Training Strategies in the Virtual Physiological Human Network of Excellence
Jesus Bisbal, Carlos Martin, Patricia V. Lawford, Andrew V. Narracott, Keith McCormack, Bindi Brook, Margarita Zachariou, Vanessa Diaz

INTRODUCTION
An ambitious, long-term aim of the Virtual Physiological Human [1] Initiative (VPH-I) is to transform the delivery of healthcare into a more personalized, predictive, and integrative process. This will require a suitably trained workforce equipped with the skills required and with the flexibility and access to the training necessary to further develop these, and take up new skills in the future.

The identification of training requirements of the VPH community is one of the tasks being addressed within the VPH Network of Excellence (NoE). Funded under the 7th Framework Programme, the VPH NoE is centred on ICT infrastructure, coordination and training for the VPH community. The main objective is to complement the activities within the VPH Initiative projects to develop and implement biophysical-based computational models that can be transferred into the clinical environment, primarily by industrial partners. The rapid development of e-science and e-medicine in an emerging multidisciplinary field such as biomedical modelling requires advance and far reaching concepts and techniques (e.g. data fusion, multiscale modelling, and complex clinical workflows) that are not currently addressed by formal education systems. VPH research has emerged from the collaboration of a wide range of researchers and practitioners that come from different educational and conceptual backgrounds and, in many respects this is an advantage for the development of this innately multidisciplinary field; but, there are imbalances in terms of the disciplines represented and their capacity for interdisciplinary communication. Training is required in order to promote the ability of “translators” who can foster a more integrative research approach [2].

In this context, the essential motivation for VPH training and integrative activities can be grouped in two thematic areas. The first, and perhaps the more challenging of the two, is the creation of a multidisciplinary, European-wide VPH study programme. In-line with the aims of the Bologna Process, VPH training focuses on developing multi-disciplinary skills, complementing the traditional ‘vertical’ specialities with strong ‘horizontal’ training. The second area, continued integrative training, emerges from an urgent need to constantly adapt to advances in VPH research as tools are developed and adopted by industrial and healthcare sectors. ‘Life-long learning’ (see Figure 1) is crucial to this and a range of activities, promoted by the NoE, are being implemented in order to address this challenge.

METHOD
The VPH training strategy is designed to address the different priorities in the two thematic areas described above, providing resources for a portfolio of training activities that fulfil different but complementary objectives. The VPH NoE is well-placed to interact with academic, industrial and clinical sectors to ensure that the training activities are relevant to current needs. Moreover, wide consultation and vision is needed as any formal programme must provide the type of curriculum and professional training needed to meet the projected future training requirements.

Training activities are also coordinated across other workpackages of the NoE in order to facilitate the use and update of state of the art tools from the Toolkit (WP3) and the Exemplar projects (WP2). Dissemination (WP5) also plays a key role, providing a route to reach out to all VPH Initiative Projects and to identify and work in collaboration on their specific needs. This provides a powerful mechanism to improve current tools and methods, and to rapidly disseminate that knowledge.

Examples of on-going activities within the NoE training effort are Study Groups, Hands-on workshops on tools, Exchange programmes, and the Multi-institutional programme (MIP). These are described in more detail below;

1. Study Groups
These scientific events, planned once a year, represent a central activity for the NoE. They allow groups from different disciplines to work together to solve specific scientific problems (Regenerative Aspects of Epithelial Cells and Tissues, Study Group 2009, University of Nottingham, http://www.youtube.com/watch?v=PtLnyvH4kuE) or on
specific modelling techniques (Multiscale Modelling; Computational Aspects and Relationship with Translational Research in Biomedicine - Study Group 2010, IMIM-BSBMI-Universitat Pompeu Fabra, http://www.bsbmi.eu/). A third Study Group, organised by ERCIM, will take place in France in the middle of 2011. The specific focus of this will be based on the most recent developments and on feedback from the other training activities.

2. Workshops on tools
In contrast to the Study Groups, the Hands-On workshops involve interaction between researchers and developers and provide training on use of the tools incorporated into the VPH Toolkit. The emphasis is on practical comparison and interoperability of different tools. Effort is channelled to address specific problems posed by VPH-I projects and to explore possible technological solutions included in the Toolbox. This process simultaneously provides training on the VPH toolkit and on-going training for developers and researchers.

3. Exchange programmes
Exchange programmes enable mobility of students and researchers in order to take full advantage of the different capacities and expertise at each centre. Some NoE Member Universities are pioneering this initiative, taking advantage of existing Erasmus exchange frameworks, complemented by bilateral agreements, to ensure the quality and impact on VPH training. The pilot initiative (University of Nottingham – Universitat Pompeu Fabra) is open to other Universities, irrespective of whether or not they are Members of the NoE. These exchange programmes will provide the foundation for the development of a full multi-institutional programme.

4. Multi-institutional graduate programme for VPH scientists (MIP-VPH)
The MIP-VPH is intended to pull resources from various Universities in order to better fulfil the challenging requirements of designing an appropriate curriculum. Currently there is no formal VPH-specific training in Europe. Some Masters programmes in related areas partially address this challenge\(^1\), but none focus on the essential characteristics of the discipline, such as heterogeneous data fusion, multi-scale and multi-physics modelling of human physiopathology, and simulation of complex clinical workflows. The VPH-MIP is designed to address this deficiency by developing a framework for VPH graduate programmes, Figure 2.

In a multi-disciplinary field such as the VPH, it is essential that students have a solid scientific grounding. The curriculum envisaged is tailored to VPH needs, but will be founded on relevant, and successful, pre-existing programmes at partner institutions. Novel VPH-specific modules covering core topics will be developed for use in all participating institutions and delivered through intensive use of ICT technologies, facilitating cultural and language adaptations.

\(^1\) http://www.biomedicaltechnology.eu/
Under this scheme, a key factor is student and researcher mobility. ERASMUS-exchange programmes will be promoted to facilitate mobility between institutions, enabling students as well as researchers to complement the training provided by their primary institution by undertaking selected specialist modules at a second institution (and perhaps, as the system develops, a third). Common or VPH related training modules offered at several institutions will be identified to form the basis for successful exchange programmes. In the longer term, joint or double degrees are envisaged to further consolidate this formal training.

The NoE is well positioned to promote this training initiative and help develop it by means of a series of formal and Life-long training courses/modules/programmes in subsequent years but sustainable framework will be needed to guarantee regular update of the VPH curriculum and address quality assurance issues across the multi-institutional programme scenario. The proposed VPH Institute would be well-placed to pick up these roles when the NoE comes to an end. ²

CONCLUSIONS

- The VPH Community has to address both formal education and in-career training. Whilst different in nature, both have to provide a number of very demanding attributes. These are; (1) a strong scientific grounding; (2) competence in information technology; (3) problem oriented and practical applications; (4) multidisciplinary abilities.
- Currently no single institution can offer all the required formal VPH training at a European level. MIP-VPH is designed to bridge this deficiency offering a multi-institutional programme based on their VPH-related training while creating a VPH Core module that can be shared.
- The VPH NoE is addressing a novel discipline that demands a multidisciplinary approach to complement and integrate the views of all key stakeholders (e.g. research, healthcare, and industry – from pharma to biomedical device manufacturers). This scenario increases the need for flexibility in providing appropriate training and makes the need to diversify training strategies and collaborate at the international level more evident: this is the one role of the NoE.

REFERENCES:

² http://www.biomedtown.org/biomed_town/VPH/VPHnews/vph-institute-start