasa vasorum, pericytes, venous valves, and arteriovenous and lymphovenous anastomoses. That "general organization of the pulmonary circulation system" was not designated "core" was unexpected. If instead of using a threshold of greater than 60% to categorize a topic as being "core" a 50% threshold was employed, arteriovenous and lymphovenous anastomoses would not become "core." If however a 70% threshold was employed, the following "core" topics would no longer be "core" but would become "recommended": histology of the heart valves, small arteries and arterioles, continuous, discontinuous and fenestrated capillaries, function and properties of endothelial cells, the classification of veins and the histology of veins of different sizes and all topics for the lymphatic vascular system excepting the route of lymphatic drainage. Note that future advice from other stakeholders (e.g., anatomical societies, clinicians) may change categorization during later stages of the development of the core syllabus.

For information regarding blood cells and hemopoiesis, the reader is referred to a previous paper (Cui & Moxham, 2021).

For the lymphoid system (Table 2), most topics were considered to be "core" using the IFAA standard 60% threshold for categorizing "core" topics, excepting topics associated with intraepithelial lymphocytes, types of immunoglobulins, surface markers of lymphocytes, residual regions for B and T lymphocytes, mucosa-associated lymphatic tissues (MALT), blood flow of the lymph nodes and high endothelial venules, types of epithelial reticular cells in the thymus, thymus involution, and general organization of the splenic circulation (open and closed circulation). All these items were "recommended" and no topic was considered to be "not recommended" or "not required." If a threshold of greater than 50% was employed, with the exception of surface markers of lymphocytes, blood flow of the lymph nodes and high endothelial venules, and thymus involution, would become "core". For a threshold of greater than 70%, the following items would cease to become "core" and would become "recommended": positive and negative selections of lymphocytes, memory and effector lymphocytes, immune functions of B and T lymphocytes, non-specific and specific defenses, primary versus secondary lymphatic organs, general structure and function of the tonsils (palatine, lingual and pharyngeal tonsils), lymphatic nodules in the appendix, bronchus-associated lymphatic tissue (BALT), lymph flow of the lymph nodes, and items associated.

Table 3 provides the Delphi Panel's findings for the respiratory system, using the IFAA standard 60% threshold for categorizing "core" topics. We draw to the reader's attention that bronchopulmonary segments, pulmonary lobules, and pulmonary acini are on the borderline between being "core" and "recommended." It was somewhat surprising to the authors that the histology of the paranasal sinuses was lowly regarded, being only borderline recommended. Also not considered "core" but "recommended" were the sympathetic and parasympathetic nervous innervation to the bronchial tree (bronchodilation and bronchoconstriction) and the histology of the lower respiratory airway (trachea, extrapulmonary bronchi, intrapulmonary bronchi, bronchioles and terminal bronchioles). However, Club cells (formerly termed Clara cells) and the histology of the upper respiratory tract was considered to be "core". All aspects of the respiratory portion (respiratory bronchioles, alveolar ducts, sacs and alveoli, blood-air barrier and gas exchange, type I pneumocytes, type II pneumocytes, and alveolar macrophages (dust cells)) were deemed to be "core". If instead of using a threshold of greater than 60% to categorize a topic as being "core," a 50% threshold was employed, "core" topics would then include the bronchopulmonary segments and the lower respiratory airway. If instead of using a threshold of greater than 60% to categorize a topic as being "core," a 70% threshold was employed, the following presently deemed "core" topics would instead become "recommended" topics: blood supply to the bronchial tree and lung and all aspects of the upper respiratory tract.

For the digestive tract of the digestive system (Table 4), within the oral cavity only the histology of the oral mucosa and the tongue were considered to be "core" according to the greater than 60% IFAA rule. However, the histology of the taste buds was "recommended." While it was not unexpected that the teeth and periodontal tissues would not be "core" within a medical course, the authors were surprised that alveolar bone and the temporomandibular joint were rated lowly. Most topics for the digestive tract were considered to be "core," excepting "recommendation" status for cardiac glands versus

TABLE 1 Rating results for the cardiovascular and lymphatic circulatory system.

Topic	Core	Recommended but not core	Not recommended	Not required
General organization of systemic circulation system	71%			
General organization of pulmonary circulation system	57%			
The heart				
Three layers of heart (epicardium, myocardium and endocardium)	81%			
Conductive function of heart and related structures	71%			
Heart valves	67%			
Cardiac fibrous skeleton	60%			
Purkinje fibers	73%			
The arterial system				
General features of arteries	81%			
Classification of arteries	71%			
Large/elastic arteries	71%			
Medium/muscular arteries	71%			
Small arteries	62%			
Arteriole	67%			
Vasa vasorum	53%			
The capillary system				
General features of capillaries	91%			
Classification of capillaries	71%			
Continuous capillaries	67%			
Fenestrated capillaries	67%			
Discontinuous capillaries (sinusoidal capillaries)	67%			
Function and properties of endothelial cells	62%			
Endothelial cells	80%			
Pericytes	60%			
The venous system				
General features of veins	81%			
Classification of veins	62%			
Venules	67%			
Small veins	62%			
Medium veins	67%			
Large veins	67%			
Valves in veins	53%			
Arteriovenous anastomoses	47%			
The lymphatic vascular system				
Route of lymph drainage	71%			
Lymphatic capillaries	62%			
Lymphatic vessels	62%			
Lymphatic ducts	62%			
Lymphovenous anastomoses	20%			

Note: Percentages show the responses of the Delphi Panel to topics being regarded as "core". The shaded boxes indicate where a topic is categorized.

gastric glands, the development of the digestive tract, M-cells and general GI immune function, and (surprisingly) the rectum. Shifting the threshold from 60% down to 50% would make "core" the dental tissues, cardiac glands versus gastric glands, M-cells and general GI immune function, and the rectum. If the threshold were raised to 70%, the enteric nervous system of the GI tract, the morphology and function of enteroendocrine cells in the digestive tract, the histology of different parts of the esophagus, cellular components in different

TABLE 2 Rating results for the lymphoid system.

Topic	Core	Recommended but not core	Not recommended	Not required
Cells of the lymphoid system				
Origination and maturation of T and B lymphocytes	95%			
Intraepithelial lymphocytes	60%			
Positive and negative selections of lymphocytes	62%			
Memory and effector lymphocytes	67%			
Types of Immunoglobulins	52%			
Surface markers of lymphocytes	48%			
Immune function of B and T lymphocytes	67%			
Antigen-presenting cells	71%			
Non-specific and specific defenses	64%			
Lymphoid tissues and organs				
Primary and secondary lymphoid organs	87%			
Diffuse lymphatic tissue	71%			
General structure and function of lymphatic nodules (Primary versus secondary nodules)	71%			
Primary versus secondary lymphatic organs	67%			
Residential regions for B and T lymphocytes	52%			
Mucosa-associated lymphatic tissues (MALT)	50%			
Gut-associated lymphatic tissue (GALT)	71%			
General structure and function of the tonsils (palatine, lingual and pharyngeal tonsils)	67%			
Peyer patches (aggregated nodules) in the ileum	71%			
Lymphatic nodules in the appendix	67%			
Bronchus-associated lymphatic tissue (BALT)	62%			
Lymph nodes				
General structure and function of the lymph nodes	81%			
Lymph flow of the lymph nodes	65%			
Blood flow of the lymph nodes and high endothelial venules	48%			
Thymus				
General structure and function of the thymus	67%			
Types of epithelial reticular cells in the thymus	58%			
Blood-thymus barrier and T cell maturation	62%			
Thymus involution	47%			
Spleen				
General structure and function of the spleen	76%			
White pulp and immune function and the components (lymphatic nodules, central arteries, and periarterial lymphatic sheath)	76%			
Structure and function of red pulp and filtration of blood	76%			
General organization of the splenic circulation (open and closed circulation)	55%			

Note: Percentages show the responses of the Delphi Panel to topics regarded as "core". The shaded boxes indicate where a topic is categorized.

regions of stomach, the colon and cecum, and the anorectal junction would change from being "core" material to being just "recommended".

Table 5 provides the findings for the digestive glands and organs associated with the digestive tract, employing the IFAA's 60% threshold rule. Accordingly, while the general structure of the major salivary glands is considered "core," other aspects of these glands are on the borderline between "core" and "recommended" (serous demilunes not being recommended). The histology of the pancreas (excepting the exocrine ducts) and the liver and gall bladder is "core," but not

TABLE 3 Rating results for the respiratory system.

Topic	Core	Recommended but not core	Not recommended	Not required
General structure of the airway	72%			
Blood supply to the bronchial tree and lung	62%			
Bronchopulmonary segments, pulmonary lobules, pulmonary acini	60%			
Sympathetic and parasympathetic nervous innervation to the bronchial tree (bronchodilation and bronchoconstriction)	38%			
Respiratory epithelium and cellular components	76%			
Conducting portion – Upper respiratory airway				
The nasal cavity (nasal mucosa)	62%			
Olfactory epithelium	67%			
Paranasal sinuses	33%			
Nasopharynx and oropharynx	62%			
Larynx (epiglottis and vocal cords)	62%			
Conducting portion – Lower respiratory airway				
Trachea	57%			
Extrapulmonary bronchi	48%			
Intrapulmonary bronchi	52%			
Bronchioles	57%			
Terminal bronchioles	57%			
Club cells (exocrine bronchiolar cells)	67%			
Respiratory portion				
Respiratory bronchioles	65%			
Alveolar ducts, sacs, and alveoli	70%			
Blood-air barrier and gas exchange	76%			
Type I pneumocytes	76%			
Type II pneumocytes	81%			
Alveolar macrophages (dust cells)	76%			
Pleura				
Pleura	33%			
Pleura pulmonalis – mesothelium	33%			

Note: Percentages show the responses of the Delphi Panel to topics being regarded as "core". The shaded boxes indicate where a topic is categorized.

the acinus of Rapport concept, hepatic stellate cells and liver regeneration. Changing the threshold to 50% would result in all aspects of the major salivary glands (excepting the serous demilunes) and the hepatic stellate cells becoming "core." Should the threshold be 70%, the ultrastructure of the liver (hepatocytes, bile canaliculus & space of Disse), hepatic discontinuous endothelial lining, bile production and drainage, bile canaliculi, gallbladder histology, duct system of exocine pancreas, and, for the major salivary glands, all but the general structures and functions would change from being "core" items to being just "recommended".

For the Integument (Table 6), and using the IFAA's 60% threshold rule, the epidermis (excepting Merkel cells/Tactile epitheliocytes) and dermis (excepting dermal blood circulation and thermoregulation) were considered to be "core." The authors also expected Meissner and Pacinian corpuscles to be "core" but the Delphi Panel only rated them "recommended." Development of the skin and damaging and repairing of the skin were also designated "recommended" topics. For the accessory structures of the skin, the glands and hair were designated "core" but not the pilosebaceous apparatus, nor hair growth and hair bulge. The authors noted that the nails were not "core" topics. If the threshold was lowered to 50%, the following topics would become "core": damaging and repairing of the skin, Merkel cells/tactile epitheliocytes (mechanoreceptors function), and Meissner and Pacinian corpuscles. With a higher threshold of 70%, thick skin versus thin skin and the general structure and function of the hair follicles would shift from being "core" to being "recommended".

4 | DISCUSSION

Traditionally, histology is a basic component of the anatomical sciences in the medical curriculum and has particular relevance to

TABLE 4 Rating results for the digestive tract.

Topic	Core	Recommended but not core	Not recommended	Not required
Oral cavity				
Oral mucosa (lining and masticatory mucosae)	75%			
Tongue and papillae (filiform, fungiform, circumvallate, and foliate)	71%			
Taste buds	60%			
Lips and Lip-skin border	27%			
Teeth				
Tooth development (odontogenesis)	33%			
Tooth (dental) tissues	52%			
Periodontal ligament (PDL)	40%			
Alveolar bone	33%			
Temporomandibular Joint	35%			
Digestive tract				
General structure of the digestive tract (mucosa, submucosa, muscularis externa, and serosa/adventitia)	81%			
Enteric nervous system of GI tract	67%			
Submucosal (Meissner) plexus and myenteric (Auerbach) plexus in the digestive tract	71%			
Morphology and function of enteroendocrine cells in the digestive tract	67%			
Esophagus				
General features and function of esophagus	81%			
Three regions of esophagus (upper, middle, and lower)	67%			
Esophagogastric junction	81%			
Stomach				
General features and function of stomach	76%			
Different regions of the stomach (cardiac and pyloric regions; fundic and body regions)	71%			
Cellular components in different regions of stomach	62%			
Cardiac glands versus gastric glands	52%			
Special cells in the stomach (parietal cells and chief cells)	81%			
Small intestine				
General structures and function of small intestine	76%			
Special feature (folds) of the small intestine (plicae circulares, villi, and microvilli)	95%			
Special cells in the small intestine (Paneth cells and goblet cells and enterocytes)	95%			
Different regions and features of the small intestine (duodenum and Brunner glands; jejunum; ileum and Peyer patches)	81%			
Large intestine				
General structures and function of large intestine	76%			
Special feature and cells of large intestine (teniae coli, straight tubular glands of Lieberkühn and goblet cells)	76%			
Cecum	62%			
Appendix	71%			
Colon (ascending, transverse, descending, and sigmoid portions)	62%			
Rectum	60%			

(Continues)

TABLE 4 (Continued)

Topic	Core	Recommended but not core	Not recommended	Not required
Anal canal	70%			
Anorectal junction	65%			
Additional topics				
Development of digestive system	40%			
M-cells and general GI immune function	50%			

Note: Percentage show the responses of the Delphi Panel to topics being regarded as "core". The shaded boxes indicate where a topic is categorized.

TABLE 5 Rating results for the digestive glands and associated organs.

Topic	Core	Recommended but not core	Not recommended	Not required
Major salivary glands				
General structures and function of the major salivary glands	71%			
General organization of the duct system of major salivary glands	62%			
Structure and function of striated duct (ion and fluid transportation)	62%			
Parotid glands (serous glands)	62%			
Submandibular glands (mixed glands)	62%			
Sublingual glands (mixed glands)	62%			
Serous demilunes	27%			
Pancreas				
General structures and function of the pancreas	86%			
Exocrine versus endocrine pancreas	91%			
Exocrine pancreas and zymogen granules	86%			
Duct system of exocrine pancreas	62%			
Endocrine pancreas (islet of Langerhans)	91%			
Liver				
General structure and function of the liver	81%			
Blood supply to the liver	81%			
Structure and function of the portal triad	81%			
Classic lobules and exocrine function of the liver	76%			
Portal lobules	76%			
Hepatic acinus lobules (zone 1, 2, and 3) and clinical relevance	76%			
Ultrastructure of liver (hepatocytes, bile canaliculus & space of Disse)	67%			
Bile production and drainage	67%			
Hepatic stellate cells (Ito cells)	60%			
Acinus of Rapport concept	43%			
Kupffer cells	73%			
Role of Kupffer cells in RBC phagocytosis	50%			
Hepatic discontinuous endothelial lining	64%			
Bile canaliculi	67%			
Liver regeneration ability	36%			
Gallbladder				
General structure and function of the gallbladder	67%			
Mucosa of the gallbladder	67%			

Note: Percentage show the responses of the Delphi Panel to topics being regarded as "core". The shaded boxes indicate where a topic is categorized.

TABLE 6 Rating results for the integument.

Topic	Core	Recommended but not core	Not recommended	Not required
Skin				
Epidermis and dermis	100%			
Hypodermis	73%			
Layers of the epidermis	86%			
Thick skin versus thin skin	62%			
Development of the skin	38%			
Damaging and repairing of the skin	52%			
Dermal blood circulation and thermoregulation	33%			
Cells of the epidermis				
Keratinocytes in different layers of skin	71%			
Melanocytes and melanosome formation	91%			
Langerhans/dendritic cells (derivation and antigen presenting function)	76%			
Merkel cells/Tactile epitheliocytes (mechanoreceptors function)	57%			
Epidermal cell turnover with psoriasis	20%			
Sensory receptors of skin				
Meissner corpuscles	57%			
Pacinian corpuscle in the hypodermis	57%			
Accessory structures of the skin				
Sebaceous glands	76%			
Eccrine sweat glands	76%			
Apocrine sweat glands	76%			
Pilosebaceous apparatus	33%			
General structure and function of the hair follicles	62%			
Hair growth	43%			
Hair bulge	36%			
General structure and function of the nails	43%			
Nail growth	29%			

Note: Percentage show the responses of the Delphi Panel to topics being regarded as "core". The shaded boxes indicate where a topic is categorized.

pathology (and histopathology in particular) and it remains an important feature of medical research. Furthermore, it might be expected that, for a learned profession, medical students should have core knowledge of the discipline.

While a core syllabus for the teaching of oral histology for the dental curriculum (Moxham et al., 2018) and a survey of dental histology instruction (Burk et al., 2013) have already been published, publication of core subject matter for the teaching of histology within the medical curriculum is lacking. To date, an IFAA approved core syllabus for the teaching of cell and basic tissue histology for medicine has been published (Cui & Moxham, 2021) and here we follow up by reporting on aspects of organ/systems histology.

That there is a need to develop core syllabuses for medical histology is, in our view, necessary given its declining place in the curriculum, data showing that the time provided for the teaching of histology with US medical courses averages only 51 h, with some schools having zero hours teaching (McBride & Drake, 2018). The limited time devoted to histology teaching might be related to the fact that, in the absence of core syllabuses, designers of medical courses are insufficiently informed. We must be aware, however, that the panelists employed for this study, being histologists, might value too greatly the clinical relevance of their discipline, although in mitigation it should be noted that the panelists are experienced educators. Despite significant reductions in the time devoted to the teaching of histology, medical students still appreciate the clinical importance of histology. By means of a large-scale survey, Moxham et al. (2017) reported that medical students across Europe considered histology to be an important, and relevant, part of their medical training. A similar finding, using similar methodologies, has been reported by Waseem et al. (2021) for medical students in Pakistan. This accords with the attitudes of laypersons in Europe who consider that the anatomical sciences are highly clinically relevant. Indeed, they reported a diminished respect for the medical profession if the disciplines were undermined (Moxham et al., 2016).

For this study, consensus above 60% of the panelists was evident for many of the topics they were required to evaluate. This contrasts with the IFAA syllabuses already published for the core syllabus for the cell and basic tissues (Cui & Moxham, 2021). The topics regarded by panelists as not being "core" that surprised the authors were: general organization of the pulmonary circulation system, histology of the paranasal sinuses, the lower respiratory airway (trachea, extrapulmonary bronchi, intrapulmonary bronchi, bronchioles, and terminal bronchioles), taste buds, alveolar bone, the temporomandibular joint, the rectum, Meissner and Pacinian corpuscles, and the nails. It should however be borne in mind that during stages 2 and 3 of the IFAA process, the reasons for the failure to agree consensus on a question, or series of questions, can be explored.

Through its international educational program (FIPAE), the IFAA is committed to producing detailed, topic-based, syllabuses rather than adopting a "broad brush" approach. The Federation advocates that "core" topics should be considered as international norms that are required to be covered in a university's/medical school's curriculum. In so doing, public assurance about the quality of healthcare provision can be aided. In relation to the view that the biomedical sciences should be made more clinically relevant, there is a presupposition that there is a clear understanding of what can be considered core material within the medical syllabus. We contend that this can be accomplished by having internationally recognized core syllabuses.

In order to permit regular review and change, the IFAA follows the principle that a core syllabus must be flexible and that teams of experts should not solely dictate what should be taught. Thus, while input of "experts" in a Delphi Panel is important to formulate an initial core syllabus, regular updating from the whole community of stakeholders (including anatomists, scientists, clinicians, students, administrators, and those politico-educational forces that govern medical schools) is required. Indeed, as new material appears, and as old material ceases to be academically or clinically relevant, syllabuses must evolve and comments that will be passed to FIPAE for their consideration are welcomed so that the syllabus undergoes further phases of evaluation. In this regard, it cannot be overemphasized that a core syllabus devised from the assessments of the Delphi Panel is only stage 1 in the process of producing the IFAA core syllabus (see Moxham et al., 2014). Other stakeholders (including anatomists, anatomical societies, clinicians and national and international medical educational authorities) should have an input into further developments of the syllabuses. Thus, an IFAA syllabus remains flexible, and therefore reviewable, as new educational and medical advances occur and will not be "set in stone." That said, the publication of the core syllabus following the deliberations of the Delphi Panel provides, even at this first stage, an important background for discussion and for the develop of curricula.

In previous papers on the core IFAA syllabuses (e.g., Moxham et al., 2015, 2018, 2020; Tubbs et al., 2014, 2015), the question was raised: what is the purpose of a core syllabus? While universal agreement on the details is hard to obtain, a core syllabus provides the minimum level of knowledge expected of a recently-qualified medical graduate. This is important to ensure that students are not overloaded with facts and that they can carry out clinical procedures effectively and safely. It should not be, however, that ONLY core material should be taught and examined. The strength of universities lies in the possession of different schools of thought and, if a university education is to be worthy of its name, students should be taken to the frontiers of knowledge in some areas. If ONLY core knowledge is examined then it follows logically that the pass mark impossibly approaches 100%! This situation is to some extent ameliorated by courses where important material is returned to at different stages of a course (e.g., in a "spiral course"). Consequently, the aim of the IFAA is to set international standards and not to impose them. It is thus to be understood that the core syllabus does NOT dictate HOW or WHEN the syllabus is delivered. The IFAA's goal therefore is to provide the international community with detailed SUGGESTIONS AND RECOMMENDATIONS concerning topics relating to histology. It is anticipated that the syllabus will be particularly of use when curricula for the teaching of histology to medical students are being redesigned.

ACKNOWLEDGMENTS

We are most grateful to Dr. Pawlina Wojciech for his help in the design and selection of the initial topics used in this study. Members of the Delphi Panel, working under the principles of anonymity and confidentiality, provided extremely valuable contributions; without their time, expert review and feedback, this project would clearly not have been possible.

ORCID

Bernard John Moxham https://orcid.org/0000-0002-9683-6376

REFERENCES

Burk, D., Lee, L. M. J., & Lambert, H. (2013). Embryology and histology education in North American dental schools: The basic science survey series. *Journal of Dental Education*, *77*, 744–756.

Connelly, S. A., Gillingwater, T. H., Chandler, C., Grant, A. W., Greig, J., Meskell, M., & Finn, G. M. (2018). The Anatomical Society's core anatomy syllabus for undergraduate nursing. *Journal of Anatomy*, *232*, 721–728.

Cui, D., & Moxham, B. J. (2021). A core syllabus for histology within the medical curriculum – The cell and basic tissues. *Clinical Anatomy*, *34*, 483–495.

Cui, D., Naftel, J. P., Daley, W. P., Lynch, J. C., Haines, D. E., Yang, G., & Fratkin, J. D. (2011). *Atlas of histology with functional and clinical correlations* (1st ed.). Wolters Kluwer/Williams & Wilkins.

Drake, R. L., McBride, J. M., & Pawlina, W. (2014). An update on the status of anatomical sciences education in United States medical schools. *Anatomical Sciences Education*, *7*, 321–325.

Fakoya, F. A., Emmanouil-Nikoloussi, E., Sharma, D., & Moxham, B. J. (2017). A core syllabus for the teaching of embryology and teratology to medical students. *Clinical Anatomy*, *30*, 159–167.

Federative International Programme for Anatomical Terminology. (2008). *Terminologia Histologica: International terms for human cytology and histology, book/CD-ROM bundle*. Lippincott Williams & Wilkins.

Finn, G. M., Hitch, G., Apampa, B., Hennessey, C. M., Smith, C. F., Stewart, J., & Gard, P. R. (2018). The anatomical society core anatomy syllabus for pharmacists: Outcomes to create a foundation for practice. *Journal of Anatomy*, *232*, 729–738.

Gartner, L. P., & Hiatt, J. L. (2017). *Color atlas and text of histology* (6th ed.). Wolters Kluwer/Williams & Wilkins.

Junqueira, L. C., & Carneiro, J. (2013). *Basic histology text & atlas* (13th ed.). Lange.

Matthan, J., Cobb, M., McHanwell, S., Moxham, B. J., & Finn, G. M. (2020). The Anatomical Society's core anatomy syllabus for dental undergraduates. *Journal of Anatomy*, *236*, 737–751.

McBride, J. M., & Drake, R. L. (2018). National survey on anatomical sciences in medical education. *Anatomical Sciences Education*, *11*, 7–14.

Meyer, G. (2014). Meyer's Histology: A complete online learning and teaching resource. Retrieved from http://histology-online.com. Australia

Moxham, B. J., Emmanouil-Nikoloussi, E., Brenner, E., Plaisant, O., Brichova, H., Kucera, T., & Chirculescu, A. (2017). The attitudes of medical students in Europe toward the clinical importance of histology. *Clinical Anatomy*, *30*, 635–643.

Moxham, B. J., Hennon, H., Lignier, B., & Plaisant, O. (2016). An assessment of the anatomical knowledge of laypersons and their attitudes towards the clinical importance of gross anatomy in medicine. *Annals of Anatomy*, *208*, 194–203.

Moxham, B. J., McHanwell, S., & Berkovitz, B. K. B. (2018). The development of a core syllabus for the teaching of oral anatomy, histology, and embryology to dental students via an international 'Delphi panel'. *Clinical Anatomy*, *31*, 231–249.

Moxham, B. J., McHanwell, S., Plaisant, O., & Pais, D. (2015). A core syllabus for the teaching of neuroanatomy to medical students. *Clinical Anatomy*, *28*, 706–716.

Moxham, B. J., & Pais, D. (2017). A critique of utilitarian and instrumentalist concepts for the teaching of gross anatomy to medical and dental students. Provoking debate. *Clinical Anatomy*, *30*, 912–921.

Moxham, B. J., Plaisant, O., Smith, C. F., Pawlina, W., & McHanwell, S. (2014). An approach toward the development of core syllabuses for the anatomical sciences. *Anatomical Sciences Education*, *7*, 302–311.

Moxham, B. J., Stephens, S., Sharma, D., & Loukas, M. (2020). A core syllabus for the teaching of gross anatomy of the thorax to medical students. *Clinical Anatomy*, *33*, 300–315.

Pawlina, W. (2019). *Histology: A text and atlas with correlated cell and molecular biology* (8th ed.). Wolters Kluwer.

Smith, C. F., Finn, G. M., Stewart, J., Atkinson, M., Davies, D. C., Dyball, R., & McHanwell, S. (2016). The Anatomical Society core regional anatomy syllabus for undergraduate medicine. *Journal of Anatomy*, *228*, 15–23.

Smith, C. F., Finn, G. M., Stewart, J., & McHanwell, S. (2016). Anatomical Society core regional anatomy syllabus for undergraduate medicine: The Delphi process. *Journal of Anatomy*, *228*, 2–14.

Stevens and Lowe. (2015). *Human histology* (4th ed.). Elsevier.

Tubbs, R. S., Sorenson, E. P., Sharma, A., Benninger, B., Norton, N., Loukas, M., & Moxham, B. J. (2014). The development of a core syllabus for the teaching of head and neck anatomy to medical students. *Clinical Anatomy*, *27*, 321–330.

Tubbs, R. S., & Paulk, P. B. (2015). Essential anatomy of the head and neck:The complete Delphi panel list. *Clinical Anatomy*, *28*, 423.

Waseem, N., Iqbal, K., Anwar, N., Rehman, I., Kundi, H., & Qamar, A. (2021). Medical students' attitudes towards the clinical importance of embryology. *The Journal of the Pakistan Medical Association*, *71*, 1167–1170.

Webb, A. L., Green, R. A., & Woodley, S. J. (2019). The development of a core syllabus for teaching musculoskeletal anatomy of the vertebral column and limbs to medical students. *Clinical Anatomy*, *32*, 974–1007.

Woodley, S., Green, R. A., & Webb, A. L. (2022). A core musculoskeletal anatomy syllabus for undergraduate physical therapy student education. *Clinical Anatomy*, *36*, 190–223.

How to cite this article: Cui, D., & Moxham, B. J. (2023). A core syllabus for histology within the medical curriculum – The cardiovascular and lymphoid systems, the respiratory and digestive systems, and the integument. *Clinical Anatomy*, 1–11. https://doi.org/10.1002/ca.24063