Psychiatria Danubina, 2016; Vol. 28, Suppl. 2, pp S260–S262
Medicina Academica Mostariensia, 2016; Vol. 4, No. 1-2, pp 76-78 *Letter to Editor*

PATHOPHYSIOLOGY AS AN AUTONOMOUS DISCIPLINE IN THE MEDICAL CURRICULUM IN PORTUGAL - REACTION TO CHURILOV'S PAPER

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António Bensabat Rendas, at the Faculty of Medical Sciences of NOVA University, in Lisbon, founded the first department of Pathophysiology, in Portugal in 1982. Although with a background in Experimental Pathology, from his PhD Thesis from the University of London (Cardiothoracic Institute), the original commitment given to him by the Medical School was to organise a joint physiology and pathophysiology department which later became separated both for teaching and research functions.

In 1987 the Problem-Based Learning (PBL) project was started, in collaboration with the Southern Illinois School of Medicine, in the United States, aiming at developing integrated pathophysiological reasoning and involving students in the learning process. In those years, teaching of medical students in Portugal was rather traditional, teacher-centred, discipline oriented and mostly lecture-based. The reason why it was so successfully applied to a single discipline such as pathophysiology was because its nature and specifities allows truly integration of basic sciences knowledge and the PBL methodology facilitates to cross the bridge to clinical medicine using real patient problems, although specially adapted.

"After 3 years of using short-case presentations in small-group discussions, the project, in 1990, started aiming to develop the acquisition of pathophysiological knowledge in a clinical context and develop the other objectives of PBL - medical reasoning, self-learning, and motivation." (Bensabat Rendas et al. 1998).

In the PBL project we have used complete patient simulations, the PBL module, to develop information-searching and reasoning skills in a context closer to the future professional career.

We believe that the introduction of PBL in a single discipline, in our medical school, was also made possible due to Pathophysiology' s learning objectives - integrating knowledge from various basic sciences and using clinical examples to make pathophysiological knowledge easier to learn.

A frequent criticism made about PBL use in the preclinical years relates to the fact that students have to extract information from a clinical case without any previous knowledge about history-taking methods or differential diagnosis. In this respect, our experience is similar to that reported by other groups (Barrows 1986), as we found out that our students used the clinical information to learn pathophysiology and were not primarily concerned about reaching a diagnosis.

On the basis of this experience, we consider that PBL allowed our students to acquire relevant pathophysiological knowledge (Corrêa et al. 2003), but, because we have developed our strategies more toward educational interaction, we were still lacking evidence about students' understanding of the concepts during the learning process. That's why we have introduced the use of concept mapping in the PBL pathophysiology course since 2003 (Rendas et al. 2006). Although concept mapping was noted from the start as a significant innovation aimed to promote meaningful learning (Watson 1989), few studies have been reported in medical education, even fewer have been related to PBL and none in pathophysiology. From Croatia there is an integrative approach through algorithms and etiopathogenetic clusters (Kovac 2014).

Research in Pathophysiology

Since the foundation of the Department, it was planned to install in Portugal a multidisciplinary laboratory specialized in human functional evaluation. Our main expertise was, however, in the respiration field but not just related to the pulmonary area. This expertise allowed the installation of a lung function laboratory, unique in Portugal at that time. The basic equipment for lung function was first acquired followed by innovative techniques like the Respitrace® monitor (Sackner 1996), occlusion pressure for the evaluation of ventilatory control (Bárbara et al. 1995), a dosimeter for bronchial provocation tests (Gamboa et al. 1997), exhaled nitric oxide (Caires et al. 2008) and exhaled

breath condensates (Martins et al. 2012). These research activities led to seven PhD thesis, not only in respiratory disease but also on integrated mechanisms of disease (see table 1).

Table 1. Research on mechanisms of disease

Mota Carmo, M	Mechanisms of dyspnea
Neuparth, N	Lung hyperinflation in asthma
Gamboa, T	Airways reactivity and hyperoxia
Botelho, MA	Functional capacity in elderly
Bárbara, C	Pathophysiology of hypercapnia in COPD
Fradique, A	Mechanisms of metastases in gastric cancer
Martins, PC	Air pollution and bronchial inflammation

Since 2007, we belong to the NOVA Medical School Research Center – CEDOC (Chronic Diseases Research Center) that is focused mainly in Biomedical, Translational and Clinical Research on chronic diseases (www.cedoc.unl.pt). Our research group recently evolved from "respiratory diseases" to "integrated pathophysiological mechanisms of disease". This research group includes now 30 investigators, of which 11 PhDs (10MDs). 8 lines of research are currently being developed: 1) Air quality and respiratory diseases (Carreiro-Martins et al. 2014); 2) Mechanisms of pulmonary fibrosis (Wuyts et al. 2013, Robalo Cordeiro et al. 2016); 3) Aging and integrated mechanisms of disease (Carreiro-Martins et al. 2016); 4) Mechanisms of acute infection (Póvoa & Salluh 2013, Póvoa et al. 2014); 5) Mechanisms of viral infection (Paixão et al. 2014); 6) Biomarkers of disease (Martins et al. 2008); 7) Integrated mechanisms of cardiovascular disease (de Sousa Almeida, de Araújo Gonçalves et al. 2016); 8) Mechanisms of cough.

Conclusion

The challenge is now to consolidate the teaching of pathophysiology to medical students giving them a holistic perspective of disease and a comprehensive knowledge of the causes and of the mechanisms of disease, making the bridge to clinical sciences.

Concerning research in pathophysiology, it is important to pursue on the route to a multidisciplinary function laboratory where clinicians are challenged to discover new mechanisms of disease and to develop new monitoring tools such as biomarkers.

Acknowledgements: None.

Conflict of interest : None to declare.

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