10 Training Needs

Vaccinology covers a wide range of disciplines including immunology, microbiology, epidemiology, infectious diseases, pediatrics, clinical development, biotechnology, production processes, quality control, quality assurance, preservation, shipping, cold chain/supply chain management, public health, health economics, sociology, ethics and communication, to only mention a few.[40]

Furthermore, the diversity of profiles involved in vaccine innovation success throughout the value chain raises the challenge of adapting educational programmes to specific needs. This applies to many stakeholders, from scientists developing innovative vaccines, to engineers in manufacturing as well as healthcare workers that must convince the population about the value of vaccination.

The VACSATC[40] (Vaccine Safety-Attitudes, Training and Communication) study showed that among medical students less than 60% reported to have received training in safety issues and vaccination controversies; only 44% received training on how to communicate with patients and parents about vaccination; and only 50% stated to have received practical training on how to administer vaccines. Further gaps were identified in postgraduate education and the introduction of PhDs and Masters combining a broad base in vaccinology with various combinations of specialised modules, including modules of applied vaccinology.

Certainly, several key courses[41] and relevant expertise exist at EU level, ranging from courses providing a comprehensive overview of vaccinology, from immunological concepts to vaccine development and implementation of immunisation programs, to post-graduate courses in vaccine related fields such as epidemiology, vaccine safety and efficacy, policies for vaccine implementation, and GMP for vaccine manufacturers. Many others exist, but all are not readily identifiable.

Moreover, as an outcome of the TRANSVAC roadmap[42], EVRI advanced courses, with a strong hands-on component,

are expected to link the best institutions in Europe. EVRI-recognised Centres of Excellence in Vaccinology throughout Europe should be able to deliver a strong educational mandate.
In broader terms, in Europe, several other education channels exist that can be leveraged such as the European Programme for Intervention Epidemiology Training (EPIET); the European Malaria Graduate School; the European Medicines Research Training Network (EMTRAIN); and finally other tools that can enable a more flexible approach to education and vocational training, including through favoured exchange of expertise across countries, i. e. MOOCs, Erasmus Mundi programmes, and Marie-Curie actions.

GAPS AND CHALLENGES

The IPROVE stakeholder consultation workshop enabled the identification of key needs that were organised per type of stakeholder, according to what is reported in the table here below:

SKATEHOLDERS	TRAINING GAPS AND NEEDS
Public Health staff	➢ Basic knowledge for medical students, nurses, pharmacists, doctors etc., is spread across different courses. Knowledge and information needs to be more comprehensive and visible ➢ Accurate information for the personnel who is in charge of vaccinating is not always available ➢ Sociological and anthropological studies on hesitancy should form part of the Training
Researchers (from both industry and academic/public centres)	➢ Manufacturing (considered to be a largely neglected area) ➢ Process development + Upstream + Downstream ➢ Quality Assurance + New assays to include novel technologies + Faster assessment + Reduced in vivo-testing + Train more 'academic' Qualified Persons

[40] VACSTAC is a European collaboration project with 14 partner countries ran in 2006-2009, aiming to improve immunisation programs related to knowledge about attitudes to immunisation, training of medical and paramedical personnel, and number of websites that fulfill criteria set up by GACVS (the WHO Global Advisory Committee on Vaccine Safety)
[41] Non exhaustive list can be found at http://www.euvaccine.eu/node/307
[42] www.transvac.org

SKATEHOLDERS	TRAINING GAPS AND NEEDS
Researchers (from both industry and academic/public centres)	➤ Formulation + Thermostability + Adjuvants + Novel delivery devices ➤ Animal models to assess efficacy + Opportunities to develop a wider range of animal models + Increase expertise and resources having in-vivo skills with existing models, at all containment levels, starting at the PhD level[43] ➤ Immunology + Biomarkers and correlates of protection + Immunomonitoring
Staff working in the regulatory field	➤ Training in regulatory science and training for "inspectors"/reviewers
School teachers	➤ Vaccine education at school should be provided for both pupils and parents. School education related to vaccines can come at different stages, general knowledge earlier, followed by specific knowledge surrounding certain vaccines. Education can be plugged into relevant subjects such as biology, etc.
Media	➤ Mass media journalists need access to scientifically robust and accessible information, that can be readily disseminated to a broad public ➤ Training needs for journalists might vary from country to country

RECOMMENDATIONS FOR EU LEVEL ACTION

Audience and training offer in Europe:

- Target groups for training should be better identified as needs between groups are quite different. Each group should be offered the most appropriate training (both in content and format) addressing their specific needs. This could be the topic of a specific study funded at EU level

Training format, accessibility and recognition

- Short-term training only is not enough: Europe requires specialised and in depth long-term training as well as continuous training (life-long learning)
- Training courses should cover the entire process from vaccine R&D to licensure
- Training should be embedded in and compatible with the careers people are working in
- Training in vaccinology needs to be incentivised in order to make it attractive for participants from EU countries
- Training offered needs to be accredited by relevant higher education organisations

Training providers

- Establishment of vaccine training platforms would allow the sharing and shipment of equipment required for training to the sites/organisations most suited for the organisation of training courses
- Funding for the establishment of infrastructure facilities devoted to training for GMP manufacturing is required as training in existing industrial facilities is not possible

Recommendations as for implementation – moving forward:

- Wherever possible use up-to-date vaccinology training courses, such as various IMI-funded projects (e.g. EMTRAIN, LifeTrain) and providers of online education such as massive open online Course - MOOC (e.g. Iversity, edX)
- Both traditional, face-to-face and online education should be offered, as they can be complementary
- Both country-specific and pan-European training should be provided, evaluating which activities are better implemented at national or at EU level
- Short- and long-term training is required to address specific training needs for different career paths and stages
- Mapping of competency profiles for different jobs related to vaccinology might be useful for developing a comprehensive training offer addressing training needs for different career paths and stages
- Establishment of teams of teachers bringing together different competencies should be fostered,

[43] https://www.mrc.ac.uk/documents/pdf/review-of-vulnerable-skills-and-capabilities/

as knowledge today is too broad for a single person to be an expert in everything

- Liaison between public sector and vaccine industry is important and should be fostered based on clear codes of conduct for guiding decisions and procedures
- Measuring the impact of training provided is important to demonstrate the added value of training programmes
- Achieve a critical mass by federating and networking of existing platforms and competencies
- Sustainability is key for maintaining competencies and the infrastructures developed.

Training

GAPS & CHALLENGES	Recommendations
Gaps are based on the need for appropriate training according to specific target groups needs, i.e.: ➤ **Public health staff** ➤ **Researchers** ➤ **Regulators** ➤ **School teachers** ➤ **Media**	➤ **Identify and profile target groups for training responding to their needs** + Adapt the training offering in term of content and format to specific groups + Map out and describe competency profiles for different vaccinology related functions ➤ **Review and adapt training formats, accessibility and recognition:** + Collaborate with higher-education organisations and companies to incentivise training in vaccinology and increase accreditation + Set-up specialised initial and life-long training covering the entire process from vaccine R&D to licensure, compatible with career paths ➤ **Invest in training the trainers** + Establish vaccine training platforms to allow the sharing and shipment of equipment required for training + Fund the establishment of facilities devoted to training for GMP manufacturing and train the trainers ➤ **Further actions to support implementation** + Leverage existing platforms, e.g. IMI-funded projects (e.g. EMTRAIN, LifeTrain) and MOOCs (e.g. Iversity, edX) + Achieve a critical mass by federating and networking of existing platforms and competencies + Establish teams of teachers bringing together different and complementary skills + Appropriate measurement of training provider's impact with clear and established metrics