Meeting on coordination of rabies control in Europe

Strasbourg, 3-4 January 1985

INTRODUCTION

The meeting was held under the auspices of the World Health Organization (Geneva) and the Office International des Epizooties (Paris) with the participation of the European Collaborating Centres of the WHO and the assistance of other national and international organizations and foundations.

The first objective of the meeting was to enable representatives of government Services of each of the European countries concerned with rabies to compare their respective epidemiological situations, the control measures taken and regulations enforced, and the results and future application of these.

The second objective was to unify the preceding measures by an agreed adoption of the most efficient ones and to coordinate their implementation on a European level and then to define, if necessary, how to maintain this coordination and integrate it with the strategies already laid down by the EEC, EC, FAO, OIE and WHO.

The programme prepared by the WHO collaborating Centre in Nancy was adopted after official acceptance by sixteen invited countries to cooperate and confirmation by twelve of those countries to attend the meeting.

The meeting was attended by government representatives and scientists of twelve European countries concerned with the control of wildlife rabies, i.e. the reservoir of rabies in the fox population. The meeting was assisted by seven WHO collaborating centres located in European countries and by non-governmental organizations.

During the 1970’s, the WHO, in collaboration with the FAO and OIE, concentrated its efforts on promoting collaborative research on the biology of vector species, on the mechanisms of the spread of rabies in nature, and on the ecological conditions favouring or impeding its continuing spread.

Field techniques have been developed to limit the growth and movement of fox populations: vaccines have been improved and a European Rabies Surveillance System has been inaugurated: methods of reducing fox populations such as the gassing of fox dens have been developed and adapted to ecological conditions. The reasons for the success or failure of different control measures have become better understood, so that, today, a variety of complementary methods are available. Properly applied, the different methods can protect man and domestic animals effectively, and even halt the progression of the epizootic and eliminate the disease over large areas.

In some countries, the oral vaccination of wild foxes over wide areas is coming to the fore as a feasible, effective control measure.
The new techniques, if used in an internationally agreed strategy, give real hope for the ultimate elimination of rabies as a burden to the agricultural economy and as an ever-present hazard to human health in Europe.

The meeting represented a milestone in the history of rabies control in Europe, in that international cooperation in epidemiological research in Europe is now turning towards concerted action of rabies control based on defined strategies and procedures.

**SUMMARY OF THE NATIONAL REPORTS**

Representatives from Belgium, Denmark, France, Holland, Italy, Luxemburg, Great Britain, Poland, Switzerland, the Federal Republic of Germany, Czechoslovakia and Yugoslavia all described the epidemiological situation in their country and the prophylactic measures they use to combat rabies. An overall picture of the epidemiological situation in Europe was given by Dr Müller from the WHO Collaborating Center of Tübigen (FRG).

**Epidemiology**

Endemic rabies is present in Belgium, Switzerland, France, Luxemburg, FRG, Poland, Czechoslovakia and part of Yugoslavia. The current epizootic in Europe originated from Poland in 1939. Denmark, Italy and the Netherlands suffer from rabies cases coming across their borders, but the rabies situation in these countries is not considered to be endemic though, in Italy, much will depend upon the success of current control strategies. There is an unusual situation in the middle and southern part of Yugoslavia where canine and vulpine rabies coexist. Great Britain is still free of rabies, but has developed contingency plans to deal with domestic animal and wild life rabies, should it be introduced.

All the speakers identified the fundamental role of the fox as the main vector and reservoir of rabies. The importance and role of domestic animals is dependent on local conditions; in Denmark, for example, there are very few cases of cat rabies. France and the Netherlands have identified cases of rabies in domestic animals of exotic origin.

**Sanitary prophylaxis - Control of fox populations**

Many methods of fox control have been used in Europe. Most speakers agreed that the gassing of fox dens was effective, but this method is not well accepted by the public. Belgium, Italy, Luxemburg, the Netherlands, FRG and Switzerland have abandoned this method, but Czechoslovakia and Yugoslavia still use it. In Denmark, although gassing has proved to be highly effective in three successive epizootics, oral vaccination of foxes would be preferred in any future action required.

The fox is the only target species controlled by those methods. In Poland, dogs were also controlled and in Yugoslavia, wolves, rodents, stray dogs and cats. The method most generally used at the present time to control the fox is shooting, assisted, in France, by the use of chloropicrin to evict foxes from their dens.

Throughout Europe, control measures are mainly carried out by hunters and game-keepers, but in Denmark, specially hired people are engaged for the purpose, as would
also be the case in Great Britain, should it be necessary. Most countries still encourage fox control by offering bounties. Only Switzerland and Czechoslovakia have attempted to make accurate estimations of the population density of foxes before or after control operations were carried out. In France, the rabies front has become stationary; this has coincided with a strategy to control foxes in a deep zone (as much as 200 km) ahead of the advancing frontal zone. In Belgium, Luxemburg and Switzerland, control measures have successfully reduced the incidence of rabies in foxes. In Czechoslovakia, good control has been achieved locally. As mentioned earlier, Denmark has succeeded in eradicating the disease on three separate occasions during the period 1964 to 1982.

**Oral vaccination of foxes**

Although the representatives of Belgium, Denmark and Luxemburg are considering the use of this method, only Switzerland, the Federal Republic of Germany and Italy are using it at present. However, in these three countries, oral vaccination is still only experimental and is not official policy. Before starting these operations, detailed investigations were undertaken in the field and in the laboratory on suitable baits, uptake of vaccine-loaded baits by foxes, on the possible effects of the vaccine on non-target species and the effective vaccine dose for foxes.

Switzerland made its first laboratory experiments in 1973. The efficiency of this method has therefore been considered over a number of years. The results of the present large-scale experiments are very satisfactory and a dramatic reduction of the zoonosis has been achieved in several areas. The vaccine has been used strategically in areas where natural barriers to the spread of rabies occur. Consequently, the combination of natural barriers and an immune barrier has proved to be effective.

Field experiments in the Federal Republic of Germany began two years ago. The trials are very promising. During this period, over 300,000 doses of vaccine were distributed over an area of about 10,000 km².

**Medical prophylaxis - Domestic animal immunization**

Most countries mainly use inactivated virus vaccines, but some, in addition, also use modified live virus vaccines as in Belgium, the Netherlands, Italy, Switzerland, Czechoslovakia and Yugoslavia. Various substrates and methods of inactivation are used. Polyvalent vaccines are forbidden in Belgium, Czechoslovakia, Yugoslavia as well as in Great Britain. Most countries use adjuvanted vaccines. In some countries, such as Switzerland, Holland, Luxemburg, Czechoslovakia and Yugoslavia, it is obligatory to immunize dogs. This immunization is strongly recommended in other countries and is compulsory for certain types of dogs (e.g. working dogs). The first inoculation has to be given between 3 to 6 months of age; further booster inoculations are given according to the type of vaccine used.

The vaccination of cats is encouraged in most countries, but is difficult to implement.

The vaccination of cattle is also encouraged in countries suffering from endemic rabies, but it is considered to be unnecessary in countries where the disease is only sporadic.
Other measures

Most participants described other methods auxiliary to the main methods of rabies control. These include, informing the public adequately, the control of movements of animals across frontiers (e.g. the United Kingdom), restriction of the movement of animals, quarantine regulations, etc. In Switzerland, there is rigorous control of dogs by a dog tax and a method of indentification of dogs enables annual vaccination to be verified.

Conclusion

All speakers expressed their satisfaction of the control measures taken in their respective countries, but most also agreed that present measures were inadequate to control foxes and fox rabies in all circumstances. Oral vaccination of foxes offers hope of success of wildlife rabies control in the future.

During the past years, classical methods of wildlife rabies control by reduction of the fox population have been supplemented and locally replaced by ecological approaches, such as habitat control and oral immunization of foxes, though such measures are still in the stage of field research. The meeting is considered a milestone in this area.

Meanwhile, despite vigilance in each country, human infection still occurs. Thanks to effective and safe vaccines, those in high rabies-risk occupations can be protected and those exposed to infection can be successfully treated. Consequently, there have been no cases of rabies in man in fox rabies endemic areas since 1982.

REPORT OF THE COMMISSION:
"INTENSIFICATION OF RABIES SURVEILLANCE"*

1. The present data collection, evaluation and distribution system, as undertaken for the Rabies Bulletin Europe, edited by the WHO collaborating center for surveillance and research in Tübingen (FRG) should continue. At present twenty-seven countries report regularly. It is recommended that more countries submit, with their quarterly data, accounts of changes in epidemiological situations and control measures, of any national surveys and other detailed information of interest to the countries participating in the surveillance system.

2. The creation of an interactive integrated Rabies European Information System should be pursued. The system should be decentralized and based on national information centres.

The present framework providing epidemiological data to the Tübingen WHO collaborating centre could form the basis for the creation of such a system.

3. The information system, in addition to the present data reporting and surveillance management could be extended to provide up-to-date:

Inventories on current research activities;
rabies literature (both published and "grey") and audiovisual material;
address lists of laboratories, experts and reference centres;

* Commission coordinated by Messrs. V. Caporale and W. Müller.
specific public health legislation and regulations;
lists of epidemiological data handling methods.

4. The European Information System on rabies should be adequately integrated
within existing international information systems such as those of the O.I.E., E.E.C.,
etc. This would lead to a greater efficiency and effectiveness of rabies information
management by simplifying the work of the data reporting authorities and will avoid
the possibility of conflicting sets of data being published.

5. Training of competent staff in rabies information system management is of
great importance. Both formal and on-the-job training by existing information pro­
cessing units should be envisaged.

REPORT OF THE COMMISSION:
"RABIES PREVENTION IN MAN"*

The prevention of rabies in man is the ultimate objective of any rabies control
measure. Such prevention can be planned and applied at three different levels: in
wild animals, in domestic animals, and in man.

Wild animals

Interruption of the transmission cycle by reduction of fox population densities
and/or the oral vaccination of foxes.

Public awareness campaigns (information, education) to prevent direct contacts
between man and animals.

Domestic animals

Immunization of domestic carnivores (cats and dogs) and, if necessary, domestic
herbivores.

Prevention of domestic animal/wild animal contacts (stray cat and dog control).

Prevention of direct contacts between man and domestic carnivores (control of
stray dogs in particular).

Man

Preventive vaccination of those persons professionally exposed to contamination,
e.g.

• by wild animals (game-keepers, forestry workers, hunters, taxidermists, etc.);

• by domestic animals (veterinarians, dog handlers, policemen and firemen from
  stray-catching teams, laboratory workers, animal breeders).

* Commission coordinated by Pr. P. Sureau.
Post-contamination vaccination (anti-rabies treatment): inactivated purified, concentrated rabies vaccines produced in cell culture are both highly immunogenic and well tolerated; such vaccines are readily available in all European countries concerned by the disease. In cases of severe exposure, vaccines can be used in conjunction with hyperimmune human globulins.


- recommended that vaccine activity be titrated in International Units (I.U.) and that minimum titres required be fixed according to different vaccination schedules;
- drew up a draft human rabies vaccination certificate;
- strongly emphasised the risks incurred by corneal transplant operations of human to human transmission.

REPORT OF THE COMMISSION:
“RABBIES CONTROL LEGISLATION”**

Eighteen countries were consulted by questionnaire for their views on legislation for rabies control. Sixteen replied and the following paragraphs summarize their answers**.

- Thirteen countries considered it desirable to unify regulations governing rabies control on a European level. Three countries were not in agreement, two of which are rabies-free and, understandably, do not at present wish to align their rabies legislation with other countries.

- On the question of whether priority should be given to preventive measures in man or in domestic animals, or to control measures against wild animals, most countries (ten) believed that priority should be given to the control of rabies in wild animals. Because the control of wildlife rabies is the key to control of the disease in domestic animals and man in Europe, it was considered that preventive and control measures for domestic animals, whilst essential, merited a lower priority at present.

- Ten countries favoured unification or amalgamation of the regulations governing the international movement of animals and biological products.

It should be noted that a basis for this already exists in the OIE International Zoo-Sanitary Code 1982 (Chapter 2.6.1. Appendix 5.1.6 and Part 6.1.1., The International Certificate of Vaccination against Rabies) and in the WHO Manual of Guidelines for Dog Rabies Control 1984 (Chapters 4 & 7) and also in the WHO Expert Committee on Rabies, Seventh Report 1984 (Chapter 11).

It is recommended that the unification of rabies control legislation should be discussed at future meetings of the OIE Regional Commission for Europe.

** The detailed answers will be published in full in the next issue of the Review [Rev. sci. tech. Off. int. Epiz., 1985, 4 (3)].
REPORT OF THE COMMISSION:
"CONTROL OF RABIES IN DOMESTIC ANIMALS"*

Vaccination of domestic animals

**Antirabies vaccines in Europe**

Live virus vaccines are still used in eight countries, either alone or jointly with inactivated vaccines, but the general trend currently is to abandon live vaccines in favour of inactivated vaccines prepared in cells (except for 3 countries) for safety and reasons of compatibility.

Boosters are generally carried out every year, but sometimes 2 or 3 years in 4 countries.

Failures or accidents are exceptional but have been reported in some countries with both live and inactivated vaccines, and generally in young animals.

In most countries, the rabies vaccine is associated with other valencies in cattle and carnivores.

**Vaccination practices in Europe**

Vaccination is always practised under the authority of veterinarians in all European countries and is generally under State control.

Vaccination of dogs is compulsory in some countries and encouraged in all others.

Vaccinated dogs are identified by collars or medals (rarely by tattooing).

Vaccination of herbivores after contamination is still practised in a few European countries.

**Desirable unification and recommendations**

**Antirabies vaccines**

Since the general trend is to abandon live vaccines in favour of adequate inactivated vaccines, it is desirable to promote this trend of producing vaccines by cellular culture in order to:

— Improve the reliability of animal vaccination without diminishing the duration of immunization.

— Reduce risks for man.

— Facilitate exchanges of animals in Europe.

— Standardize control in accordance with the European pharmacopoeia.

In order to minimize the possibility of vaccination failures or accidents, it is recommended that the manufacturer’s directions concerning the target species (particularly in the use of live vaccine) and their recommendations for the preservation of the vaccine during storage at between 2° and 8 °C should be strictly observed. Manufacturers are requested to indicate clearly any contra-indications.

* Commission coordinated by Messrs. Blancou and Hromadko.
The frequency of booster vaccination for all species should conform to the manufacturer's recommendations for animals remaining in one country, but in cases of international movements of domestic carnivores, boosters should be made annually. If the vaccine is of the inactivated kind, it should have a minimum antigenic value of 1 Antigenic Unit per dose.

**Vaccination practices**

For international movement, it is desirable that certificates of the FAO/OIE/WHO type should be issued for domestic carnivores, and the animals should, if possible, be tattooed.

It is most desirable to encourage the vaccination of all cats at risk.

It would be desirable for dogs to be individually registered and identified in each European country, whether or not they have been vaccinated against rabies.

It is recommended that antirabies vaccines should not be given therapeutically to animals suspected of being contaminated except where they have been previously vaccinated.

**Measures auxiliary to vaccination**

**Information**

It is essential to promote rabies awareness among both the public and veterinarians throughout Europe. Intereuropean advisory literature in the form of pamphlets would be helpful in this respect.

**Sanitary control**

In the domestic animal context, two measures are essential for adequate sanitary control of rabies in Europe:

— The control of dog populations. This should be done in line with the recommendations of the WHO Expert Committee on Rabies (7th Report, paragraph 10-2).

— The elimination of contaminated animals (euthanasia of non-vaccinated animals bitten by rabid animals).

**REPORT OF THE COMMISSION**

**“CONTROL OF RABIES IN WILDLIFE”**

**Destruction of vector animals**

**Target species**

The fox is the main target species in all participating countries. In some countries, raccoon dogs, badgers, wolves, small mustelidae, stray dogs and cats are also destroyed.

* Commission coordinated by Messrs. Schneider and Wandeler.
Recommendations

— Wildlife vector control should concentrate on population reduction of the red fox, the species responsible for the maintenance and spread of rabies in Central Europe.

— Carnivores of high population density like stray cats, stone martens and, in some areas, also badgers, should also be kept under strict surveillance.

— Attempts to eliminate exotic species like raccoon dogs and raccoons should be made.

— Except in cases of necessity, otters, polecats, pine martens, badgers, lynx, wild cats, bears and wolves should be excluded from destruction campaigns, especially in areas where these species are or could become endangered.

Gas

Gassing of fox dens is regarded as one of the most effective methods of reducing most fox populations. Its use calls for a careful registration of the geographical locations of dens, a gas of high toxicity with a rapid lethal effect, the adequate dissemination of information to the people living in the affected area and personnel well-trained in all aspects of the effective and safe use of gas.

It is recognized that the gassing of fox dens may be hazardous for other animals. Consequently, only dens inhabited by foxes should be gassed.

Shooting

Among methods used to control fox populations, shooting is recognized as being effective and has the great advantage of being selective. Shooting is, in general, implemented by hunters during their traditional sporting activities; rewards are offered to motivate them. The complementary use of gas to evict foxes from their dens can facilitate the success of shooting. In some countries or regions, it has been noted that hunters are not all interested in shooting foxes, because the fox is not considered to be harmful to the game being hunted, because the fox is not a traditional quarry, or because the hunting area precludes the successful shooting of foxes.

The use of professional hunters or of specific hunting techniques (such as spotlight shooting) can be of positive help to the mass action of hunters. What is more, during night shooting campaigns, foxes can be counted and the fox population density thus evaluated.

The Group recommends that shooting should continue to be encouraged, and although it alone is not likely to wipe out fox rabies entirely, it can contribute to a reduction of contacts between rabid wild animals and domestic animals, thereby protecting man from contamination.

Trapping

Trapping is not very species specific, especially as small mustelids are caught with nearly equal frequency as foxes. Skilled trapping is very effective. Occasionally, trapping is used as a supplementary measure to shooting. But, the use of a variety of different trap types is illegal in many European countries. Where permitted, the use of traps should not violate human principles.
Poison

The use of poison baits should be abandoned except under very specific conditions.

Habitat control

The fox population density can be very high in many suburban and urban areas of Europe. This is due to a high fox carrying capacity of these habitats. Only a few attempts have been made to reduce the resources available to foxes in these areas.

Recommendations

— Domestic, commercial and municipal garbage or waste, and fox dens should be made unavailable to foxes in urban and suburban areas.

— Natural resources outside densely inhabited zones should not be destroyed but special steps should be taken to control foxes at such locations.

Ecological studies in relation to population control

The Group notes that the current methods of controlling fox populations (trapping, shooting, gassing and poisoning) have all been ineffective in most of the countries where they have been used, individually or together, in preventing the spread of or eradicating rabies. However, all participants agree that these fox population control measures have enabled a reduction in the incidence of the disease. In order to be able to act effectively and specifically against fox populations, particular attention should be given to the development of ecological methods of control of fox populations.

Recommendations

To this effect, the Group recommends the development of complementary studies to determine:

— the density of fox populations in different environments.
— the social structure and behaviour of foxes in different habitats.
— the influence of the action of man and in particular of methods of controlling fox populations on the behaviour and movement of these animals.

Methods recommended are, for example:

— counting by spotlight
— proportion of baits consumed
— census of occupied and unoccupied dens
— scent station census techniques.

Oral immunization of foxes against rabies

Development

The WHO has been coordinating research on the oral immunization of foxes for many years. Immunization with inactivated vaccines by the oral or enteric route was not successful. Live virus vaccines were successfully developed to the stage, in 1978, where field trials seemed to be applicable.
Present status

Large-scale field trials were begun with SAD virus in Switzerland in 1978, with a SAD B 19 variant in the Federal Republic of Germany in 1983, and in Italy in 1984. Laboratory testing and field observations yielded the following results:

— Tetracycline bait-marking revealed that distributed baits were consumed by between 40 and 85% of the fox populations in treated areas.
— According to seroneutralisation assay, between 50 and 75% of the foxes developed immunity to rabies.
— No evidence of vaccine-induced rabies was obtained in any wild or domestic animals.
— Rabies spread came to a halt or even disappeared from treated areas.

Recommendations

In accordance with the recommendations of the Expert Committee on Rabies (WHO Technical Report Services 709, Geneva 1984), the following is proposed:

— Oral vaccination of wildlife against rabies should continue to be regarded as an experimental procedure for the present.
— Field trials should be the responsibility of national authorities.
— Field trials should be carried out with vaccine virus strains shown to be effective and safe.
— A comprehensive plan should guarantee proper control, conduct and evaluation of the trials.
— International cooperation should be ensured at field trials conducted in border areas.

Future research

Should have as objectives the development of:

— inactivated oral or enteric vaccines
— polypeptide vaccines
— formulated baits containing chemical attractants
— vaccines for possible use in other animals.

REPORT OF THE COMMISSION:
“NATIONAL PROGRAMME DEVELOPMENT AND COORDINATION OF RESEARCH”*

Existing facilities and results of survey

Diagnosis and surveillance

All countries have centers for rabies diagnosis. In some countries, these centers are centralized, in others they are dispersed.

* Commission coordinated by Dr Bögel.
In all countries, immunofluorescence and, in most, animal inoculation diagnostic techniques are used. In some countries, smear staining and histology of brain tissues are also done.

**Human antirabies treatment after exposure, vaccination schedule of man after exposure, vaccines used for human treatment**

Vaccines prepared in human diploid cells are used in eleven countries: Belgium, France, Italy, Luxemburg, Poland, FRG, Switzerland, Yugoslavia, Denmark, the U.K., and Ireland. The vaccination schedule consists of 6 injections (SC or IM route) at day 0, 3, 7, 14, 30 and 90.

The same schedule is used in France with vaccines prepared in foetal bovine kidney cells and in the Netherlands in dog kidney cells.

A vaccine prepared in hamster kidney cells with the Vnukovo-32 strain is used in Czechoslovakia (14 injections + 2 boosters).

Nervous tissue vaccines are used in two countries: suckling mouse brain vaccine in Rumania (7 injections SC + 4 boosters ID at day 10, 14, 30 and 90) and sheep brain vaccine Hempt type in Hungary (6 injections + 1 booster).

The vaccinations are performed in 12 countries by specialized centers, in 3 countries by private practitioners and by both means in 12 countries.

The vaccination schedule with concentrated tissue culture vaccines (minimum potency 2.5 I.U.) should conform to the recommendations of the WHO Expert Committee on Rabies (7th Report, 1984): that is, 5 doses in all, on day 0, 3, 7, 14 and 30, booster dose on day 90 being optional.

**Research centres and programmes**

Ten countries have centres, 5 countries have none. The main objects of research are:

- vaccines and immunization (oral and parenteral)
- diagnostic methods
- epidemiology and surveillance.

Eight countries, where centres exist, think that the centres are useful, two countries are not satisfied.

All countries that responded to the questionnaire agreed to the integration of research aims and programmes at a European level.

The topic over-riding all others is the control of wild animal vectors, mainly the fox (cheap method of population limitation).

**Conclusions and recommendations**

**International cooperation in national programme planning and implementation**

The meeting noted that a number of European countries have already established particularly close cooperation in rabies surveillance and control in their border areas. It is recommended that central governments develop proposals for the integration of projects and policies on both sides of a border and preferably seek a formal agreement on direct communications across borders between local authorities
Projects of wildlife rabies control in border areas call for exchange of information and, as far as possible, synchronized activities from the strategic point of view, whether this concerns application of control measures, intensified surveillance, public information or services of human post-exposure treatment. Border committees could be created with representatives of local services of the countries concerned.

Special data exchange services could be introduced and technical cooperation offered by exchange of experts, materials and other resources.

Plans of action ensuring the integration of activities in border areas could be laid down in national project documents of neighbouring countries and thus become part of overall national commitments. The meeting noted that tools and procedures for the planning and formulation of national programmes have been described by the WHO Expert Committee on Rabies. Although this managerial guide is aimed at the control of human and canine rabies in developing countries, it is fully applicable to national programmes and projects of wildlife rabies control.

Promotion of national diagnostic services

In countries where there is more than one rabies diagnostic laboratory, there should be one reference laboratory for the coordination and integration of diagnostic methods among all laboratories of that country.

Research recommendations

In view of the importance of epidemiological surveillance, research should continue on the improvement of techniques and reagents for the identification of rabies virus strains and for the examination of their biological characteristics. The collaborative monoclonal antibody studies presently undertaken should lead to the provision of a standard set of reagents and it is hoped that this will soon become available to the interested governments.

Although the virus strain used at present in Europe for the oral immunization of foxes can be considered safe within the framework of well defined and comprehensive field investigations which incorporated intensified surveillance, future research should concentrate on the improvement of vaccine production (virus yield), verification of the genetic stability of vaccine strains, their safety for different species, and the mass production of baits and their uptake. The meeting welcomed the initiative already taken by WHO collaborating centres in Europe and requested the WHO to keep all interested governments informed of plans and results.

In view of the desirability of cheaper readily available rabies vaccines, a high research priority is the bio-molecular analysis of the virus for the identification of the best immunogenic fractions for the development of a potent antigen for immunization of animals and man. Various methods for expression of the antigen and its delivery provide options for oral, enteric or parenteral administration.

In view of the intense activity in molecular genetics, the meeting suggests that a workshop of specialists should be convened in order to analyse potential risks and precautions in the use of viruses as carriers of DNA recombinants for rabies immunization.