



MEETING REPORT

Expert consultation on rabies post-exposure prophylaxis

Stockholm, 15 January 2009

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Abbreviations

ECDC	European Centre for Disease Prevention and Control
EBLV	European bat lyssavirus
ERIG	Equine immunoglobulin
HRIG	Human rabies immunoglobulin
MABs	Rabies monoclonal antibodies
PEP	Post-exposure prophylaxis
RIG	Rabies immunoglobulin

1 Background

The founding regulation (1) establishing the European Centre for Disease Prevention and Control (ECDC) gives ECDC a mandate to strengthen the capacity of the European Union for the prevention and control of infectious diseases.

Rabies, a viral zoonosis which is almost always fatal in humans, poses a potential health risk due to the recent shortage of post-exposure prophylaxis (PEP) for potentially exposed patients (i.e. the administration of specific immunoglobulin injections and vaccination) reported by several countries. According to some estimates, this shortage may continue in the near future (2).

When considering the European situation, a number of questions need to be addressed:

- What is the status of the provision of vaccine and immunoglobulin in Europe?
- How do the countries in Europe prioritise the use of limited immunoglobulin and vaccine availability?
- Is the use of human rabies immunoglobulin and vaccine in Europe appropriate, and/or is there a need to ration it (geographical restrictions, administration to contacts, etc.)?
- Is there a need for vaccine/immunoglobulin stockpiles at the EU level?

In order to address these questions on a European level, ECDC organised a multidisciplinary consultation of rabies experts (Appendix 1) on 15 January 2009.

2 Objectives of the consultation

The objectives of this consultation were:

- to review the epidemiological situation of rabies in Europe;
- to identify the different approaches regarding the administration of PEP, e.g. with regard to the definition of the risk zone and the type of exposure; and
- to identify solutions to the shortage, including the possibility of establishing a virtual stockpile of PEP, potentially available to all Member States in the European Union.

3 Rabies post-exposure prophylaxis in humans, WHO guidance

Dr François-Xavier Meslin, WHO headquarters, Geneva, presented the global situation and the WHO recommendations concerning rabies.

Rabies is widely distributed around the globe. According to WHO data, more than 55 000 people die of rabies each year, about 95 % of these deaths occur in Asia and Africa. Most human deaths are caused by bites from infected dogs. Between 30 % and 60 % of the victims of dog bites are children under the age of 15.

The recommended treatment to prevent rabies after suspected exposure depends on the type of the exposure (see Table 1).

Table 1: Rabies post-exposure prophylaxis modalities

Type of exposure	Description	Use of rabies biologicals
Category I	Touching, feeding of animals, or licks on intact skin	No exposure, therefore no prophylaxis if history reliable.
Category II	Minor scratches or abrasions without bleeding or licks on broken skin and nibbling of uncovered skin	Use vaccine alone.
Category III	Single or multiple transdermal bites, scratches, or contamination of mucous membrane with saliva (i.e. licks) and suspected contact with bats.	Use immunoglobulin plus vaccine.

Source: WHO, 2007

The three categories of exposure and corresponding recommendations were updated and published on 11 December 2007, based on reports from WHO rabies expert committee meetings and consultations, and are an update of the previous document (WHO expert consultation, 1992 (8-10)). The main revision was the transfer of sections of former exposure category II to category III, resulting in a more conservative overall risk assessment. Currently, and partly due to the shortage of biologicals this past year, WHO plans to re-open the discussion on categories.

Post-exposure care to prevent rabies includes cleaning and disinfecting the wound or point of contact, and administering anti-rabies immunisation as soon as possible. Rabies vaccine is given for category II and III exposures. Anti-rabies immunoglobulin should be given for Category III contact, or to people with weaker immune systems. Initiation should not wait the results of laboratory diagnosis or be delayed by dog observation when rabies is suspected.

Two main vaccination schedules in post-exposure prophylaxis (11) are distinguished:

- The Essen schedule is the most common, with five doses intramuscular in five visits, on days 0, 3, 7, 14 and 28. Each dose is applied intramuscular into the deltoid muscle;
- The Zagreb schedule is a reduced multisite intramuscular regimen (2-1-1): four doses distributed in three visits on days 0, 7 and 21. Each dose is applied intramuscular into the deltoid muscle.

Intradermic administration of the vaccine is responsible for approximately 60 % to 80 % of vaccine consumption; this vaccine could be saved (11), providing it was administered in a centre receiving sufficient number of patients and capable of using this technique.

With regard to immunoglobulin, there is no established time limit as to when PEP should be provided to exposed humans, and how this should be done systematically in suspected cases. Most of the immunoglobulin should be administered deep into the wound, while the remaining amount, if any, should be administered at an additional intramuscular site away from the wound.

Finally, WHO recommends an observation of the suspected source animal for ten days, as the early symptoms of the disease in dogs or cats are not very specific. However, several countries recommend longer observation times, including France, the Netherlands and Spain (14 days).

It is planned to update the maps in the next edition of WHO's International Travel and Health. The publication will also identify the countries and areas at risk and provide recommendations for travellers. These will include individual behaviour and professional activity, among others.

4 Epidemiological situation in Europe

Dr Hervé Bourhy, Institut Pasteur, National Reference Centre for Rabies and WHO Collaborating Centre for Reference and Research on Rabies, Paris, presented the rabies situation in Europe. Dr Alexandra Mailles, from the Institut de Veille Sanitaire, co-authored the presentation.

4.1 Canine rabies

Canine rabies disappeared from the countries of western and central Europe during the first half of the 20th century. Most of them are now free of rabies in terrestrial mammals. Nevertheless, canine rabies is still reported in south-eastern Europe, the Middle East and North Africa, and there is limited information concerning countries bordering the EU towards the east. Raccoon dogs have been found infected in Poland and other central-eastern countries.

The virus involved in canine rabies is the rhabdovirus (RABV) genotype 1 (order Mononegavirales, family Rhabdoviridae, genus *Lyssavirus*). It is worldwide distributed and affects dogs, wild carnivores and bats. There is a good vaccine providing cross protection.

In the EU, several imported cases of rabies-infected pets in otherwise rabies-free countries have been recently reported:

- February 2008: a dog called 'Gamin', imported from Morocco to France in October 2007, passed through Portugal and Spain, causing secondary transmission to other dogs (5, 6).
- April 2008: a dog called 'Luigi' from Gambia, passed through Brussels, Belgium, and St Tropez, France.
- November 2008: a dog, probably from Morocco, passed through Spain, and eventually arrived in France, from where no secondary transmission was reported.
- December 2008, a dog from Croatia was imported to Germany.

The reintroduction of the virus from rabies-enzootic areas could have a big impact on the consumption of rabies PEP and may occur through the translocation of animals from neighbouring countries, illegal importations from more distant areas, the adoption of puppies from enzootic countries without valid vaccination (or without vaccination at all), or from the travel to these countries with non-vaccinated European dogs.

4.2 Bat rabies

Wild rabies poses the risk of human infection and is still endemic in some European countries. The reservoir is bats, in which rabies is common but often not recognised. European bat lyssaviruses (EBLVs) are divided into two groups:

- EBLV-1 (genotype 5) affects insectivorous bats (e.g. *Eptesicus spp*); natural transmission has been reported in humans, cats, one stone marten, and sheep.
- EBLV-2 (genotype 6) affects bats (e.g. of the genus *Myotis*); transmission to humans has been reported.

The data on bat rabies comes mainly from passive surveillance. The EBLV was first identified in 1954, and transmission has been reported to sheep, cats, foxes, and a stone marten (3, 4). Since 1985, only three human deaths from EBLVs have been confirmed. There is only partial cross-protection between these genotypes.

4.3 Fox rabies

In Europe, rabies in foxes spread south-westward from the 1930s to the 1980s. Oral vaccination of foxes with different strains started in 1978 and now covers more than twelve countries in Europe. It was administered by hand, helicopter or plane, and has been a very effective measure for controlling the disease.

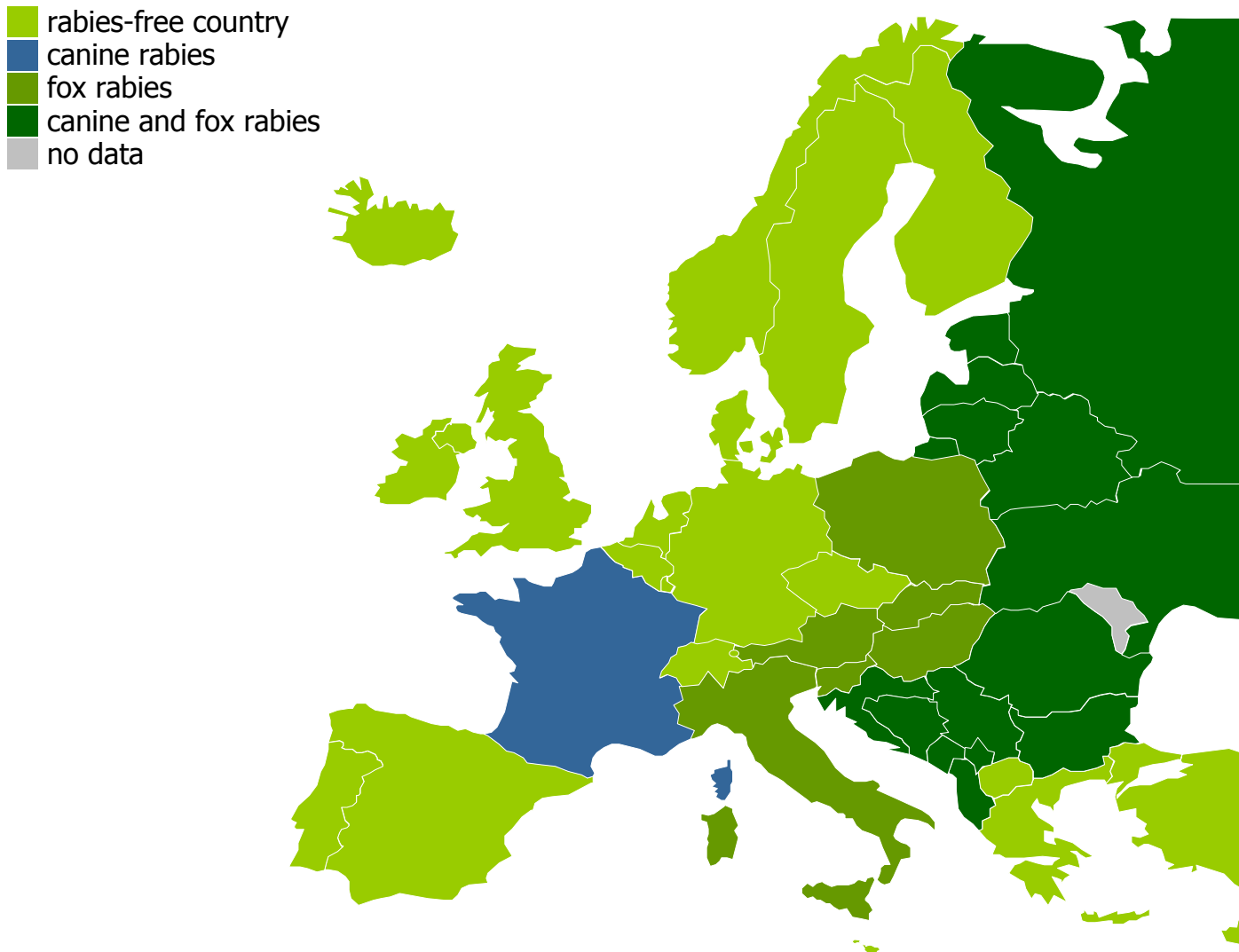
Still, in November 2008 rabies was reported in two foxes in northern Italy, where the previously reported case dated back to 1995. The virus was found to be phylogenetically connected with the strain reported in Slovenia.

4.4 Summary of current situation

In the European Union, the distribution of rabies by main affected species is approximately as follows:

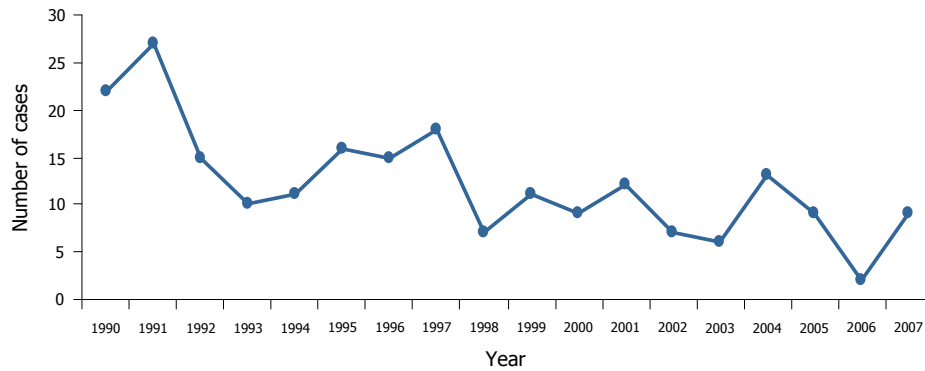
- Canine rabies: France. Report of two successive transmissions of the virus to dogs on French territory; no further transmission since February 2008 (5,6).
- Fox rabies: Poland, Slovak Republic, Slovenia, Austria, Italy, and Hungary.
- Fox and canine rabies: Romania and Bulgaria.

Figure 1: Rabies in Europe (2008)



Source: Hervé Bourhy and Alexandra Mailles, based on data from Rabies Bulletin Europe

Between January 2000 and January 2009, there were 13 imported and five indigenous cases of human rabies in the EU. During the same period, 57 indigenous cases and no imported cases were reported in Ukraine and Russia. (See Figure 2).

Figure 2: Number of cases of human rabies in Europe (1990–2007)

Source: *Rabies Bulletin Europe and Rabnet*.

The main reasons for exposure to rabies in humans in Europe are thought to be the lack of awareness of exposed or bitten persons, delayed care after potential contamination, non-adherence to the WHO recommendations, or limited access to PEP (immunoglobulin) in enzootic areas.

5 Country perspectives: problems and solutions

5.1 France

Dr Hervé Bourhy presented the rabies situation in France and reported on the impact of imported cases on the use of rabies biologicals. Dr Alexandra Mailles, Institut de Veille Sanitaire, co-authored the presentation.

A total of 74 anti-rabies medical centres (ARMCs) are available throughout France. The ARMCs are responsible for providing PEP to persons with suspected exposure, following WHO recommendations. The physicians in charge receive regular training in order to keep pace with the latest protocols in the field. The ARMCs report the number of exposure notifications and consultations directly to the Institut Pasteur. Suspected cases in animals are reported to the Ministry of Agriculture and specimen testing is done at the Institut Pasteur or at the 'Agence française de sécurité sanitaire des aliments' (AFSSA) depending whether or not the animal is suspected of animal contamination.

The most recent rabies-related health events were presented, as well as their impact on the prescription and use of PEP. In the event of February 2008 (see above), a total of 152 PEP were prescribed, whereas 32 PEP were provided following the April 2008 event. In 2004, the importation of a rabid dog induced more than 1580 PEP, which had a major impact on the vaccine supply.

When cases of rabies are imported to countries with a rabies-free status, the consumption of rabies biologicals increases. It was noticed that this can cause a shortage of anti-rabies immunoglobulin and rabies vaccine — as illustrated by the recent events in France.

Some of the solutions proposed during the presentation were increased border controls of imported animals from both outside and inside the EU, additional support to neighbouring countries in controlling/eliminating rabies, and the optimisation of PEP protocols.

5.2 Poland

Dr Małgorzata Sadkowska-Todys, Polish National Institute of Public Health/National Institute of Hygiene, presented the rabies situation and policy in Poland.

Poland set several milestones in the elimination of rabies when it introduced:

- mass vaccination of dogs in 1950;
- safe and immunogenic cell-culture-based vaccine in 1984; and
- mass oral immunisation of foxes in 1993.

From 2005 to 2007, almost all of the detected rabid animals were foxes, mainly in the east of the country. The two most recent cases of human rabies were reported from northeast Poland (2000) and southern Poland (2002). Both cases were infected in Poland, and none of them received pre- or post-exposure prophylaxis.

The rabies vaccine is bought on the central level and distributed throughout the country to the vaccinating ambulatories in the designated hospitals, with an estimated 7 000 PEP prescriptions per year. The use of immunoglobulin in PEP in Poland is low and not systematically integrated in the management of suspected cases.

5.3 Spain

Dr Luisa P Sanchez Serrano presented the situation in Spain and proposed solutions to current problems.

Spain is considered free of rabies since 1978, except Ceuta and Melilla (two Spanish autonomous cities on the north coast in North Africa), where approximately one rabid dog is reported per year. Intensive active surveillance has been maintained, and thousands of animals involved in bite incidents or with clinical suspicions of rabies were examined according to WHO-recommended protocols. The Spanish Epidemiological Surveillance Network covers human rabies; reporting is also mandatory for animal rabies. Since 1978, only bats have been reported to be infected in Spain.

The most likely introduction scenario for rabies in Spain is considered to be the importation of stray dogs, by sympathetic people wanting 'to rescue the sick, skinny dogs'. Therefore, animal control at the borders has been reinforced over the last years.

The use of rabies vaccine in Spain is coordinated by the Spanish Medicine and Health Products Agency. The regional health authorities are responsible for the purchase, recommendation and administration of vaccines, as well as reporting to the surveillance network. Pre-exposure is recommended for specific risk groups, for example naturalists working with bats.

Spain does not expect any problems with the supply of biologicals on a regular basis, but if there are rabies events or outbreaks, a shortage could occur. The presentation suggested that information about the availability of vaccine in Europe might be important in certain epidemiological situations. Creating an actual stockpile was not deemed necessary, but a virtual one was thought to be useful.

5.4 United Kingdom

Dr Hilary Kirkbride, UK Health Protection Agency, presented the situation in the United Kingdom.

The UK has been rabies-free since 1992, apart from EBLV-2 virus circulation in bats. The Health Protection Agency advises health professionals and centralises the administration of the vaccine and immunoglobulin, based on individual risk assessments; no distinction was made between WHO categories II and III, but after identifying the shortage in immunoglobulin, the different risk in these categories is being considered when deciding on applying post-exposure prophylaxis. The criteria used for the risk assessment for providing PEP include the source, type, and geographical location of exposure, as well as the time passed since the exposure and the previous vaccination history.

Approximately 3 500 vaccines and 1 200 doses of immunoglobulin are used per year, with an increase of 50 % registered between 2006 and 2008. While no problems of vaccine shortage are foreseen, problems are anticipated for the immunoglobulin. The presentation suggested the importance of contingency plans for potential shortages, central purchasing, annual contracts with the industry, and agreements on a minimum regular supply. Maintaining a close liaison with manufacturers to ensure awareness of potential problems was advised. Other suggestions included ensuring access to information on risks concerning all countries, the use of risk assessment algorithms, and the delay of pre-exposure vaccination (i.e. when there is a temporary shortage in supply of vaccine).

5.5 Germany

Dr Gerd Burchard, clinician and infectious-disease specialist at Bernhard Nocht Institute for Tropical Medicine, Hamburg, explained the needs in pre- and post-exposure prophylaxis, mainly in relation to travel advice.

In Germany, recommendations for vaccinations — especially in children — are published annually by the German Standing Vaccination Committee (STIKO), a vaccination committee and recommendation body that belongs to Robert Koch Institute (RKI), the central federal institution responsible for disease control and prevention. Its responsibilities include issuing advice regarding vaccination practices. STIKO issues an annual immunisation reference guide entitled 'Empfehlungen der ständigen Impfkommision' (recommendations of the Standing Vaccination Commission). Additionally, the German Society for Tropical Medicine and International Health (DTG)

issues more detailed recommendations and current updates concerning travel medicine — including pre-travel and post-exposure rabies immunisation. In the end, however, the actual administration of pre-travel and post-exposure vaccinations is decided solely by the treating clinician. For the final decision on treatment, the WHO recommendations are used as a basis but other guidelines are also considered, e.g. the 'Recommendations of the Advisory Committee on Immunization Practices' (8). As practiced in the UK, many clinicians in Germany also apply only two of the three WHO categories (I and III).

In the light a potential vaccine shortage and the fact that only 20–30 % of rabies vaccine is used for post-exposure prophylaxis, the criteria for recommending pre-exposure prophylaxis among travellers are currently under discussion in Germany. While only about 3.5 % of all travellers receive pre-travel vaccination, a higher percentage would be indicated.

5.6 The Netherlands

Dr Jim Van Steenberg, Dutch Institute for Public Health and the Environment (RIVM), presented the situation in the Netherlands.

In the Netherlands, WHO risk categories II and III are treated as one category, i.e. category III. The distribution of PEP is now coordinated by the national public health services, which has decreased the demand.

The question of what to do in case of contact with non-canine wild animals in non-endemic countries or regions was raised, e.g. fox bites on camping sites in areas at risk. It was concluded not to treat such cases as no wild transmission has been documented.

In order to address the potential shortage of both vaccine and immunoglobulin, it was suggested that a case-by-case and geographical assessment should be ensured; in low-risk areas, vaccination would be considered sufficient PEP; immunoglobulin would not be given. In addition, the observation of suspected source animals was recommended whenever possible.

6 Manufacturers' perspectives

6.1 Vaccines: supply status and strategies proposed for shortage

Representatives of the two main producers of rabies human vaccine for Europe presented the situation regarding human supplies. At the international level, the global supply of vaccine is constrained (both pre- and post-exposure). Vaccines produced on cell lines, and human immunoglobulin for rabies are licensed in Europe.

Novartis: Claudius Malerczyk and Dieter Gniel

The purified chicken embryo cell vaccine Rabipur® for post-exposure prophylaxis has been produced by Novartis since 1984 in Marburg (Germany). The vaccine is also in production in Ankleshwar (India). The vaccine is licensed in 21 countries in the EU (Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, France, Germany, Hungary, Ireland, Italy, Luxemburg, Norway, Poland, Portugal, Romania, Slovak Republic, Spain, Sweden, the Netherlands, United Kingdom) and in Switzerland. The total rabies vaccine demand in the EU is estimated to be 600K doses per year, 20–30 % of which is expected for post-exposure prophylaxis. Novartis started building a new rabies vaccine production facility in Germany in May 2008. It is expected to be fully operational in 2011.

In order to address the current potential shortage in Europe, Novartis proposes to prioritise vaccine availability for PEP; additional doses could be allocated as security stock in case of emergencies. The possibility of partnerships between public health authorities and manufacturers was suggested in order to evaluate and implement a stockpile plan. Furthermore, the importance of individual risk assessments before providing rabies PEP to individuals was emphasised.

Sanofi Pasteur: Jaco Smit and Thierry Allavoine

Sanofi Pasteur, the vaccines division of sanofi-aventis Group, is present in 19 EU countries, producing two types of vaccines:

- IMOVAX[®] human diploid cell vaccine (HDCV); and
- VERORAB[®] vero cell vaccine.

The company has seen an increase in the use of rabies vaccine in the years 2006–2008: 2.6 times for HDCV and 1.8 times for VERORAB. The renovation of Sanofi Pasteur's French-based production facility for HDCV is scheduled to be completed by mid-2009. Considering the country registration timelines, the current supply shortage is expected to continue until the end of 2009. By 2010 or 2011, the vaccine supply is expected to be normal again.

6.2 Immunoglobulin: supply status and strategies proposed for dealing with shortage

The Sanofi Pasteur representatives presented the two main types of immunoglobulin on the market: human rabies immunoglobulin (HRIG) and equine immunoglobulin (ERIG).

HRIG is produced from serum obtained from US blood donors and sold primarily in the US, Canada, Australia and Europe. Compared to the US, Europe has a relatively low demand. The supply is sufficient for routine demand levels in Europe, but an increased demand due to 'mass exposure' could be problematic.

ERIG has been licensed in France since 1985 but it is not distributed in Europe. The global supply is sufficient for routine use demands internationally. However, a rapidly increased demand at specific locations can be problematic if the lead time is insufficient due to production time and packaging constraints.

Rabies monoclonal antibodies (MAbs) are in development with the Dutch partner Crucell (first licences expected in 2012–2013 outside Europe). It is a cocktail of two MAbs providing equivalent protection against a panel of wild rabies strains. It is produced with a well defined and characterised cell culture process without human or animal raw materials. An advantage is that the needed volume is reduced by 70 % versus HRIG. However, it is currently not clear when this product will be licensed in Europe.

7 Discussion on solutions for potential shortage of rabies vaccine and immunoglobulin

7.1 Sources of information on rabies epidemiology in Europe

The Rabies Information System of the WHO Collaboration Centre for Rabies Surveillance and Research managed by Friedrich Loeffler Institute in Germany provides surveillance data on the epidemiology of rabies in Europe and other specific information (<http://rbe.fli.bund.de>).

The WHO recommendations for rabies post-exposure prophylaxis are an important reference for developing algorithms or decision trees for individual risk assessments (4, 11).

Useful surveillance data of Rabies in Europe is provided by the German Bulletin and special reports from WHO. Additionally, the website of Rabies at WHO Europe is considered a good source of updated information.

7.2 Different approaches in EU countries

Currently, not all EU countries use the three WHO categories (I, II, III). There is an agreed need of conducting an individual risk assessment at the local level about the event, the type of exposure, etc. Awareness of the problem needs to be raised among physicians. Their links to the national public health authorities are important and may also contribute to the most efficient use of biologicals. The potential inclusion of geographical criteria in the decision process was discussed, and it was suggested that information about available public health resources in the Member States should be shared, e.g. on best practices and the existence of guidelines.

7.3 Rationing of vaccines and/or immunoglobulin?

The consultation agreed that there was no shortage of vaccines or immunoglobulin for routine consumption, although some Member States experienced difficulties to obtain vaccine and immunoglobulin from the producers.

However, in events where many persons are at risk, a substantial amount of vaccine and immunoglobulin may be needed for PEP. In addition, risk perception, influenced by public warnings, and increased awareness of doctors and veterinarians may increase the demand for vaccines. In such cases, shortages should be anticipated.

Several experts reported recent supply problems, specifically for immunoglobulin. The centralisation of PEP use, in conjunction with individual assessments, was suggested as the recommended solution. In addition, regular communication between the national public health authorities and the industry would facilitate addressing supply issues.

The idea of a European stockpile of immunoglobulin was raised as a response to potential shortages. An example would be the stockpile for yellow fever vaccine, funded by the Global Alliance for Vaccines and Immunization (GAVI). The possibility of a virtual stockpile in the EU was also discussed; ECDC could potentially play a role in this area.

8 Experts' recommendations

Based on the presentations and discussions, the following recommendations were suggested by the expert consultation:

- the strengthening of links between clinicians and public health authorities, particularly for reporting potential exposures and conducting individual risk assessments, as this could contribute to the most efficient use of biologicals in post-exposure prophylaxis;
- a mapping of the current situation in the European Union of pre- and post-exposure prophylaxis against rabies (regarding usage, procedures and guidelines) would support Member States in their risk assessments and policy making. Sharing such information — as well as the facilitation of contacts between Member States and manufacturers — would support the most efficient use of PEP. The WHO Collaboration Centre for Rabies Surveillance and Research in Wusterhausen, Germany, already compiles useful data on human rabies in the European Region of WHO (12);
- a virtual stockpile for immunoglobulin to be used in PEP needs to be considered, taking into account the cost and logistical issues;
- close contact between the different stakeholders — including the Member States, WHO, ECDC and the Commission — is important to keep consistency in the implementation of guidelines; and
- close collaboration with all relevant stakeholders, including the industry, should continue.

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Annex 1: Meeting participants

Country code	First name	Last name	Institution
CH	François-Xavier	Meslin	World Health Organization (WHO)
FR	Jaco	Smit	Sanofi Pasteur
FR	Thierry	Allavoine	Sanofi Pasteur
DE	Dieter	Gniel	Novartis
DE	Claudius	Malerczyk	Chiron
FR	Hervé	Bourhy	Institut Pasteur
NL	Jim	van Steenberg	Rijksinstituut voor Volksgezondheid en Milieu (RIVM)
PL	Malgorzata	Sadkowska-Todys	National Institute of Public Health
ES	Luisa P.	Sanchez Serrano	Instituto de Salud Carlos III (ISCIII)
UK	Hilary	Kirkbride	Health Protection Agency (HPA)
DE	Gerd	Bruchard	Bernhard Nocht Institute
BE	Steven	van Gucht	Scientific Institute of Public Health
DE	Heidi	Meyer	Paul Ehrlich Institute; European Medicines Agency (EMA)
EU	Evelyn	Depoortere	ECDC
EU	Carmen	Varela Santos	ECDC
EU	Hervé	Zeller	ECDC
EU	Kari	Johanson	ECDC
EU	Helena	de Carvalho Gomes	ECDC

Annex 2: Programme of the consultation

09:00 – 09:10	Opening of the meeting. • Hervé Zeller (ECDC)
09:10 – 10:00	Update on the rabies situation in Europe. • Herve Bourhy (Institut Pasteur, France)
10:00 – 10:40	WHO criteria for use of vaccine and immunoglobulin as PEP. Scientific background. • Francois-Xavier Meslin (WHO, Geneva)
10:40 – 11:00	Break
11:00 – 11:40	Status of the provision of vaccines and immunoglobulin in Europe. • Claudius Malerczyk and Dieter Gniel (Novartis/Chiron) • Thierry Allavoine and Jaco Smit (Sanofi Pasteur)
11:40-12:40	Solutions proposed for shortage of vaccine and immunoglobulin. • Jim van Steenberg (RIVM, the Netherlands) • Malgorzata Sadkowska Todys (National Institute of Public Health, Poland) • Luisa P. Sanchez Serrano (Instituto de Salud Carlos III, Spain)
12:40 – 13:40	Lunch
13:40 – 14:20	Solutions proposed for shortage of vaccine and immunoglobulin, continued. • Gerd Burchard (Bernard Nocht Institute, Germany) • Hilary Kirkbride (Health Protection Agency, UK)
14:20 – 15:00	Discussion on possible solutions for ensuring PEP.
15:00 – 15:15	Break
15:15- 16:00	Conclusions and next steps