Preventative health measures for primates and keeping staff in British & Irish zoological collections.

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## SUBJECT INDEX

<table>
<thead>
<tr>
<th>Measures for Primates.</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>General health.</td>
<td>4</td>
</tr>
<tr>
<td>Enclosure design.</td>
<td>4</td>
</tr>
<tr>
<td>Identification &amp; records.</td>
<td>4</td>
</tr>
<tr>
<td>Pest control.</td>
<td>4</td>
</tr>
<tr>
<td>Quarantine.</td>
<td>5</td>
</tr>
<tr>
<td>Ongoing preventative medicine programme.</td>
<td>6</td>
</tr>
<tr>
<td>Vaccinations.</td>
<td>7</td>
</tr>
<tr>
<td>Post mortem examinations.</td>
<td>8</td>
</tr>
<tr>
<td>Transportation of primates.</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measures for People.</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-employment staff screening.</td>
<td>9</td>
</tr>
<tr>
<td>Health of staff during employment.</td>
<td>10</td>
</tr>
<tr>
<td>Staff illness and injuries.</td>
<td>10</td>
</tr>
<tr>
<td>Staff personal hygiene.</td>
<td>10</td>
</tr>
<tr>
<td>Cage cleaning.</td>
<td>11</td>
</tr>
<tr>
<td>Equipment.</td>
<td>12</td>
</tr>
<tr>
<td>Zoonotic infections.</td>
<td>12</td>
</tr>
<tr>
<td>Pregnancy.</td>
<td>12</td>
</tr>
<tr>
<td>Immunosuppressed staff.</td>
<td>12</td>
</tr>
<tr>
<td>Veterinarians.</td>
<td>13</td>
</tr>
<tr>
<td>Other people.</td>
<td>13</td>
</tr>
</tbody>
</table>
INTRODUCTION.

Numerous pathogenic micro-organisms can cause disease in both man and non-human primates, thus the potential will always exist for the transmission of disease between the two groups - in either direction. Furthermore, pathogenic organisms can be inadvertently transferred between different groups of primates by staff working with more than one group. A range of relatively simple measures are described below which are designed to prevent or limit such disease spread and therefore help safeguard the health of both captive primates and staff.

Infections and infestations shared by humans and other animals are often designated "zoonoses", and non-human primates have always been noted for their zoonotic potential. Most zoo primate populations in the UK are composed of captive-bred individuals and importations of wild-caught animals are now extremely uncommon. For the majority of zoos importation of primates from any source is not a common event. Given these factors and the DEFRA-imposed quarantine period of 6 months, it should be stressed that in the majority of UK primate collections the animals will be at a greater risk from humans than vice-versa. However, all primates should be treated as potential carriers of zoonotic disease. Similarly, all staff should be considered as a potential source of infection for the animals.

Diseases can be spread between primates and man by numerous methods, including physical contact (bites, scratches, exposure to excreted material), ingestion and airborne or aerosol transmission. A comprehensive list of specific zoonotic diseases will not be given. Such a list is hardly necessary, would be very long and may cause unnecessary alarm. If more specific details are required, a veterinarian specialising in zoo and wildlife medicine should be consulted. Measures are described below for both the animals and the people who have contact with them. Most of these recommendations are a matter of common sense, but the UK Primate TAG considered it a useful exercise to draw everyone's attention to them.

Whilst staff who care directly for non-human primates must assume a large amount of responsibility for implementing the measures described, co-operation is also required from the managers and owners of collections in providing adequate equipment, facilities and training.

The recommendations contained in this document are only intended as guidelines. Each institution should develop its' own written set of instructions for primate keepers, modifying the guidelines where necessary to take local circumstances and practices into account. This process should be carried out in co-operation with the collection’s veterinary advisor, and the resulting document should be read and signed by all primate staff concerned.
MEASURES FOR PRIMATES.

General health.

Animals that are in good general health are far less likely to carry or suffer from infectious diseases than those living on impoverished diets or in sub-optimal physical or social conditions. Constant attention must therefore be paid to good husbandry practice.

Enclosure design.

Enclosure design should minimise direct or indirect contact between different primate species, especially between African and Asian species, and between different South American groups such as tamarins and cebids.

Often overlooked in the construction of primate houses is the provision of adequate ventilation. Six air changes per hour are recommended and exhaust air should be vented to the outside.

Particular attention should be paid to eliminating sharp edges from the inside and outside of primate enclosures – i.e. those edges on which animals and staff could cut themselves. Service passages must be sufficiently wide to prevent animals reaching out to scratch or otherwise injure the keeping staff.

Identification and records.

Ensure that all primates are readily and reliably identifiable by the use of transponders, tattoos, etc, and that medical records are kept up to date. Prior to any animal transfer, a copy of the medical record should be forwarded to the receiving institution.

Pest control.

Many infectious diseases of primates can be carried by invertebrate and vertebrate pest species frequently encountered in and around primate facilities. Specialist advice should be sought to reduce or eliminate such pests, which include cockroaches, rodents and wild birds.
Quarantine.

All primates entering a collection, irrespective of their origin, should undergo a period of quarantine. During this period a variety of screening tests can be performed to establish their health status, their vaccination status can be reviewed (see later), and a serum bank established for each individual.

Ideally, quarantine should last for at least 90 days – especially for wild-caught animals - although if animals are being transferred within the UK 30 days is usually adequate. If the facility sending an animal is effectively a “sealed unit” (i.e. no imports within the past year and a clean health record) there may be occasions when a shorter quarantine period, sufficient only for the performance of screening tests detailed below, is appropriate. This applies particularly to highly social monkey species, chimpanzees, bonobos and gorillas.

Only zoos with a very high standard of quarantine facility should import wild-born animals.

Direct handling of conscious animal during quarantine should be avoided.

During the quarantine period the following procedures are advised:-

- Full clinical examination under a general anaesthetic, including a careful assessment of the weight, teeth, eyes, reproductive organs and method of identification (microchip, tattoo etc).

- Haematology and serum biochemistry profiles.

- Further serum samples should be stored at < minus 70°C to establish a serum bank.

- Assessment of internal and external parasite burden. Faecal tests will be necessary to determine whether internal gut parasites are present.

  NB: Advice should be sought from the veterinary consultant to maximise the chances of detecting the more delicate protozoan parasites.

- Faecal samples should be tested for the presence of pathogenic bacteria such as *Campylobacter*, *Shigella*, *Salmonella* or *Yersinia* species carried in the gut. Some of these organisms are only shed intermittently, necessitating the examination of several samples.

- Where pathogenic parasites or bacteria are detected, appropriate treatment should be given and its effectiveness confirmed by further tests during the quarantine period.
• Depending on the origin of the animal, a test for tuberculosis may be indicated. Unfortunately very few individual TB tests are completely diagnostic and further veterinary advice should be taken for each set of circumstances.

• All incoming primates should be tested for SIV (Simian Immunodeficiency Virus), STLV (Simian T-lymphotropic virus) and Hepatitis B virus. Other pathogens may be added to this list as our knowledge advances in future, and a wider range of viral screening tests is generally appropriate for wild born animals – discuss with veterinarian.

• Macaque species should also be tested for Herpesvirus simiae (Herpes B virus) and related viruses (on 2 occasions with a 3 month interval) and SRVs (Simian Retroviruses). 
   Advice can be sought from Dr Gopal at the Public Health Laboratory Service, Colindale (020-8200-4400), on currently available & appropriate tests for Herpes B in macaques.

• Vaccination as appropriate (see below).

The tests for SIV, STLV, SRV, Herpesvirus simiae, and Hepatitis B virus could be usefully carried out before an animal is transferred, thus avoiding the unnecessary stress of a move if positive. With respect to the other tests (i.e. faecal screens and TB) – even if these are negative pre-transfer - the receiving institution is strongly advised to repeat them during quarantine as some animals may become positive during or shortly after a move.

In the case of animals testing positive for any particular infection advice should be sought initially from the collection’s veterinary advisor.

**Ongoing preventive medicine programme.**

An ongoing preventive medicine programme should be in place for all captive primates after they have cleared quarantine. Collections that have not carried out any screening on resident animals should apply the tests listed in quarantine before moving on to the following schedule.

• Regular faecal testing for pathogenic bacteria and parasites should be carried out every 6 months - more frequently if a particular problem is known to exist. Where an infection with pathogenic bacteria or parasites has been treated, follow up faecal samples should be examined to establish the effectiveness of treatment. The blind use of anthelmintic drugs at regular intervals is not advised. Parasites can become resistant to drugs as can bacteria, and therefore animals that are regularly treated without faecal examinations can carry high parasite burdens.
• Under certain circumstances, it may be wise to re-test macaques annually for *Herpesvirus simiae*. Advice should be sought from the collection’s veterinary advisor concerning this difficult issue.

• The vaccine status of each animal should be reviewed annually and boosters given when appropriate.

• Serum samples should be taken and stored at minus 70 degrees C or below as and when the opportunity arises. Serum banks thus created can be invaluable in the diagnosis of viral disease, the determination of vaccine efficacy and in the screening for new diseases as they are described. Furthermore serum banks represent an invaluable research tool.

• Repeated testing for TB is not currently recommended unless local circumstances dictate otherwise. (Consult veterinary advisor).

**Vaccinations.**

There may be value in vaccinating monkeys against tetanus, measles and poliomyelitis, although the case for polio is less compelling than for the other two. Apes should be vaccinated against all three diseases. When vaccines are used, the type, batch number and source of vaccine should be recorded in the medical records, as well as the site of vaccination in the case of injectable products.

• **Tetanus:** Clinical tetanus has been reported in wild and captive macaques, squirrel monkeys, guenons and other species, and is generally fatal. Three intramuscular doses of tetanus vaccine (standard human tetanus toxoid containing 40iu of tetanus toxoid per dose is acceptable) are given at 2 - 3 month intervals, starting at 3 months of age. Intramuscular boosters are given after 5 years and at 10-year intervals thereafter.

• **Measles:** Many species are susceptible. Vaccinate with intramuscular, live, hyperattenuated vaccine at 6 months and boost with same at 12 months. Monovalent vaccines prepared for humans are appropriate. Apes should be given a single dose at 15 months of age or over. Live measles vaccine should not be given at the same time as other vaccines, or to animals with other infections, or to any immunosuppressed animal. An intramuscular booster is given after 10 years. *(NB The use of live attenuated human measles vaccines in marmosets, tamarins and Owl monkeys may lead to disease and even fatalities in these species)*

• **Polio:** Clinical poliomyelitis has been reported in chimpanzee, gorilla & orang-utan. Other species are known to be susceptible experimentally. Three doses of live, oral, trivalent polio vaccine (containing attenuated strains of
Poliomyelitis virus, types 1, 2 & 3) are given at 1-month intervals. This may be started at 2 months of age (or earlier if a particularly high risk exists). Oral boosters are given after 5 years and at 10-year intervals thereafter. It is important to give the oral polio vaccine to all animals in a group at the same time. This is particularly important with the first dose of any course.

- An alternative strategy is to use the enhanced potency inactivated polio vaccine (eIPV) containing polio viruses of all three types inactivated by formaldehyde. Three 0.5mls doses are given by subcutaneous injection at monthly intervals, starting at 2 months of age or above. Booster doses of eIPV are given after 5 years and at 10-year intervals thereafter.

- **Other diseases:** Vaccine programmes should be adapted to changes in disease prevalence and increased knowledge of the efficacy and safety of available products. In unusual circumstances, i.e. in the face of specific challenges, primates can be vaccinated against viral hepatitis B, influenza, bacterial meningitis, Haemophilus influenzae, Pneumococcus etc. Vaccination against pseudotuberculosis is recommended as routine for marmosets and tamarins.

Do not vaccinate against tuberculosis as it interferes with the tuberculin skin test for TB and probably only induces a limited period of immunity.

Do not use the triple vaccine known as DPT or DTP (diphtheria, tetanus and pertussis). There have been a large number of adverse reactions recorded in non-human primates and they are not particularly susceptible to diphtheria or pertussis.

Mumps & rubella (German measles) are primarily subclinical diseases in non-human primates.

- **As and when** the opportunity arises, serum samples from vaccinated primates should be tested to establish the effectiveness of the vaccine schedules.

**Post mortem examinations.**

A thorough post mortem examination should be carried out on all primates dying in a collection, whether or not the cause of death is "obvious". Particular care should be taken with primates dying in quarantine. These animals must be assumed to be of high zoonotic potential until proven otherwise.

**Transportation of primates.**

Primates being moved within or between collections should always be transported in secure containment.
MEASURES FOR PEOPLE.

NB: COSHH Regulations (1994) require employers to assess the risk of infection to employees and other people who may be working with the animals and their by-products. Where a risk is identified, appropriate preventative or control measures must be applied. A code of practice should be drafted in co-operation with the collection’s veterinarian.

Pre-employment staff screening.

To reduce the dangers of disease transmission to primates, prospective new members of staff should undergo certain health checks - rather like the health checks carried out during quarantine for animals. This pre-employment medical check has clear advantages for staff and employer alike, and should be developed in co-operation with the collection’s occupational health advisor.

- New members of staff should not have any contact with primates for the first 2 weeks of employment. This should allow sufficient time for the development of most infectious diseases that the new employee may be incubating when taken on, and for the completion of specific tests detailed below.

- Ideally the candidate should undergo a thorough medical examination by the collection’s staff doctor.

- Faecal tests should be conducted to establish whether the prospective member of staff is carrying any pathogenic enteric bacteria or parasites.

- A skin test for tuberculosis should be carried out. If this is positive, the doctor will probably suggest further tests.

- A blood screen for hepatitis B and C should be carried out.

- Prospective staff should be offered an HIV screen.

- The vaccine status of the new employee should be reviewed. It is important that vaccinations against hepatitis A, hepatitis B (especially if working with apes), measles, mumps, polio, rabies, rubella, tetanus, tuberculosis, and typhoid are current.

These measures are suggested purely on medical and veterinary grounds. No comment or advice is given concerning the financial or legal implications of the tests or any treatment that may be required as a result.
Health of staff during employment.

- It is essential that all members of staff be in good general health. People that are run down in any way are far more likely to contract infectious diseases than healthy individuals.

- Six-monthly faecal tests for pathogenic bacteria and parasites are advised.

- Members of staff should undergo a similar faecal test after having returned from countries where such infections are commonly acquired, or from working in other primate collections. Specialist guidance should be sought if unsure as to whether a particular country is considered a high risk.

- Each member of staff should ensure that all vaccines are current.

- In certain circumstances (e.g. where a collection is regularly importing primates), an annual skin test for tuberculosis is advised.

Staff illness and injuries.

Colds, ‘flu, measles, viral hepatitis, salmonellosis and many other infections can be passed to primates and may cause serious disease in a collection.

- Staff members who are ill should not work with animals or prepare food.

- All injuries, accidents and illnesses of staff should be recorded.

- Bites and scratches should be thoroughly washed (NOT scrubbed) and medical attention sought if severe. Further detailed information should be available to staff working with animals in quarantine (especially those imported from range countries) and animals in the collection that have been incompletely screened.

- Staff with active herpes simplex lesions should not work with primates and should be encouraged to seek medical advice about treatment.

- If a doctor is consulted about illness in a member of staff, he/she must be made aware that the patient's work involves care of non-human primates.

Staff personal hygiene.

High standards of personal hygiene are required of primate keepers if the transmission of infectious zoonoses is to be avoided.
Frequent hand washing is probably the single most important measure to reduce or prevent the spread of infection. Washing is particularly important immediately before and after working with any primates. Hands should always be washed after handling bedding and other enclosure materials, uneaten food, faeces, urine, blood, saliva and any other body secretions. Although disposable gloves should be worn when handling primates or primate material, hands should still be washed after gloves are discarded. In order that staff may wash effectively and sufficiently often, it is vital that suitable facilities are provided. These are best placed just outside animal holding areas.

It is best practice for animal staff to wear a range of protective clothing when working in primate facilities. Generally speaking this involves the use of overalls, rubber boots, and disposable gloves. Fully protective goggles and facemasks may also be necessary where a particularly high risk of zoonotic infection exists - such as when working with any primate in quarantine, any wild-born primate, or with any macaques before it has been established that they are Herpesvirus simiae (Herpes B) negative. Zoos are strongly advised to consult their veterinary advisor to assess the level of protection that is appropriate.

To reduce the risk of mechanical transmission of infectious agents between primate facilities/houses, separate sets of protective clothing should be available for staff in each place. Neither overalls nor boots should be taken home by staff for any reason.

People with open cuts or sores on their hands must wear disposable gloves when working with primates or their environment.

Staff should be encouraged to keep hands away from their face when working in animal areas. It is remarkable how often people touch their faces without thinking about it! Similarly, staff should be discouraged from putting pencils, pens etc into their mouths.

Boots should be washed and preferably disinfected before entering and after leaving primate houses. Suitable facilities are rarely made available, although they can be very simple.

No smoking, eating, drinking or spitting should be permitted in animal areas.

Cage cleaning.

Protective clothing (overalls, boots, disposable gloves & masks, goggles) should be worn when cleaning animal areas.
• Bedding and excreta should be removed in sealed bags to avoid the spread of material by the wind.

• Animal areas should be cleared and scrubbed before hosing down. High-pressure hoses or steam cleaners should be avoided if at all possible, as they tend to create aerosols or sprays of potentially infectious material.

Equipment.

Restraint equipment should always be in good working order. Nets, gloves, squeeze cages, crushes, crates should be regularly inspected. Defective equipment can lead to injuries to animal and man, and in the worst case escapes. Equipment must be cleaned after each job to avoid the mechanical transmission of infectious material. It is strongly advise that nets are not used to catch macaques before it has been established that they are Herpesvirus simiae negative

Zoonotic infections.

Staff should be made aware if primates in their care are known or suspected to be suffering from potentially zoonotic infections. Additional measures (if any) to prevent transmission of infection should be explained. This job will fall primarily to the veterinarian.

Pregnancy.

Staff who are pregnant should be extremely careful when working with non-human primates and should seek specialist advice.

Immunosuppressed staff.

Staff who are immunosuppressed for any reason should be extremely careful when working with non-human primates and should seek specialist advice. Radio- or chemotherapy, large doses of steroids or HIV infection may all cause immunosuppression.
Veterinarians.

Veterinarians should take great care to follow the general guidelines given above.

- Many of the animals examined and treated by veterinarians will be sick and therefore the risk of zoonotic infection is often higher than for most animal care staff.

- Veterinarians must adopt the most rigorous standards of personal hygiene and wear disposable protective clothing as often as is practical.

- Particular attention should be paid to avoiding the mechanical transmission of infective material via clothing and equipment, both between primate houses and between primate collections.

- Veterinarians must ensure the correct disposal of clinical waste.

Other people.

It should always be remembered that other people who have access to non-human primates may pose a threat to the animals and may themselves be at risk of infection. Therefore the role and management of volunteers, students, temporary staff, visiting zoo personnel, contractors working in animal areas and in some cases, visitors, needs careful consideration.