Deaths from infectious diseases have declined in developed countries in recent decades due to improvements in hygiene and sanitation, widespread immunisation and effective drug treatments.

But infectious diseases can continue to catch the world off guard – they are an ever-moving target. Some medicines are losing their effectiveness and the world is becoming a smaller place with the rapid increase in air travel allowing for diseases to be transported from one continent to another in a matter of hours. Diseases once thought to be retreating have made a deadly comeback, whilst new killer diseases have emerged.

Below is a brief summary of some current issues making headlines in infectious diseases across Europe. A range of ESCMID experts and spokespeople are available to interview about these topics.

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Antibiotic resistance
Antibiotic resistance is developing at such a pace many fear we could soon face a future where many common infections would no longer have a cure, and a range of medical treatments would be seriously threatened. There are warnings that if no action is taken we could be faced with an almost 19th century environment where routine operations, cancer treatments and organ transplants would no longer be possible.

Some previously manageable infections will become untreatable with antibiotics. Experts are calling the increase in antibiotic resistance a “ticking time bomb” with the World Health Organization (WHO) warning many common infections could kill “unabated” alongside the emergence of what is being called “nightmare bacteria”.

The superbug MRSA is now resistant to so many drugs it is already hard to treat. Cases of multi-drug resistant TB are on the rise, and new threats emerging such as New Dehli metallo-beta-lactamase-1 (NDM-1), which originated in India where poor sanitation and antibiotic use have helped resistance spread. Such threats spread rapidly due to the ease of international travel which can see infections spread from one country to another in a matter of hours.

Misuse of antibiotics is one of the key factors underlying the crisis and is rife in some parts of the world. Experts are concerned with inappropriate use such as overprescribing or self-medication where antibiotics are available over the counter. It is also thought that the widespread use of antibiotics in animals has led to resistant strains of some bacteria being transmitted to humans via the food chain, although Europe has banned the use of antibiotics to boost the growth of livestock. Compounding this is the sale of counterfeit
drugs in some regions which, as well as causing deaths, contributes to growing resistance. Individual’s adherence to the full course of an antibiotic treatment prescribed is also a factor.

There has been no new class of antibiotics since 1987 and few antibiotics in the development pipeline, whereas new pathogens are emerging every year and existing bugs are developing resistant to current treatments. The market incentive for pharmaceutical companies to research and develop new antibiotics is somewhat limited as antibiotics will only be used for a week or two, and have a limited life span because of possibility of resistance.

Coordinated action is needed between governments, the medical community, the pharmaceutical industry and the general public. A renewed focus on developing new antibiotics is required, and appropriate use of the ones that still work, alongside improved education in antimicrobial resistance for medical students and doctor, general public education and awareness, screening, and a range of surveillance systems that collect data on antibiotic/antimicrobial resistance and drug susceptibility.

**Measles and rubella epidemics**

Measles has re-emerged in Europe recently with the number of cases increasing by a factor of four between 2010 and 2011. Measles has been virtually eliminated in North and South America, but Western Europe is lagging behind due to stagnating vaccine coverage.

Between 2000-2010 an estimated 5 million individuals in EU countries aged 2-12 years had not had the MMR (measles, mumps, rubella) vaccination. 25 European countries saw an increase in cases of rubella in 2012, largely affecting teenagers. Whilst anti-vaccination activists continue to spread the message that childhood immunisations are unnecessary and harmful, the impact on unvaccinated or under-vaccinated pockets of populations is currently being seen across Europe.

In 2012 France, Italy, Romania, Spain and the UK accounted for 87% of the total cases across Europe, with the UK seeing measles cases hitting the highest level in 18 years. France had six deaths from measles in 2011 – five of whom were teenagers. With an estimated 2.5 million population potentially susceptible in the age group 0-19 years, there were more than 9,000 cases in 2011, whilst the previous year an outbreak in Bulgaria saw 24,000 cases, 90% of which occurred in Roma communities and caused some 25 deaths.

The UK is currently experiencing an epidemic concentrated in Swansea, Wales, where more than 800 cases have been diagnosed. The outbreak is blamed in part on the discredited report – and the media coverage of it - by Andrew Wakefield that wrongly linked the MMR vaccine to autism. Health experts say it is the result of a 10-15 year “legacy” of concern around the MMR vaccine and reports suggest that 45% of children in the affected area had not been vaccine again measles. Drop-in vaccination clinics have been held at hospitals. One death is being linked to the outbreak so far and health officials are warning more are likely.

Measles is often associated with being a disease of the past and as a result, some are unaware of how serious an infection it is. But complications, which are quite common and can include pneumonia and inflammation of the brain, can be fatal. An estimated 12% of
children infected with measles in Europe suffer some sort of complication according to WHO.

A worrying development is the report of two cases in Germany of subacute sclerosing panencephalitis (SSPE) which is a rare, late complication of measles occurring on average about seven years after having a natural measles infection. It causes progressive deterioration of behaviour and intellect, followed by awkwardness, seizures, and eventually death.

All countries in the European Region of the WHO have renewed their commitment to eliminate measles transmission by 2015 – a target that will only be possible if vaccination coverage is above 95% with two doses of the MMR vaccine in all population groups and in all geographical areas.

**New strain of bird flu (H7N9)**
A new strain of influenza has emerged – H7N9 - centred in Eastern areas of China with more than 100 human cases confirmed, and some 20 deaths (as at 21 April 2013). Reported new cases are now being compiled and posted daily.

The H7N9 strain is normally found in birds and not previously known to infect humans until March this year. The source of infection is still unclear and further cases are expected. The worry is it appears to be well-adapted to infect humans but officials in China are currently describing the situation as stable. Whether the A(H7N9) virus could actually cause a pandemic is unknown and other animal influenza viruses that have been found to occasionally infect people have not gone on to cause a pandemic. But as experts say, with an influenza virus expect the unexpected.

**Vaccines**
Vaccines are one of the major achievements of public health care and the most effective and efficient strategy to prevent infectious diseases. Yet vaccination rates in industrialised countries have been declining for the past decade due to a distrust of vaccinations and concerns about vaccine safety, as well as the belief that new outbreaks of diseases which have been nearly eliminated over the past decade are unlikely to occur.

Vaccine-preventable diseases are costly both at an individual and societal level and the current measles outbreaks being seen in Europe clearly demonstrate the consequences of under-vaccination. A 1996 outbreak of polio in Albania, Greece and former Yugoslavia showed how easily a disease can be reintroduced to countries once free of the disease if immunisation coverage is allowed to drop.

Anti-vaccination activists continue to spread the message that childhood immunisations are unnecessary and harmful. In the US 20 states now allow parents to refuse immunisations based on philosophical exemptions, whilst religious exemptions are allowed in all but two states. Discredited research in the UK by Andrew Wakefield is being blamed for wrongly linking the MMR vaccine to autism which has left a 10-15 year “legacy” of concern around the vaccine.
A new Vaccine Study Group is being proposed by ESCMID which will focus on comparing immunisation and vaccine data across countries, as well as how to counter the anti-vaccine messages and fears some still have, and identify priorities for research and education on vaccines.

The HPV vaccine
The human papillomavirus (HPV) vaccine has been introduced in 19 European countries for girls to immunise them against the virus that causes cervical cancer. Worldwide cervical cancer is the second most common and the fifth deadliest cancer in women with an estimated 60,000 cases and 30,000 deaths in the WHO European region each year.

Yet, uptake of the HPV vaccine is lower than expected, despite most countries providing the vaccine for free. It is reported that rates in EU counties range from 17 - 84%. Only Portugal and the UK reported full vaccination coverage rates above 80% in 2010.

There are a number of factors contributing to the slow uptake including the cost as well as the three doses required over a 6 month period. Because routine vaccination is aimed at girls aged 10-14 years, as the vaccine is most effective if given before the onset of sexual activity, these girls require parental permission so parents have a key role to play in the decision.

Public health officials are being asked to look at why HPV vaccination coverage rates are not higher and to focus on strengthening their national campaigns. Despite the cost, the HPV vaccination protects against more than just cervical cancer and governments are being urged to take these and other health gains into account when considering the cost of rolling out vaccines and to whom.

There is a debate around whether boys should receive the HPV vaccine and discussion around whether including boys is likely to be cost-effective. So far Australia is the only country to routinely offer universal vaccination to boys and girls.

TB vaccine
Experts believe it is a key moment in tuberculosis vaccine research as medical research focuses on an improved tuberculosis vaccine. The current Bacillus Calmette-Guerin (BCG) vaccine was introduced in 1921 and is only partially effective. A vaccine that provides greater and more consistent protection against TB could revolutionise control of the disease as prevention is better than cure.

In February 2013 researchers reported on the failure of a trial of a new booster vaccine which marked a disappointing setback in the fight against TB. But the researchers stressed that it was a significant step as it was the first efficacy trial – the first of a new TB vaccine for nearly a century - and much can be learnt from the work done. Some 12 new TB vaccines are currently being tested in humans and some 50 vaccines candidates are being tested in the lab. All those involved are aware of the urgency to control the global TB epidemic and the role a vaccine can play in this.

Travel and vaccines
Travellers suffering from vaccine preventable diseases are frequently hospitalized demonstrating their seriousness and cost. Many are not properly immunized before travel
with the most common vaccine preventable diseases seen in travellers being enteric (typhoid or paratyphoid B) fever, acute viral hepatitis, influenza, varicella, measles, pertussis and bacterial meningitis.

In addition to the impact on individuals, vaccine preventable diseases can pose serious public-health consequences if they introduce or re-introduced infection from abroad when returning to areas with susceptible populations, such as children and the elderly.

The international spread of poliomyelitis, Neisseria meningitidis serogroup W135 meningococcal infections, measles and influenza provides strong evidence of the role of international travel in the globalization of such diseases. What is essential is effective surveillance of the emergence, re-emergence or spread of vaccine preventable diseases to help adapt pre-travel advice and the responses.

**HIV vaccine**
An AIDS vaccine has long-been elusive after 20 years of research. However, whilst a vaccine still remains far off, researchers say some progress has been towards the goal of a vaccine, despite enormous challenges and disappointing setbacks. An estimated $845 million was spent on AIDS vaccine research in 2011 – by the public sector, private sector and philanthropic donors.

Thirty-four million people in the world are HIV-positive, and 2.5 million are newly infected each year worldwide. In the absence of a vaccine, many experts want to focus efforts on prevention. Antiretroviral drugs are the only effective way to treat HIV.

**Vaccines and the elderly**
The age profile across Europe is expected to change dramatically in the coming decades and the region’s population is ageing rapidly. Those aged 65 and over are the fastest-growing segment of the population and are estimated to comprise more than 25% of the region’s population by 2050.

The increased vulnerability to infection of the elderly makes them a particularly important target population for vaccination. However, most vaccines are less immunogenic and efficient in the elderly because of age-related changes in the immune system. Despite major advances in vaccines over the last decades, there is still room for improvement in vaccines for the elderly and novel approaches are required to help achieve optimal protection against infectious diseases in old age.

Vaccination against influenza, Streptococcus pneumoniae and varicella zoster virus is recommended for the elderly in many countries. Regular booster immunisations, for example against tetanus, diphtheria and, in endemic areas, tick-borne encephalitis, are essential during adulthood to ensure protection of the elderly. Also with increasing health and travel opportunities in old age, the importance of travel vaccines for those over age of 60 is growing.

**Coronavirus**
The scientific community is monitoring the emergence of a new coronavirus – a variant of the respiratory virus that can cause the common cold but was also the cause of the SARS
(severe acute respiratory syndrome) outbreak of 2003 which swept across the world killing more than 700 people.

The new coronavirus, first detected in September 2012 in a patient in Saudi Arabia, was followed by cases in Qatar and the UK and by the end of March 2013 is estimated to have infected 17 patients, causing eleven deaths. A second case was recently confirmed in Germany and there is also evidence of person to person transmission with implications for travel.

As the 10th anniversary of the SARS outbreak was marked this year in March, the lessons learnt during that epidemic are serving well in monitoring and preparedness for future outbreaks. Prevention is better than cure so interrupting the transmission of infection is vital. Collaboration between affected countries and other global partners is also playing a critical part of continued risk assessment.

**Tuberculosis**

TB is still killing 44,000 every year in Europe, with cases of multi-drug resistant TB on the rise. With an estimated 380,000 new TB cases every year, more than 1,000 people every day across Europe are diagnosed. London has the highest TB rate of any capital city in Western Europe.

Drug-resistant TB – which is hugely expensive and more difficult to treat – is increasing with about one-third of all new TB cases in Eastern Europe resistant to the front-line drugs and cases in the UK increasing by 25% last year. Some 15 of the 27 countries with the highest burden of drug-resistant TB are in the WHO European region (includes Russia). Whilst TB can affect everyone it is especially linked to the social determinants of health including migration, imprisonment and social marginalisation.

Drug resistant strains of TB develop through inappropriate use of anti-TB drugs and poor management of the disease. Experts point to the widespread emergence of drug resistant TB in Asia and Eastern Europe heralding the possibility of virtually untreatable TB. Less than 50% of patients detected with multi-drug resistant TB are successfully treated.

TB is also a leading killer among people living with HIV/AIDS – people who are co-infected with TB and HIV are up to 34 times more likely to develop active TB disease than those without HIV. TB further weakens the immune system of people living with HIV and AIDS who are already compromised.

It was Robert Koch, a German physician and scientist who discovered the cause of TB that led to diagnosis and the development of treatment. When he presented his discovery in 1882 one in seven of all human beings died from tuberculosis.

There are currently a few new TB drugs in the pipeline and a new TB vaccine is needed if the goal of zero TB deaths is to be met. Experts believe it is a key moment in tuberculosis vaccine research as medical research focuses on an improved tuberculosis vaccine. The current Bacillus Calmette-Guerin (BCG) vaccine was introduced in 1921 but is only partially effective. A vaccine that provides greater and more consistent protection against TB could revolutionise control of the disease at a time when there is increasing urgency to control the global epidemic.
HIV/AIDS
There are few signs of a decline in HIV transmission across Europe with more than 121,000 new HIV cases reported in 2011. And Eastern Europe has fastest growing HIV epidemic in the world. Only one in four patients receives the necessary antiretroviral treatment in the Eastern part of the region – a rate that is among the lowest in the world.

Of those newly infected with HIV in the region, some 50% get tested late which impacts on the effectiveness of treatment and longer term outcomes. Efforts to promote HIV counselling and testing are seen as key in the region.

In the Europe region HIV is concentrated in specific populations such as men who have sex with men, injecting drug users and people originally from countries with generalised HIV epidemics.