Framing a concept and an agenda for infectious diseases in EMBO Molecular Medicine

Each year, 12 million individuals on the planet succumb to one infection. Ninety per cent of these deaths occur in the developing world. Seventy-five per cent of them are concerned with children. Loss of precious lives, social disturbances that also encompass severe losses of activities (i.e. DALYs) are a major handicap to the most impoverished populations and to the economic development of the nations in which the victims live. Embedded in this precarious situation is the risk of emergence, reemergence and extension of new, or renewed, infectious diseases that can spread to the other end of the planet at the speed of modern air mass transport. I need not cite here the most recent pandemics that have indiscriminately affected the North and the South, but it is clear that the greatest toll is always borne by the poorest countries.

In this broad context of nosocomial infections some syndromes, like sepsis and septic shock, emerge as major threats. Both are thought to kill about 150,000 Europeans each year. Another source of infections in our modern societies is industrialization of the food chain. Breaches in hygiene during processing or other manipulations, or in the cold chain that includes personal refrigerators, lead to rapid and broad dissemination of psychrophile microorganisms such as Listeria and Yersinia. Added to all this, ageing of the Western population (25% of Europeans are expected to be older than 65 in 2050) carries its own, yet complex to evaluate, risk of infectious emergence. Each year, 5,000–6,000 French citizens die of the winter epidemic of flu, a number equivalent to traffic casualties. Vaccine protection decays with age, and a decreasing number of lymphocytes able to ‘handle’ infecting pathogens exhaust themselves fighting chronic, often latent viral infections like herpes viruses that have been acquired earlier in life. The time may have come to think about delaying the age of retirement of the immune system! Research is warranted in this crucial area. Last but not the least, a recent explosion of studies in human genetics has shown that individuals are certainly not equal in the face of infection. Genetic susceptibility to infectious diseases, multigenic or Mendelian is an emerging science that is expected to provide biomarkers of susceptibility or resistance to severe conditions (i.e. meningitis, pneumonia and severe sepsis) that will take their place both in epidemiological studies and also possibly in therapeutics, under the umbrella of what is now called personalized medicine.

Let us try to take an optimistic view and think that molecular medicine in the field of infectious diseases now plays a major role in their control and that it will continue to do so in the future. One example may summarize this view and concurrently help to better delineate what the role of EMBO Molecular Medicine could be in this complex arena. Viral Genomic Diagnostics, following its global implementation in Western countries, has brought the risk of accidental transmission of HIV, HBV and HCV by blood transfusion close to zero. This is of course the result of a complex array of molecular approaches encompassing superb basic science that led to the identification of these viruses, development of molecular diagnostic tools such as PCR, and their global implementation. Similar considerations apply to the
recognition of HPVs as the cause of cervical cancer and to the development of a vaccine that is now on its way to prevent the disease both in the North and the South.

In the field of infectious diseases, a huge amount of excellent science has laid the basis for an understanding in molecular and cellular terms of how microbes (i.e. bacteria, viruses, parasites, yeasts and even prions) alter cellular functions. Cellular and subcellular analyses have, with the help of the combination of imaging, molecular biology and genomics, reached a phenomenal degree of resolution and articles describing this research make their way into journals for various audiences, ranging from the specialized to global. Such papers may make their way as well to EMBO Molecular Medicine provided they are of relevance to the medical field.

»...translation is an ethical obligation.«

However, it is a tragedy that this mass of ‘academic’ knowledge is not more efficiently translated into innovative tools to control infectious diseases through diagnostics, therapeutic molecules, vaccines and immunotherapeutic approaches. I often stress that translation is an ethical obligation.

The fact that it does not yet happen widely enough may simply be that the academic sector is rarely ready, or sufficiently equipped to seize the challenge of translational research, and to bring candidate tools to a point of visibility and credibility that would interest the pharmaceutical/vaccine companies. A lack of communication between the academic and industrial worlds may also be an issue. Translational research is increasingly considered by academia, as some of its approaches, such as high-throughput screening, provide in return molecular tools for basic research. EMBO Molecular Medicine could become a natural medium for high profile projects that foster this virtuous circle.

There is more than this however. Intrinsic obstacles hamper the development from the very basic studies (i.e. cellular microbiology) of concepts that could lead to the translational paradigm shift. A non-exhaustive list of such obstacles includes lack of a global vision of the dynamics of infectious processes at the tissue and organ level, human specificity of the microorganism and restriction of studies to animal (mostly murine) models, whereas it is now clear that a switch to studies on samples obtained from sick patients, on human primary tissue explants, or in humanized murine models is essential, particularly in infectious immunology. Let us also consider that certain microbes are likely to account for chronic (inflammatory) diseases that are specifically human, as starter or sustained etiological agents. Reporting of the discovery of such agents should without doubt make its way to EMBO Molecular Medicine. Last but not the least, high level contributions on the genetic susceptibility and resistance to infections, when associated to excellent epidemiological methodologies and strong basic mechanistic studies is also an area of major interest for this Journal. This is the field that one expects may bring the most unexpected contributions in infectious diseases in the future and to prepare, as already mentioned, the revolution of personalized medicine.

»...the launch of this Journal is very timely.«

The agenda is broad, thus any attempt to fully define the role of EMBO Molecular Medicine in the field of infectious diseases would be both a complex and premature endeavour. One certitude is however that the launch of this Journal is very timely and that by virtue of its unique position at the interface between basic and translational research, it offers both basic and translational researchers the opportunity to synergize their efforts through its pages.

Philippe J. Sansonetti
Philippe Sansonetti, MD is a Senior Editor of the Journal and Head of the Unité de Pathogénie Microbienne Moléculaire at the Institut Pasteur. He is Professeur at the Collège de France, Professeur at the Institut Pasteur and a Howard Hughes Medical Institute foreign scholar.
Institut Pasteur
INSERM U786
Paris, France
E-mail: psanson@pasteur.fr
DOI 10.1002/emmm.200900031