
Veterinary Medical Summary

Douglas Armstrong, Omaha's Henry Doorly Zoo

The project veterinary medical team worked with veterinary medical teams in nine zoos in Indonesia to complete 59 immobilizations on 48 cats during the period from 1992 to 1995. In the course of those immobilizations nearly all tigers received complete physical examinations including ophthalmic, otic and dental exams. The tigers were permanently identified with transponders placed interscapularly and by tattoos placed on the inside of the rear leg. Preventative medical procedures were performed, including the removal of dental calculus or tartar from the teeth and the removal of excess claw sheaths from overgrown or ingrown claws. Blood samples were collected from most of these cats for complete blood cell counts and serum chemistries to evaluate the health status of the animals. Hair and skin biopsies were collected for genetic evaluation. Semen was collected by electroejaculation from tigers on 14 occasions. The semen was cryopreserved and placed in a Genome Resource Bank for the Sumatran tiger in Indonesia (see Byers, this Chapter). Serum samples and the genetic samples from many of the cats were also placed in the bank.

Immobilization doses were modified over this time from initial doses used in 1992 of 0.44 mg/kg of xylazine to a dose of 0.24 mg/kg xylazine. Xylazine is used to sedate the cat during immobilization and the higher xylazine doses caused respiratory depression in some cats although no mortalities occurred. Ketamine doses remained the same throughout the program at 4-5 mg/kg. The reduced xylazine dose requirement observed in Sumatran tigers in Indonesia may reflect a nutritional concern for these tigers involving kidney function (see below) and their ability to metabolize xylazine.

Fractured canine teeth were found in eight tigers and 14 of these teeth were repaired with complete endodontic or root canal procedures. Two of the tigers found to have broken teeth in 1994 were found to have one additional broken tooth when reexamined in 1995. This reinforces the need for routine physical examination to detect this problem which may be a common occurrence in these animals. Many of the tigers had heavy calculus on their teeth, which can also cause serious health problems. Although all teeth were cleaned by hand scaling and the calculus removed, it is important to note that in a group of tigers in which the teeth were thoroughly cleaned in 1994 and then reexamined in 1995, calculus had reoccurred and the teeth needed to be cleaned again. This lends further support to the need for annual physical examination of tigers in Indonesia.

A number of tigers were found to have overgrown claws and in some cases the claws had become ingrown, curving back into the pad, which causes pain and increases the risk of infection or lameness. Although overgrown claws were trimmed this condition is likely to occur again.

Cataracts were identified in three tigers and the repair of a lacerated cornea was attempted in one. Several tigers were found to be overweight, which is detrimental to health and reproductive ability.

The most widespread, immediate health concern with this population of tigers was related to unusual kidney function values observed on serum chemistry tests from all animals for which data is available. Blood sample values were received from 30 of the 43 tigers examined in 1992 and 1994. All had Blood Urea Nitrogen (BUN) levels which were outside of the range of normal values for tigers in the International Species Information System (ISIS) database. The normal range for tiger BUN values in the database is 20.7- 35.1 mg/dl. The values for Sumatran tigers in Indonesia ranged from 41.4 - 117.3 mg/dl with an average of 73.7 mg/dl. These values are highly significant in that for nearly all mammals and for tigers in particular these values would be regarded as a very important indicator of a probable disease problem. These values primarily indicate compromised kidney function which may result in reduced reproductive ability and shortened life expectancy.

For Sumatran tigers in Indonesia these values probably reflect some factor that this population of tigers shares in common such as a very high protein diet. This diet can have a long-term effect on the kidneys of these animals. This long-term effect is important for the tiger conservation program because, even though there may be an identifiable cause for these values, there may also be a long-term effect on the health and reproductive ability of this population of tigers. Further investigation of this problem is a high priority in order to determine the effects on this population.

The long-term concerns for the Sumatran tiger program involve a number of issues related to the continuation of effective programs for the management of the species.

- The first is the maintenance of the long term health of individual animals in the program through an established protocol of health maintenance including annual physical examinations for all individuals and the annual completion of preventative health maintenance procedures such as cleaning teeth and trimming claws.
- The second issue is the permanent identification of all animals in the population with tattoos and transponders as soon as possible. The conservation of this species is based on an effective genetic management program, which is in turn based on the ability of everyone involved to always be able to positively identify each individual animal.
- The third issue of long term importance for this program is the development of the Genome Resource Bank. The GRB is dynamic and serves multiple functions. It should receive regular deposits of semen collected during annual physical exams from males in the program for long-term genetic conservation, skin biopsies from all animals to provide a resource to answer future genetic questions that may arise and multiple serum samples from each individual animal, collected during every tiger's annual physical examination in order to help manage the long-term health of the population.

New programs for the long-term management of the population also need to be instituted and enforced in order to conserve this subspecies. The first would be a centralized reporting and information distribution system for collecting information from annual examinations, information about disease problems and complete necropsy reports from all animals that die in order to identify population wide disease problems that may not be apparent in individual institutions. A required program of annual vaccination for preventable disease problems, such as rabies, for all animals in the program is a high priority. The prevention of disease spread is equally important and can be addressed through a program of required disease testing for all tigers before movement between institutions and an established protocol for quarantine after movement. Finally, there will continue to be new health issues which need to be addressed for these animals on a population wide basis. The establishment of a health advisory committee to review the programs established health maintenance protocols and to advise about new health concerns as they arise would provide the tiger program with a way to effectively and quickly meet the new problems that will inevitably arise in the future.

Issues for Consideration

1. Nutrition

- Have any or all of the zoos done a laboratory analysis of their diet to determine its nutritional components?
- Has any zoo modified its diet to improve it, based on laboratory analysis?
- If this was done, has the information been distributed to all zoos in the program?

2. Animal Management

- Are there any Sumatran tigers at these zoos that are not yet identified with a tattoo and transponder?
- All animals born in captivity should be done within three months after birth and all new older animals that are brought into the program from outside should be done within one month after they arrive.

3. Health Maintenance

- Which zoos completed annual physical examinations on all of their tigers in 1996?
- Was blood collected from all tigers in 1996 for serum banking, complete blood counts and serum chemistries? Were the tests done?
- How many animals had their teeth cleaned in 1996?
- How many broken teeth were found on examination in 1996, and were any broken teeth repaired?
- How many zoos vaccinated their tigers in 1996 and for which diseases?

4. Genome Resource Bank

- What is the status of the GRB?
- What is the current inventory of semen, serum, and genetic samples?
- How many new semen samples were placed in the GRB in 1996?
- 4. How many serum samples or genetic biopsies were placed in the GRB in 1996?

5. Program Management

- How many annual examination reports or necropsy reports did the studbook keeper receive in 1996?

Recommendations

These recommendations reflect the maturity of the Sumatran tiger captive conservation program in Indonesia. The following items are presented as recommendations to be adopted as requirements for participation in this conservation program.

1. Develop and implement a required, comprehensive nutritional assessment program for diets provided to all tigers in the conservation program.

- Appoint an individual from the tiger management group to carry out this program.
- Set a specific date for completion of each step in this program.
- Identify and engage a qualified nutritionist to provide specific advice with regard to:
 - Which laboratories to use for testing.
 - What tests to run on samples.
 - How many samples to run.
 - Interpretation of results.
 - Determination of tiger requirements.
 - Specific recommendations for each zoo in how to modify their diet.
- Identify a method for each zoo to implement these changes.
- Six months following the diet change, perform a complete physical examination on each tiger in each zoo including complete blood cell counts and serum chemistries.

2. Require reporting of results of all of the following recommendations (3 - 10) to the studbook keeper within **one** month after the procedures indicated in each recommendation are carried out.

3. Establish a formal requirement for annual physical examination and complete preventative medical procedures for all tigers in the conservation program. Require that a serum sample from each tiger exam be submitted to the Genome Resource Bank. Provide a detailed report to the studbook keeper.

4. Require that all tigers that enter the program by birth, capture or transfer from other sources be permanently identified by tattoo and transponder. Provide a detailed report to the studbook keeper.

- Animals entering by birth must be done by three months of age.
- Animals entering by other means must be done within one month of acquisition.

5. Require that all tigers in the captive conservation program receive an annual vaccination with **killed** vaccine for:

- Feline Rhinotracheitis
- Feline Calicivirus
- Feline Panleukopenia
- d. Rabies

New tigers that have not been previously vaccinated should receive a series of initial vaccinations consisting of three doses given four weeks apart begun as soon as the animal is determined to be at least eight weeks of age. Provide a detailed report to the studbook keeper.

6. Require that all conservation program tigers that are to be transferred to another institution receive a complete physical examination including complete blood cell count and serum chemistry panel, preventative medical procedures, and serum collection for virus titer screening. Provide a detailed report to the studbook keeper. This procedure should be completed no more than 60 days prior to shipment. Prior to shipment the serum sample must be screened for titers to:

- Feline Immunodeficiency Virus
- Feline Leukemia
- Feline Panleukopenia
- Feline Infectious Peritonitis
- Canine Distemper

7. Require that all institutions that receive any cats including program tigers quarantine those animals for a minimum period of 30 days in a location geographically separated from all conservation program tigers by a distance of not less than 50 meters, that there is no keeper contact between the two populations during the quarantine period and that the new tiger be given a complete physical examination including the virus screens described above within two weeks after its arrival at the new facility. Provide a detailed report to the studbook keeper.

8. Require that a complete necropsy be performed on all program tigers that die within 24 hours of death and that a complete set of tissue be submitted for histopathology. Provide copies of all reports to the studbook keeper.

9. Require a minimum of one semen collection per year from all male tigers in the conservation program and that the semen be appropriately processed, cryopreserved and deposited in the Genome Resource Bank.

10. Require the collection of genetic samples including hair and two skin biopsies from all tigers in the conservation program to be deposited in the Genome Resource Bank within six months after the tiger enters the population by birth or transfer.

11. Establish an Animal Health Advisory committee for the tiger management group.

- Appoint the committee members.
- Appoint a chairman to be responsible for coordination with the management group, the studbook keeper and the committee members.
- Require a minimum of one annual meeting to review health management programs of the Sumatran tiger captive conservation program.
- Require an annual report to the management group from this committee concerning health issues in the conservation program.

Kesimpulan Kesehatan Hewan

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Tim proyek kesehatan harimau Sumatra bekerjasama dengan tim dokter hewan pada sembilan kebun binatang di Indonesia untuk melengkapi 59 pembiusan (imobilisasi) pada 48 ekor harimau selama periode 1992 sampai 1995. Pada kursus imobilisasi, seluruh harimau mendapatkan pemeriksaan fisik lengkap termasuk pemeriksaan mata, telinga dan pemeriksaan gigi. Harimau-harimau tersebut diidentifikasi secara permanen dengan memasukkan transponder yang diletakkan pada interscapula dan pemberian tato pada kaki belakang kiri. Tindakan pencegahan dilakukan meliputi pembersihan karang gigi atau kotoran gigi dan pemotongan kuku kaki yang tumbuh tidak sempurna.

Contoh darah yang dikoleksi dari sebagian besar harimau-harimau tersebut dipergunakan untuk pemeriksaan gambaran darah dan kimiawi darah bertujuan untuk mengevaluasi status kesehatan satwa tersebut.

Rambut dan biopsi kulit diambil dan dikumpulkan untuk evaluasi genetika. Semen harimau dikumpulkan dengan metoda elektroejakulasi dari 14 penampungan. Semen diawetkan dan disimpan pada Bank Sperma (GRB) harimau Sumatra di Indonesia. Contoh serum dan contoh genetik dari berbagai harimau juga disimpan pada bank tersebut.

Dosis pembiusan yang digunakan telah dimodifikasi dari dosis yang digunakan pada tahun 1992: Xylazine 0.44 mg/kg menjadi 0.24 mg/kg. Xylazine digunakan untuk mensesdasi harimau dalam pembiusan dan xylazine dosis tertinggi dapat menyebabkan penekanan sistem pernafasan pada beberapa harimau meskipun kematian tidak pernah terjadi. Dosis ketamin yang digunakan dalam program ini tetap sama yakni 4-5 mg/kg. Pengurangan dosis xylazine pada harimau Sumatra di Indonesia dilakukan berkaitan dengan kondisi pakannya yang mempengaruhi fungsi ginjal (lihat selanjutnya) dan bagaimana kemampuan tubuh harimau-harimau tersebut untuk memetaboliser xylazine.

Gigi yang patah ditemukan pada 8 ekor harimau dan 14 dari gigi tersebut telah diperbaiki dengan lengkap melalui prosedur lengkap "endodontic" dan "root canal". Dari dua ekor harimau yang pada tahun 1995 ditemukan satu gigi berlubang, pada tahun 1995 bertambah satu. Keadaan ini menyarankan perlunya pemeriksaan rutin untuk mendeteksi kasus ini yang mana nampaknya umum terjadi pada harimau. Banyak harimau-harimau tersebut memiliki karang gigi yang dapat mempengaruhi kondisi kesehatan secara serius. Meskipun seluruh gigi telah dibersihkan dan karang gigi juga ditiadakan, perlu diperhatikan bahwa bagi sekelompok harimau yang telah dibersihkan giginya pada tahun 1994, dimana gigi telah dinyatakan benar-benar bersih, namun kasus yang sama kembali terulang pada tahun 1995 dimana memerlukan pembersihan gigi kembali. Keadaan ini juga menambahkan saran bagaimana pentingnya pemeriksaan rutin bagi harimau sumatera di Indonesia. Beberapa harimau ditemukan dengan pertumbuhan kuku yang abnormal dimana beberapa kasus nampak kuku yang tumbuh sampai menusuk bagian telapak

kakinya, hal ini menyebabkan harimau kesakitan dan meningkatkan resiko terkena infeksi atau kelumpuhan. Meskipun pertumbuhan kuku yang berlebih telah diperbaiki dengan memotong kukunya, kejadian seperti ini masih sering terulang kembali. Katarak ditemukan pada 3 ekor harimau dan upaya perbaikan kornea mata pada satu ekor harimau telah dilakukan. Beberapa harimau memiliki bobot badan yang berlebih yang dapat membahayakan kesehatan dan kemampuan bereproduksi.

Dari penyebaran harimau yang terpenting dan perlu dipertimbangkan adalah fungsi ginjal yang tidak lazim berdasarkan pemeriksaan kimiawi serum dari semua data yang ada. Data contoh darah diperoleh dari 30 ekor harimau walaupun yang diperiksa sebanyak 43 ekor pada tahun 1992 dan 1994. Seluruh harimau memiliki kadar 'Blood Urea Nitrogen' (BUN) diatas standar normal harimau berdasarkan data yang tercatat pada Sistem Pendataan Spesies Internasional (ISIS). BUN normal harimau berdasar ISIS adalah 20.7-35.2 mg/dl. Sementara harimau Sumatra di Indonesia berkisar antara 41.4 - 117.3 mg/dl dengan rata-rata 73.7 mg/dl. Nilai tersebut hampir berdekatan dengan nilai mamalia umumnya dan nilai tersebut sangat penting sebagai indikator harimau bila ditemukan adanya kelainan. Nilai - nilai ini menunjukkan adanya kelainan fungsi ginjal yang dapat mempengaruhi kemampuan reproduksi dan daya tahan hidup harimau tersebut. Nilai BUN yang tinggi bagi harimau-harimau Sumatra di Indonesia kemungkinan berhubungan dengan pola pakan yang seragam, dan mengandung kadar protein yang tinggi. Pakan ini dalam jangka panjang dapat mempengaruhi fungsi ginjal. Pengaruh jangka panjang ini sangat penting kaitannya dengan program konservasi harimau, sebab walaupun penyebab peningkatan kadar BUN diketahui, kemungkinan pengaruhnya pada kesehatan dan kemampuan bereproduksi dari populasi ini juga dipengaruhi. Pemeriksaan lebih lanjut mengenai permasalahan ini merupakan prioritas utama berkaitan dengan pengaruhnya terhadap populasi.

Pertimbangan jangka panjang program harimau Sumatra berkaitan dengan beberapa hal yang berhubungan dengan pengelolaan species secara kontinu dan berkesinambungan. Yang pertama, perawatan kesehatan hewan mencakup pemeriksaan rutin setiap tahunnya serta program pencegahan (preventif). Dengan melakukan kegiatan preventif lengkap tahunannya yang meliputi pembersihan gigi dan pemotongan kuku. Butir yang kedua adalah indentifikasi harimau secara permanen dengan pemberian tato dan transponder sesegera mungkin. Konservasi jenis harimau sumatera didasari pada program pengelolaan genetik yang efektif, selanjutnya berdasarkan kemampuan setiap orang yang terkait dalam program ini indentifikasi positif terhadap harimau dapat dilakukan. Hal yang ketiga, perkembangan Bank sumber genom ("*Genome Resorse Bank*" = GRB) penting dalam program jangka panjang harimau sumatera. GRB merupakan kegiatan yang dinamis dan memiliki berbagai fungsi. Bank ini menerima pemasukan semen yang dikoleksi dari harimau jantan pada setiap pemeriksaan tahunan guna menunjang program konservasi jangka panjang, biopsi kulit yang hasil analisisnya dapat dipergunakan untuk menjawab pertanyaan genetika (kemurnian jenis) yang dapat muncul dimasa mendatang, pengumpulan contoh serum darah dari setiap individu hewan. Pengumpulan dilaksanakan dari setiap pemeriksaan individual harimau rutin tahunan untuk membantu mengelola populasi yang sehat dalam jangka waktu yang panjang.

Program-program baru untuk pengaturan pengelolaan populasi jangka panjang juga perlu di lembagakan dan ditekankan guna mencapai konservasi jenis ini. Pertama adalah pemusatan system pendataan yang dilaporkan berdasarkan hasil pemeriksaan tahunan serta pendistribusian

(Data base) . Informasi mencakup keterangan mengenai masalah penyakit dan laporan bedah bangkai (nekropsis) lengkap dari semua hewan yang mati guna mengidentifikasi masalah penyakit yang lebih luas yang mungkin tidak di setiap institusi harimaunya memperlihatkan kasus penyakit tersebut. Program preventive tahunan (vaksinasi) harus dilaksanakan setiap tahunnya, seperti rabies, merupakan prioritas utama bagi setiap harimau sumatera dalam program. Program pencegahan terhadap penyebaran penyakit juga sama pentingnya dan dapat dilaksanakan melalui pemeriksaan penyakit tertentu yang diperlukan sebelum perpindahan harimau dari satu institusi ke institusi lainnya serta melaksanakan prosedur karantina. Akhirnya, permasalahan kesehatan baru akan ditemui terus menerus berkaitan dengan kondisi populasi satwa. Dengan pembentukan komisi penasehat kesehatan yang dapat mereview protokol pemeliharaan kesehatan yang sudah berjalan dan memberikan petunjuk mengenai masalah kesehatan yang akan muncul ,dapat memberikan saran kepada program harimau sumatera mengenai cara yang efektif dan cepat dalam penanggulangan masalah yang mungkin muncul dimasa mendatang.

Hal – Hal Yang Perlu Dipertimbangkan

1. Nutrisi

- Apakah setiap kebun binatang telah melakukan analisa kandungan makanan secara laboratorik untuk komponen diet yang diberikan pada satwanya?
- Apakah setiap kebun binatang telah memodifikasi pakan mereka guna peningkatan gizi berdasarkan hasil analisa laboratorium?
- Bila semua pertanyaan diatas telah terjawab, sudahkah informasi tersebut didistribusikan seluruh kebun binatang lain yang masuk dalam program?

2. Pengelolaan Hewan

- Apakah masih ada harimau sumatera di kebun-kebun binatang yang belum diidentifikasi dengan pemberian tato atau transponder?
- Catatan: Bagi harimau yang lahir di penangkaran pengerjaan pengidentifikasian harus dikerjakan bila satwa berusia 3 bulan dan bagi harimau baru yang lebih tua yang masuk dalam program penangkaran, pengidentifikasian harus sudah dilaksanakan selambat-lambatnya satu bulan dari waktu kedatangan.

3. Perawatan Kesehatan

- Kebun binatang mana saja yang pada tahun 1996 telah melakukan pemeriksaan kesehatan lengkap bagi seluruh harimau Sumatra miliknya?
- Apakah seluruh harimau telah dikoleksi serum darahnya guna disimpan sebagai bank serum, penghitungan gambaran darah dan kimiawi darah? Dimana pengetesan dilakukan?
- Berapa banyak harimau yang telah dibersihkan giginya pada tahun 1996?
- Berapa banyak harimau dengan kerusakan gigi yang ditemukan pada tahun 1996? Apakah setiap gigi yang rusak telah diobati pada tahun 1996?
- Berapa kebun binatang yang telah melakukan vaksinasi dan untuk jenis penyakit apa vaksinasi tersebut dilakukan?

4. Bank Sumber Genom (Genome Resource Bank)

- Apakah status dari GRB?
- Contoh semen, serum dan genetik siapa yang saat ini disimpan?
- Berapa banyak contoh semen baru yang dikoleksi pada tahun 1996?
- Berapa banyak contoh serum dan biopsi genetik yang dikoleksi pada tahun 1996?

5. Program Pengelolaan

- Berapa banyak laporan pemeriksaan rutin dan bedah bangkai yang dilaporkan ke pencatat stud book dalam tahun 1996

Rekomendasi

Rekomendasi ini merupakan refleksi dari perkembangan program Konservasi Harimau Sumatera di Indonesia. Butir-butir berikut disajikan sebagai rekomendasi yang akan diadopsikan sebagai persyaratan dalam partisipasi program konservasi.

1. Mengembangkan dan mengaplikasikan program nutrisi yang disyaratkan dan telah dianalisa untuk diet semua harimau dalam program konservasi.
 - Menunjuk seseorang dari kelompok pengelolaan harimau sumatera sebagai penanggung jawab dan pelaksana program ini.
 - Tentukan waktu tertentu untuk melengkapinya setiap langkah program ini.
 - Mengidentifikasi dan bekerja sama dengan ahli gizi yang berkompeten untuk memberikan masukan mengenai:
 - Laboratorium yang cocok dalam pemeriksaan pakan
 - Uji apa yang perlu dilakukan untuk contoh yang diambil
 - Berapa banyak Contoh yang harus diperiksa
 - Penentuan kebutuhan pakan harimau
 - Rekomendasi spesifik bagi setiap kebun binatang untuk penggantian diet yang diberikan.
 - Mengidentifikasi metoda bagi setiap kebun binatang dalam pelaksanaan perubahan ini.
 - Mengikuti perubahan diet selama 6 bulan, lakukan pemeriksaan fisik lengkap pada setiap harimau di setiap kebun binatang termasuk pemeriksaan lengkap gambaran darah dan kimiawi darah.
2. Hasil pada butir (3- 10) dalam rekomendasi ini harus dilaporkan kepada pencatat stud book satu bulan setelah pelaksanaan prosedur yang direkomendasikan.
3. Membuat persyaratan formal tahunan untuk pemeriksaan fisik tahunan dan prosedur pencegahan penyakit lengkap bagi seluruh harimau dalam program konservasi. Diharuskan mengirimkan serum darah bagi setiap harimau ke GRB. Berikan laporan rinci kepada pencatat stud book

4. Seluruh harimau yang masuk dalam program baik yang lahir di penangkaran, hasil tangkapan maupun pindahan dari lembaga lainnya harus diidentifikasi permanen baik dengan tato maupun transponder. Berikan laporan rinci kepada pencatat studbook.
 - Hewan yang lahir di kebun binatang perlu dimasukkan datanya selambat-lambatnya dalam usia 3 bulan.
 - Hewan yang tidak lahir di kebun binatang dan masuk ke dalam KB harus dimasukkan datanya selambat-lambatnya 1 bulan dari tanggal masuk (kedatangan).
5. Seluruh harimau dalam program penangkaran harus menerima vaksinasi tahunan dengan menggunakan vaksin inaktif untuk:
 - Feline Rhinotracheitis
 - Feline Calicivirus
 - Feline Panleukopenia
 - Rabies

Harimau baru yang belum pernah divaksinasi sebelumnya, perlu menerima rangkaian seri vaksinasi yang terdiri atas tiga dosis yang diberikan dengan interval waktu 4 minggu secepatnya setelah harimau diidentifikasi telah berumur paling kurang 8 minggu. Berikan laporan rinci kepada pencatat stud book

6. Setiap harimau dalam program penangkaran yang akan dipindahkan ke institusi lainnya harus diperiksa fisik secara lengkap dan pemeriksaan gambaran darah serta kimiawi darah yang lengkap, prosedur pengobatan preventif dan koleksi serum untuk pengukuran titer virus (skrening virus). Prosedur ini harus dilaksanakan dan dilengkapi tidak lebih dari 60 hari sebelum waktu keberangkatan. Sebelum keberangkatan, serum perlu di periksa untuk:
 - Feline Immunodeficiency Virus
 - Feline Leukemia
 - Feline Panleukopenia
 - Feline Infectious Peritonitis
 - Canine Distemper

Berikan laporan rinci kepada pencatat studbook.

7. Seluruh institusi penerima harimau yang asalnya bukan dalam program maupun yang ada dalam program harus melalui prosedur karantina minimum selama 30 hari di lokasi yang secara geografis terpisah dari semua lokasi harimau yang terprogram sudah ada dengan jarak tidak kurang dari 50 meter. Tidak boleh ada kontak dari keeper di kedua fasilitas tersebut dan harimau yang baru perlu dilakukan pemeriksaan fisik lengkap dan skrening terhadap virus seperti dijelaskan diatas dalam 2 minggu setelah tanggal kedatangan. Berikan laporan rinci kepada pencatat studbook.

8. Pembedahan pasca mati (nekropsi) harus dilakukan bagi setiap harimau yang mati dalam waktu 24 jam setelah kematian dan pengiriman jaringan lengkap harus dikirimkan ke lab. histopatologi. Berikan semua copy laporan pemeriksaan kepada pencatat studbook.

9. Minimal satu contoh semen dalam setahunnya dikoleksi dari pejantan yang masuk dalam program konservasi dan semen diproses dengan baik dan benar, diawetkan dan disimpan dalam GRB.

10. Rambut dan biopsi kulit untuk pemeriksaan genetik harus dikumpulkan dari semua harimau sumatera yang masuk dalam program konservasi dan disimpan dalam GRB dalam waktu 6 bulan setelah harimau masuk sebagai populasi penangkaran baik yang lahir maupun harimau pindahan.

11. Membentuk komisi penasehat kesehatan satwa dalam kelompok pengelolaan harimau.

- Menentukan anggota komisi.
- Menunjuk ketua yang bertanggung jawab sebagai koordinator dengan kelompok pengelola, pencatat stud book dan anggota komisi.
- Minimum satu kali pertemuan tahunan perlu dilakukan untuk mereview program kesehatan harimau sumatera dalam program.
- Laporan tahunan mengenai kesehatan satwa perlu dilaporkan oleh komisi kesehatan kepada kelompok pengelola konservasi program.

Immobilization and Examination Protocol for Sumatran Tigers

Douglas Armstrong, Omaha's Henry Doorly Zoo

This protocol is based on a team approach to animal immobilization, examination and procedures. Immobilizations are carried out most safely and efficiently when this team approach is utilized. In the case of a tiger immobilization, the team consists of a veterinarian, a veterinary technician and at least one animal management staff member. Although the veterinarian has primary immobilization responsibility, safe and successful monitoring of the animal's vital signs and depth of anesthesia requires the cooperation of all team members. Safe immobilization also depends on constant communication of information such as respiratory rate between team members.

Pre-Anesthetic Considerations

Animal should be off food for 24 hours prior to immobilization. Water may be provided before anesthesia but not for several hours after anesthesia due to the risk of drowning.

If the ambient temperature is high or if cats are excited, then 15 gallons of water must be available before the procedure starts for cooling the animal during procedures.

Animal should be confined alone in the smallest area possible with minimal outside disturbances.

Anesthetic Procedure

A complete immobilization record should be maintained during the procedure.

Primary drug administration - blow dart.

Secondary drug administration - pole syringe or hand injection.

- **Sedation**: 1 dart - xylazine 0.2 mg/kg IM then wait for a 10-minute interval. Vomiting can be expected.
- **Immobilization**: 2-3 darts - ketamine 4-6 mg/kg IM. Surgical anesthesia in 5-10 minutes.
- **Supplements**: ketamine 1.0 mg/kg IM (IM = intramuscular) or midazolam 0.01 mg/kg administered slowly IV (IV = intravenous), (diazepam at 0.01 - 0.03 mg/kg IV or IM is an alternative to midazolam).
To control seizure activity use only midazolam or diazepam.
- **Reversal (if needed)**: yohimbine 0.05 mg/kg given IV or IM. In emergencies the benzodiazepene antagonist, flumazenil (0.1 mg/kg IV) can also be used.

Yohimbine reverses xylazine. Xylazine is not routinely reversed in all immobilizations. Yohimbine is used only when indicated by depressed respiration or cardiac arrhythmias or depression. In some institutions animals are routinely reversed with yohimbine even when no physiologic problems occur.

Seizures

It is not uncommon for tigers to have seizures of 30-60 seconds in duration during immobilization procedures. The seizing cat may have severe muscle contractions in all limbs, arch the back and may snap its jaws. The seizures generally do not cause the animal any residual harm, however, it is important to control the seizures if they occur so that they do not progress into more serious continuous *grand mal* seizures. The seizure activity is normally controllable with the administration of diazepam (0.01-0.05 mg/kg IV) or midazolam (0.01-0.03 mg/kg IV or IM).

Emergency Drugs

(immediately available at the immobilization site)

- Doxapram: For respiratory depression or arrest - high probability of being used. Use implies cautious continuation of procedure. Range 0.2-0.5 mg/kg IV or IM.
- Yohimbine: For respiratory depression or arrest, cardiac arrhythmia or arrest - medium probability of use. Use requires ending the procedures. Dose range 0.05 mg/kg IV or IM. The cat should become alert within 2 to 10 minutes.
- Epinephrine: For cardiac arrest - low probability of being used. Use requires ending the procedure. Dose range 0.5 - 1.0 ml of 1:1000 solution intra-cardiac.
- Prednisolone: For circulatory collapse - low probability of being used. Use requires ending the procedure. Dose range 10 mg/kg IV.
- Dexamethasone: For circulatory collapse - low probability of being used. Use requires ending the procedure. Dose 1 mg/kg IV.

Emergency Equipment

(immediately available at the immobilization site)

- Endotracheal tubes with inflatable cuffs - sizes 14, 16, 18mm for adult tigers.
- Ambu bag to attach to tube to move air.
- Stomach tubes and funnel - for cold water enemas in cases of hyperthermia.

Examination (estimate 5-10 minutes for examination)

1. Continuously monitor respiration rate and depth from first dart. (8-24/min. normal). One person's primary job should be respiratory monitoring throughout the procedure.
2. Determine depth of anesthesia to be adequate by stimulation of the head with a pole syringe or stick.

Hands-on evaluation: response to stimulation of body, feet, cornea, ears and tongue. A well-anesthetized adult tiger should maintain a respiratory rate of 8-24 breaths per minute and a heart rate of 60-120 beats per minute. The jaws can be opened and the tongue exteriorized with little or no resistance.

3. Assign one person with experience to control the head of the animal throughout the procedure. This person also monitors respiration rate.
4. Auscult heart rate (60-120 beats per minute is normal) and rhythm. Auscult lung sounds.
5. Examine oral cavity: capillary refill rate, color of mucous membranes and condition of pharynx, gingiva and teeth.
6. Rectal temperature (100°-102°F normal). A temperature of 102°-104°F requires re-check in five minutes. *Temperatures over 104°F require immediate cold water enema.*
7. Examine externally: hair coat, skin, claws (evert each claw), pads.
8. Palpate: retropharyngeal area, prescapular lymph nodes, abdomen, inguinal region and testicles. Exteriorize penis.
9. Ophthalmic examination: followed by ophthalmic antibiotic ointment in eyes to keep corneas moist.
10. Otic examination.

Sample Collection (3-10 minutes)

1. Blood: 30-60 ml of blood collected from medial saphenous vein. Alternative blood collection sites are cephalic, tail and jugular veins. A 60-ml syringe with 18-gauge 1 ½" needle will be used. Blood sample will be placed in EDTA (ethylenediaminetetraacetic acid) tube for complete blood count first. The remainder of sample will go into serum tubes unless heparin or other types of samples are required.
2. Biopsy samples (genetic analysis): 6 mm punch biopsies of full skin thickness on medial inner rear leg from surgically prepared site. Close biopsy site with suture material. Apply fly repellent around sites.

3. Fecal samples: if necessary, directly from rectum.
4. Ear swab: if indicated by examination.
5. Aspiration from any abscesses or masses if noted on exam and if facilities are available for culture or histology.
6. Semen collection: by electroejaculation.

Commonly an electroejaculation procedure for tigers consists of the following series of stimulations.

10 stimulations at 2 volts
 10 stimulations at 3 volts
 10 stimulations at 4 volts

Break for 5 minutes

10 stimulations at 3 volts
 10 stimulations at 4 volts
 10 stimulations at 5 volts

Break for 5 minutes

10 stimulations at 4 volts
 10 stimulations at 5 volts

Procedures (10-15 minutes)

1. Clean teeth if required
2. Trim excess claw sheaths if required.
3. Confirm tattoos, transponders, identification.
 - Studbook number tattoo in medial upper rear leg. Left if temporary and right if permanent.
 - Trovan transponder may be interscapular or at base of left ear.

Identification Procedures

Tattoo: Permanent tattoos of either permanent or temporary studbook numbers should be placed in the medial surface of the upper rear leg. If the studbook number is temporary it should be placed on the left leg and if the number is the permanent studbook number it should be placed on the right leg. The tattoo site should be clipped to remove hair and surgically prepped before tattooing.

Transponder: A "Trovan" system identification transponder should be placed interscapularly at a surgically prepared site. Other transponder systems may be used.

Treatments

Each cat receives a single dose of injectable antibiotic. No follow-up planned. Antibiotic choices depend on each veterinarian's professional preferences. Some options include:

- Tribrissen - trimethoprim-sulfa - 20 mg/kg
- Naxcel - cephalosporin - 0.5 mg/kg (usually requires refrigeration)
- Amikacin - aminoglycoside - 10 mg/kg
- Benzathine penicillin - usually requires refrigeration 20,000 IU/kg

Vaccinations

Routine annual vaccination using killed vaccines for rabies, feline rhinotracheitis, calicivirus and panleukopenia may be given at this time.

Recovery

Cats should be recovered in areas that do not have hazards in them such as pools of water, not even shallow drinking bowls. Cats should be directly observed throughout recovery until they can maintain sternal recumbency. A routine immobilization which is one hour or less in duration and not reversed usually requires 1-3 hours for the animals to recover sufficiently to be able to maintain sternal recumbency. Normal coordination and behavior has usually fully returned within 24 hours. If yohimbine is used to reverse the xylazine then cats are usually in sternal recumbency within 15 minutes. However, these cats are often severely ataxic and may hallucinate due to residual ketamine in their systems. Reversed animals have a slightly higher probability of injuring themselves during recovery.

Routine whole blood sample tests

White blood cell count	Lymphocyte - absolute and %
Red blood cell count	Monocytes - absolute and %
Hemoglobin	Eosinophils - absolute and %
Hematocrit	Basophils - absolute and %
Mean corpuscular volume	Segmented Neutrophils - absolute and %
Platelet count	Band Neutrophils - absolute and %

Routine serum chemistry tests

Total protein	Blood urea nitrogen	Potassium
Albumin	Glucose	Chloride
Cholesterol	BUN/CR	Calcium
Uric acid	Alkaline phosphatase	Phosphorous
Creatinine	Alanine transferase (SGPT)	Total CO ₂
Bilirubin	Sodium	Anion Gap
Calculated osmolality	Lactic dehydrogenase	Triglycerides
Aspartate transferase (SGOT)		

Serum samples should be screened for the following viruses prior to and following all transfers, during all quarantine periods and possibly as part of annual examination programs.

- Feline Immunodeficiency Virus
- Feline Leukemia
- Feline Panleukopenia
- Feline Infectious Peritonitis
- Canine Distemper Virus

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Protokol Imobilisasi dan Pemeriksaan Kesehatan Harimau Sumatra

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Translated by Ligaya Tumbelaka, Taman Safari Indonesia

Protokol ini berlandaskan pada pendekatan kerja tim dalam proses imobilisasi, pemeriksaan dan pelaksanaan prosedur-prosedur lainnya terhadap satwa. Imobilisasi dapat dilaksanakan dengan aman dan efisien apabila mengikuti dasar kerja tim ini. Dalam proses imobilisasi harimau, yang tercakup dalam tim kerja adalah dokter hewan, teknisi dokter hewan dan paling kurang satu orang anggota pengelola hewan. Meskipun pembiusan merupakan tanggung jawab utama dokter hewan, akan tetapi keamanan dan kesuksesan dari pemantauan tanda-tanda vital serta kedalaman pembiusan pada satwa memerlukan juga kerjasama seluruh anggota tim. Keamanan pembiusan juga tergantung pada adanya komunikasi yang terus menerus antara anggota tim terutama dalam pemantauan sistim pernapasan hewan yang terbius.

Pertimbangan Pre-Anastesi

Hewan harus dipuaskan selama 24 jam sebelum pembiusan. Air dapat diberikan sebelum pembiusan, namun tidak boleh diberikan beberapa jam setelah pembiusan untuk menghindari resiko bagian muka terendam air.

Bila temperatur udara ruangan atau saerah sekitar tinggi, atau harimau terlalu aktif, maka perlu dipersiapkan minimal 60 liter air untuk persiapan pendinginan suhu tubuh satwa.

Hewan harus dikandangkan pada kandang kecil yang terpisah dan jauh dari satwa lainnya.

Prosedur Anastesi (p pembiusan)

Pencatatan lengkap mengenai jalannya proses imobilisasi perlu dilakukan selama prosedur berlangsung.

Cara pemberian obat:

Pertama dengan memakai tulup (blow dart)

Kedua dengan menggunakan tongkat penyuntik atau penyuntikan biasa

Sedasi: Siapkan xylazine 0,2 mg/kg dalam satu alat suntik diberikan IM, kemudian ditunggu selama 10 menit. Muntah kemungkinan juga dapat terjadi pada periode ini.

Imobilisasi: siapkan ketamin 0,2 mg/kg dalam 2-3 alat suntik2-3 alat suntik diberikan IM, kondisi anastesi untuk pembedahan dapat dicapai anantara 5-10 menit.

Suplementasi: Ketamin 1,0 mg/kg, IM atau midazolam 0,01 mg/kg diberikan IV secara perlahan, (diazepam 0,01-0,03 mg/kg IV atau IM sebagai alternatif lain dari midazolam). Untuk mengontrol terjadinya kejang hanya menggunakan midazolam atau diazepam.

Membangunkan hewan dari pengaruh anestesi (jika dibutuhkan): Yohimbine 0,05 mg/kg diberikan secara IV atau IM. Pada kasus-kasus darurat benzodiazepene, flumazenil (0,1 mg/kg IV) juga dapat diberikan.

Catatan: Yohimbine menetralkan kerja xylazine, di Omaha penetralkan xylazine tidak selalu dilakukan secara rutin pada setiap proses imobilisasi. Yohimbine hanya digunakan bila terjadi kasus sesak napas atau aritmia jantung atau depresi. Di beberapa institusi penetralkan xylazine dengan yohimbine dilakukan secara rutin walaupun tidak ditemukan kelainan fisiologik.

Kekejangan

Ditemukan pula harimau yang mengalami kekejangan selama 30-60 detik dalam proses imobilisasi. Tanda kekejangan berupa adanya kontraksi otot yang tinggi pada seluruh anggota tubuh, bagian belakang dan kekakuan pada rahang. Umumnya kekejangan tidaklah memberikan akibat yang membahayakan bagi satwa, tetapi sangatlah penting untuk mengontrol kekejangan tersebut sehingga tidak menimbulkan hal yang lebih serius yang berkelanjutan. Kekejangan dapat dikontrol dengan pemberian diazepam (0,01- 0,05 mg/kg IV) atau midazolam (0,01-0,03 mg/kg IV atau IM).

Obat-Obat Dalam Keadaan Darurat

(Sebaiknya disiapkan dalam perangkat peralatan imobilisasi yang telah tersedia)

Doxapram: dipergunakan bila hewan menahan nafas terlalu dalam atau hilangnya nafas. Kemungkinan pemakaiannya cukup tinggi. Pemakaian perlu memperhatikan prosedur yang ada. Dosis antara 0,2-0,5 mg/Kg IV atau IM.

Yohimbine: digunakan pada saat sistem pernapasan tertekan atau terhenti, aritmia jantung atau gagal jantung. Kemungkinan pemakaian sedang-sedang saja. Dosis yang digunakan 0,05 mg/Kg IV atau IM. Harimau akan kembali sadar dalam 2-10 menit.

Epinephrine: pada kasus gagal jantung. Kemungkinan penggunaan rendah. Penggunaan obat ini berarti menghentikan prosedur kerja yang dilakukan. Dosis yang dipergunakan adalah 0,5-1,0 ml larutan 1:1000, diberikan intra cardial.

Prednisolone: digunakan bila hewan pingsan --- kemungkinan pemakaian rendah. Penggunaan obat ini berarti mengakhiri prosedur kerja yang dilakukan. Dosis yang dipergunakan adalah 10 mg/kg diberikan IV.

Dexamethasone: bila terjadi "collapse" sistem peredaran darah. Kemungkinan pemakaian rendah. Penggunaan obat ini berarti mengakhiri prosedur kerja yang dilakukan. Dosis yang dipergunakan 1 mg/kg IV.

Peralatan Darurat

(Selalu tersedia dan bila diperlukan dapat cepat ditemui di lokasi imobilisasi)

Selang endotrakial (*endotrachial tube*) dengan ujung yang dapat mengembang berukuran 14, 16, 18 mm untuk harimau dewasa.

Kantung Ambu dihubungkan dengan selang endotrakial untuk menyalurkan udara

Selang perut (*stomach tube*) dan corong digunakan untuk enema dengan air dingin pada kasus hipertermic sebagai

Pemeriksaan kesehatan

(Diperkirakan waktu pemeriksaan selama 5-10 menit)

1. Dimulai sejak awal masuknya obat yang pertama, terus menerus jumlah pernapasan permenit (*respiration rate*) dan kedalaman nafas dimonitor. Normalnya sebanyak 8-24 kali permenit. Seseorang harus bertanggung jawab untuk mengawasi sistim pernafasan tersebut selama prosedur berlangsung.
2. Penentuan kedalaman anestesi dapat diketahui melalui reaksi kepala bila disentuh dengan tongkat penyuntik (*pole syringe*) atau tongkat biasa.

Berikutnya kedalaman anestesi dapat dievaluasi melalui respon tubuh, kaki, kornea, telinga dan respon lidah terhadap rangsangan. Tanda anestesi yang baik pada harimau adalah bila rate pernapasan sebanyak 8 - 24 napas/menit, detak jantung 60 - 120 kali / menit. Rahang mudah dibuka dan bila lidah ditarik keluar akan sedikit memberikan perlawanan atau tidak sama sekali.

3. Menunjuk seseorang yang memiliki pengalaman dalam mengontrol kepala harimau selama proses imobilisasi berlangsung. Orang ini juga bertugas untuk memonitor pernafasan harimau tersebut.
4. Auskultasi jantung (yang normal adalah 60-120 kali setiap menitnya) dan ritme jantung, auskultasi suara paru-paru.
5. Pemeriksaan rongga mulut - warna mukosa membram, kondisi dari pharynx, gingiva dan gigi
6. Temperatur tubuh melalui rectum - Normalnya adalah 100°F ($40,8 - 42,0$) $^{\circ}\text{C}$, setiap 5 menit temperatur tubuh harus diperiksa dan harus berada pada kisaran 102°F ($42,0 - 43,2$) $^{\circ}\text{C}$. *Bila temperatur tubuh lebih dari 104°F ($43,2$) $^{\circ}\text{C}$ harus segera dilakukan enema dingin..*
7. Pemeriksaan luar meliputi: rambut, kulit, kuku (setiap jari kuku), telapak kaki
8. Palpasi - daerah retropharynx, limfonodula prescapularis, abdomen dan daerah testis, serta pemeriksaan penis.
9. Pemeriksaan mata- diikuti dengan pemberian salep mata antibiotika untuk tetap menjaga kelembaban mata
10. Pemeriksaan telinga

Pengumpulan Contoh Spesimen (3-10 menit)

1. Darah: 30-60 ml darah diambil dari bagian medial paha dari vena safena, pengambilan darah bisa juga dari vena sefalika, ekor atau vena jugularis. Pengambilan darah menggunakan alat suntik berukuran 60 ml dengan jarum berukuran 18 Gauge 1 1/2". Contoh darah yang disimpan dalam tabung EDTA untuk penghitungan gambaran dan benda darah (hematologi). Sisanya dimasukan kedalam tabung tanpa antikoagulan untuk mendapatkan serum dan atau tabung berisi heparin bila diperlukan.
 2. Biopsi jaringan (analisa genetika) - biopsi kulit selebar 6 mm diambil dari bagian paha dalam yang telah dibersihkan dengan prosedur pembedahan, Bagian kulit yang terbuka akibat pengambilan biopsi perlu ditutup kembali dengan penjahitan. Berikan obat anti serangga
 3. Contoh feces, jika memungkinkan harus diambil langsung dari rektum
 4. Preparat ulas telinga --- bila diperlukan dalam pemeriksaan.
 5. Bila diperlukan dalam pemeriksaan dan jika kultur dan pemeriksaan histologi dimungkinkan maka aspirasi abses atau massa jaringan lainnya dapat dilakukan
 6. Pengkoleksian semen--- dengan metoda elektroejakulator
- Umumnya prosedur elektroejakulator untuk harimau dilakukan melalui rangkaian rangsangan:

10 kali rangsangan dengan tegangan 2 volt
10 kali rangsangan dengan tegangan 3 volt
10 kali rangsangan dengan tegangan 4 volt

Istirahat untuk sekitar 5 menit

10 kali rangsangan dengan tegangan 2 volt
10 kali rangsangan dengan tegangan 3 volt
10 kali rangsangan dengan tegangan 4 volt

Istirahat untuk sekitar 5 menit

10 kali rangsangan dengan tegangan 4 volt
10 kali rangsangan dengan tegangan 5 volt

Prosedur Kerja (10 - 15 menit)

1. Pembersihan gigi jika memungkinkan.
2. Pemotongan dan pengikiran kuku kaki yang rusak jika memungkinkan.
3. Mengecek ulang: tato, transponder, identifikasi lainnya.
 - a. Pemberian nomer studbook pada paha kiri bagian dalam, kiri bersifat sementara, sedangkan paha bagian dalam kanan untuk selamanya.
 - b. Transponder Trovan yang diletakkan pada interscapula atau pada dasar telinga kiri.

Prosedur Identifikasi

Tato: tato permanen baik untuk nomer studbook sementara atau permanent harus diletakkan pada paha bagian dalam. Jika nomer studbook bersifat sementara diletakkan pada paha kiri

bagian dalam, dan bila bersifat permanen diletakkan pada paha kanan bagian dalam. Lokasi tato harus dibersihkan terlebih dahulu dari rambut dan dibersihkan sesuai dengan prosedur pembersihan untuk pembedahan.

Transponder : Sistem identifikasi transponder “Trovan” harus diletakkan pada interskapula pada lokasi yang dipersiapkan secara pembedahan. Transponder jenis lainnya dapat juga digunakan.

Pengobatan

Setiap harimau harus diberikan injeksi antibiotika dosis tunggal. Tidak ada rencana pengobatan selanjutnya. Pemilihan antibiotika yang diberikan tergantung pada keinginan dokter hewan berwenang. Pilihan-pilihan yang diberikan meliputi:

Tribrissen -Trimethoprim sulfa - 20 mg/kg

Naxcel-cephalosporin- 0.5 mg/kg (biasanya dianjurkan disimpan dalam kulkas)

Amikacin-aminoglycoside-10 mg/kg

Benzathine pennicilin - 20.000 IU/kg (biasanya dianjurkan disimpan dalam kulkas)

Vaksinasi

Vaksinasi rutin tahunan dengan menggunakan vaksin inaktif (mati) untuk rabies, feline rhinotracheitis, calicivirus dan panleukopenia dapat diberikan pada saat ini.

Penyadaran

Harimau harus sadar dan bangun pada tempat yang tidak membahayakan seperti menghindari pemberian air pada tempat minumannya. Harimaupun harus secara langsung mudah diamati sampai sadar dan kembali bangun secara perlahan-lahan kekeadaan semula. Imobilisasi rutin pada seekor harimau yang berlangsung 1 jam atau kurang, biasanya memerlukan 1-3 jam untuk kembali kedalam keadaan normalnya. Keadaan dan tingkah laku normal harimau biasanya kembali setelah 24 jam. Jika Yohimbine yang digunakan untuk menetralsir xylazine maka dalam 15 menit harimau akan kembali kekeadaan normal. Namun, biasanya harimau ini masih memperlihatkan tanda tanda kejang atau gejala halusinasi disebabkan oleh residu ketamin dalam sistem tubuh mereka.

Tes darah yang rutin dilakukan

Penghitungan sel darah putih
Penghitungan sel darah merah
Hemoglobin
Hematrokit
Volume rata-rata corpuscular
Benda darah

Lymposit - absolut dan %
Monosit - absolut dan %
Eosinophil - absolut dan %
Band neutrofil – absolut dan %
Basofil - absolut dan %
Segmennetrofil - absolut dan %

Pemeriksaan kimiawi darah rutin yang dilakukan

Total protein	Phosphor	Natrium
Albumin	CO ₂ total	Kalium
Kolesterol	Osmolaritas	Klorida
Asam urat	Anion gap	Kalsium
Kreatinin	Lactik Dehidrogenase	Glukosa
Nitrogen urea darah(BUN)	BUN/CR	Trigliserida
Asparate tranferas (SGOT)	SGPT	

Contoh serum harus diskriming untuk mengetahui virus-virus yang tercantum dibawah ini sebelum dan sesudah pemindahan, selama masa karantina dan merupakan bagian program pemeriksaan tahunan.

Feline Immunodeficiency Virus
Feline Leukemia
Feline Panleukopenia
Feline Infectious Peritonitis
Canine Distemper virus

Untuk mengetahui informasi lebih lanjut atau berdiskusi dapat dihubungi:

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Husbandry and Management Report

Gerald Brady, Potter Park Zoo and Ronald Tilson, Minnesota Zoo

Overview of PKBSI Zoos

In February 1994 the seven zoos on Java were visited by the AZA "Sumatran Tiger Project Team." All zoos were inspected and data collected. In January/February 1995, the "Tiger Project Team" revisited a few of the zoos on Java, which included Taman Safari Indonesia, Gembira Loka, Satwa Taru Surakarta, and Kebun Binatang Surabaya. The project team also had the opportunity to visit two zoos in Sumatra: Medan and Jambi.

Java

Taman Safari Indonesia, Cisarua-Bogor
Kebun Binatang Ragunan, Jakarta
Kebun Binatang Bandung, Bandung
Gembira Loka, Yogyakarta
Satwa Taru Surakarta, Solo
Tinjomoyo Semarang, Semarang
Kebun Binatang Surabaya, Surabaya

Sumatra

Griya Satwa Mulya, Medan
Kebun Binatang Jambi, Jambi
Kebun Binatang Bukittinggi, Bukittinggi

Taman Safari Indonesia, Cisarua-Bogor

Taman Safari Indonesia is a drive-through safari park located 75 km southeast of Jakarta. Taman Safari maintains 130 species from five continents.

Kebun Binatang Ragunan, Jakarta

KB Ragunan is located on the south side of Jakarta, a city of over 10 million people and capital of Indonesia. This 185-hectare city zoo maintains 3600 specimens and charges 1500 Rp admission.

Kebun Binatang Bandung, Bandung

KB Bandung opened in 1933. This 14-hectare zoo is located in Bandung, a city of over 5.5 million people southeast of Jakarta. The zoo has 1,155 specimens of 223 species and charges 1000 Rp admission.

Gembira Loka, Yogyakarta

Gembira Loka first started in 1953 and is managed by a private foundation. The foundation board consists of 16 people. A new hospital and quarantine facility was built in 1993.

Satwa Taru Surakarta, Solo

Satwa Taru Surakarta was opened in 1878 by the Dutch. In 1980 the zoo became a municipal city facility comprised of 15 hectares. Solo has a population of around 80,000 people. The zoo's annual attendance is approximately 50,000 persons per year. The admission charge is 750 Rp/person, and on special days, 1000 Rp/person. The zoo has 110 zoo employees with 30 keepers and two veterinarians. There are about 160 animals representing 53 different species.

Tinjomoyo Semarang, Semarang

Tinjomoyo Semarang, a municipal city facility, started construction in 1985 and opened in 1987 on 20 hectares of land. Semarang has approximately 1.2 million people with 1.7 million people in the greater Semarang area. Annual attendance is approximately 60,000 visitors per year with an admission fee of 500 Rp per visitor. The zoo has 90 employees, with 24 being in the animal department. The zoo consists of around 42 animals with 60 different species. The budget is derived from the city government.

Kebun Binatang Surabaya, Surabaya

KB Surabaya opened in 1916 on land that was originally owned by the railroad. The zoo presently sits on 16 hectares of land in the heart of Surabaya. The population of Surabaya is approximately 2.7 million people with 5-7 million people in the surrounding area. There are approximately 30 million people in East Java. The zoo is open every day and averages over 2 million visitors a year, charging 1000 Rp per visitor. Almost the entire budget is derived from revenues received at the admission gate. The zoo has approximately 200 employees with 65 employees in the animal department.

Griya Satwa Mulya, Medan

Griya Satwa Mulya was constructed and first opened in 1972 and has approximately 300,000 annual visitors. The population of Medan is about 1.8 million people. The zoo is open every day and admission costs vary from 500-1500 Rp/adult and 250-750 Rp/child (holidays are the higher rate). The zoo is owned and operated by the city of Medan within the parks and recreation department. The zoo is managed by the Zoo Director and has a staff of 48 personnel. The animal health department is made up of three veterinarians.

Kebun Binatang Jambi, Jambi

KB Jambi first opened in 1973. The estimated annual attendance currently is over 100,000 visitors per year. The population of Jambi is approximately 1 million people with about 5 million people living in the province of Jambi. The zoo is owned and operated by the government of Jambi. Admission to the zoo is 1000 Rp/adult and 500 Rp/child. The zoo is open every day of the year. The staff consists of 10 personnel and is managed by a Zoo Director/Veterinarian. The animal health department is made of the zoo veterinarian and a consultant veterinarian.

Evaluation of Tiger Husbandry and Management

During the visit to each zoo the Tiger Project Team had the opportunity to interview zoo personnel, evaluate diets, and review tiger husbandry practices. All nine zoos went through a comprehensive process evaluating tiger husbandry and management, tiger facilities, tiger nutrition, and tiger quarantine (see Tables 1-4). After analyzing all of the data collected, there are several areas in which zoos on Java and Sumatra can improve their tiger practices. These analyses and resulting recommendations follow.

Tiger Facilities Analysis

A good tiger facility consists of an adequate exhibit area, holding area, quarantine area, maternity den, exercise yard, furnishings, sleeping boards, and many other dimensions. Each zoo must look at their own tiger facility, evaluate each exhibit and then make changes or build new facilities to accommodate the tigers that they have in their charge. Table 3 is an ideal

checklist for each zoo to incorporate into their facility. Although many of the zoos can boast that they scored positively (Y) in several categories in Table 3, the quality of each topic is of prime importance. The quality of drinking water, drainage, cleanliness, lighting, furnishings, sleeping areas, holding and overall exhibit is directly related to the health of each tiger and the value of your program.

Tiger Husbandry and Management Analysis

All zoos need to incorporate daily routines, including keeping accurate records. Documentation of animals acquired from the wild, other zoos and facilities, vital statistics, sire and dam reports, and daily reports are vital to the operation of every zoo. A trained record curator is of extreme importance. Pest control is also significant in the management of a good tiger program. This involves controlling insects, rodents, and small carnivores in exhibits and holding areas so tigers can live in a healthy environment. Additionally, there will be zoos that have to hand-rear newborn cubs. Each zoo should develop a policy on hand-rearing tigers and have everything in place to deal with the situation if it occurs (see hand-rearing section in tiger husbandry manual). The quality of cleaning exhibits and holding areas in Java and Sumatra varies from zoo to zoo. It is essential that exhibits and holding areas are cleaned daily. All cement areas must be washed with water and a cleaner, then rinsed. This is very important. "Natural" exhibits should be "spot cleaned" on a daily basis if possible.

Tiger Nutrition and Feeding Practices

The diet that a tiger receives is very important. Every diet should include meat, bones, and proper ingredients to maintain the tiger's well being. Essential ingredients should include vitamins and minerals needed for proper development and long-term health. Each zoo should evaluate their diet and make improvements where needed. A diet of just red kangaroo meat is not healthy and can cause serious medical health problems.

Additionally, the amount that a tiger gets daily is of importance. Tigers should be fed 5-6 times a week, and the times they are not fed (fasting) they should receive large bones to chew on. Tigers should be separated when fed, as serious fights can take place. Feed must be delivered to exhibits in clean containers and put in or on clean surfaces.

All diets should be stored in a freezer if possible. Diets should be thawed out gradually and kept free from pests and rodents. Keepers must wash their hands before and after diet preparation to prevent transmission of disease to themselves and the tigers. Food preparation areas should be free of pests and kept clean. A variety of feed products is ideal. The quality of these products is very important.

Water is of great importance for a variety of reasons. It is used for cleaning, bathing, and drinking. The quality, like the tiger feed, is again important. Clean water should be offered daily and holding containers cleaned frequently as well as tiger bathing areas.

The acquisition of feed for your tigers is extremely important. A lot of zoos obtain chicken and beef directly from their market on a daily basis and it is given to the tigers fresh. This is okay as long as the meat is kept clear of flies and pests and given to the tigers on a clean substrate or put into a food container (cement). Other zoos are acquiring meat and storing the meat in freezer. This is quite ideal. Frozen meat should be thawed out (free from pests) and given fresh with vitamin/mineral supplements if possible (i.e., visorbat).

All the zoos in Java and Sumatra, if possible, should have their diet (beef, chicken, kangaroo meat) chemically analyzed by the University or a commercial laboratory to evaluate the percentages of fat, protein, fiber, minerals, vitamins, and other elements. This is of great concern to insure that the tigers are getting the essential nutrition needed to maintain their health. The nutritional analysis of one of the commonly used diets for tigers in North America is attached for comparison. Consideration should be given to provide large bones at least once per week to help dental hygiene.

Tiger Quarantine

Every zoo should have a quarantine area for tigers. This is extremely important in the event that a tiger needs medical attention and needs to be isolated from the other tigers that he or she normally lives with. Each zoo should also quarantine new tigers when they arrive. These tigers should be isolated from tigers already at the zoo and should be kept away from other felines.

Exams should be performed by the zoo's veterinarian when new tigers arrive and when they are transferred to the tiger exhibit. Annual physicals are of great importance and should include vaccinations, an evaluation of the mouth, gums, teeth, and ears, and blood work if needed. Fecal exams should be done routinely, at least twice a year.

Table 1. *Quality of husbandry practices and facilities.*

	Taman Safari	KB Ragunan	KB Bandung	Gembira Loka	Satwa Taru Surakarta	Tinjomoyo Semarang	KB Surabaya	Griya Satwa Mulya	KB Jamb
Overall Exhibit	Good	Fair	Poor	Fair	Poor	Poor	Good	Fair	Good
Daily Cleaning	Good	Good	Fair	Poor	Poor	Poor	Good	Good	Good

Table 2. *Overview of tiger husbandry and management practices at PKBSI zoos.*

	Taman Safari	KB Ragunan	KB Bandung	Gembira Loka	Satwa Taru Surakarta	Tinjomoyo Semarang	KB Surabaya	Griya Satwa Mulya	KB Jambi
Daily routine	Y	Y*	Y*	Y*	Y*	Y*	Y	Y	Y
Daily reports	Y	Y*	N*	Y*	Y*	N	Y	N	N
Animal records	Y	Y	Y	Y	Y	N	Y	N	N
Computer	Y	N	N	Y	Y	N	Y	N	N
ISIS	Y	N	N	N	N	N	N	N	N
Training	Y	Y	Y*	Y	N	Y*	Y*	N	N
Keeper/animal interaction	Y	Y	Y	Y	Y	Y	Y	Y	Y
Shifting -- visual check	Y	Y	Y/N	Y	Y	Y	Y	Y	Y
Shifting -- safety	Y	Y*	N	Y/N	N	Y	Y	Y	Y
Pest control	Y	Y	Y/N	N	N	N	N	N	N
Organizational chart	Y	Y	Y	Y	N	Y	Y	Y	Y
Breeding management	N	N	N	N	N	N	N	N	N
Research	Y	Y*	N	N	Y	Y	Y	N	N
Rearing of cubs	H,M	H,M	M	M	H,M	none	H,M	none	none

H = hand reared; M = mother reared

Table 3. Overview of PKBSI tiger facilities.

	Taman Safari	KB Ragunan	KB Bandung	Gembira Loka	Satwa Taru Surakarta	KB Semarang	KB Surabaya	Griya Satwa Mulya	KB Jambi
Outdoor exhibit	Y	Y	Y	Y	Y	Y	Y	Y	Y
Holding	Y	Y	Y	Y	Y	Y	Y	Y	Y
Exercise yd	Y	Y	N	N	N	Y	Y	N	Y
Maternity den	Y	N	N	Y/N	N	Y	Y	N	Y/N
Design suitability	Y	Y/N*	N	Y/N	N	Y	Y	N	Y
Carrying capacity	15	10	2	9	2	2	8	2	5
Furnishings	Y	Y	Y	N	N	Y	Y	Y	Y
Sleeping boards	Y	Y/N	Y	N	N	Y	Y	N	Y
Enrichment	Y	Y	Y	N	N	N	Y	N	Y
Ventilation	Y	Y	Y/N	Y	Y	Y	Y	Y	Y
Lighting	Y	Y/N	N	N	N	N	Y	N	Y
Vegetation	Y/N	Y	N	N	N	N	Y	N	Y
Drainage	Y	Y/N	Y	Y	N	Y	Y	Y	Y
Water	Y	Y	Y	Y	Y	Y	Y	Y	Y
Shade	Y	Y	Y	Y	Y	Y	Y	Y	Y
Public safety	Y	Y	N	Y	Y	Y	Y	Y	Y
Graphics	Y	Y	Y	Y/N	N	N	Y	Y	Y
Security	Y	Y	Y*	Y	Y	Y	Y	Y	Y
Key access	K	K,C	K,C	K	K,D	K	K,C	K	K
Squeeze cage	Y	Y	N	N	N	Y	Y	N	N
Crate handling	Y	Y	N	N	N	Y	Y	N	N
Equipment	Y	Y	Y	Y/N	N	Y	Y	N	Y
Mechanical services	Y	Y/N	N	N	N	N	Y	N	Y
Commun. board	Y	Y	N	N	N	N	Y	N	N
Keeper sleeping area	Y	Y	N	N	Y	Y	N	N	N

Y = yes; N = no; K = keeper; C = curator; D = director

Table 4. Overview of tiger nutrition.

	Taman Safari	KB Ragunan	KB Bandung	Gembira Loka	Satwa Taru Surakarta	Tinjomoyo Semarang	KB Surabaya	Griya Satwa Mulya	KB Jambi
Diet	K	K,C,B	K,C*	K,C,B	C	B	K,C,B	B,C	B,Bu,C
Ration	4-8	4-5	6*	3-6	4-6	5	6	4	7
Schedule	1x/PM	1x/PM	alt. days	1x/PM	1x/PM	alt. days	alt. days	1x/day	6x/wk
Fasting	N	1/wk	Y	1/wk	N	Y	Y	N	Y
Bones	Y	N	1-2/wk	Y/N*	N	N	Y	N	N
Animals separated	Y	Y	Y	Y	Y	Y	Y	Y	Y
Storage	Y	Y	Y	Y	N	N	Y	N	N
Preparation area	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hygiene	Y	Y	Y	Y	Y	Y	Y	Y	Y
Quality	Y	Y	Y	Y	Y	Y	Y	Y	Y
Variability	N	Y	Y	Y	N	N	Y	Y	Y
Liver	N	Y*	N	Y	N	N	Y*	N	N
Water quality	Y	Y*	Y	Y	Y	Y	Y	Y	Y
Additives	Y	Y*	N	Y*	Y/N*	N	Y	N	Y

K = kangaroo; C = chicken; B = beef; Bu = buffalo

Table 5. Overview of tiger quarantine.

	Taman Safari	KB Ragunan	KB Bandung	Gembira Loka	Satwa Taru Surakarta	Tinjomoyo Semarang	KB Surabaya	Griya Satwa Mulya	KB Jambi
Locality	Y	Y	Y	Y	N	Y	Y	N	N
Length	2-4	2-4	2-4	1-4	N	2	4-12	N	N
Exams	Y	Y*	Y*	N	N	N	Y	N	N
Parasites	Y	Y	Y*	Y	Y	Y	Y	Y	Y
Vaccination	N	Y/N	N	N	N	N	N	N	N
Foot baths	Y	N	N	N	N	N	N	N	N

PKBSI Tiger Institutional Space Evaluation

Douglas Richardson, London Zoo

The following notes look at each zoo's potential role within the PKBSI Sumatran tiger program. It is important to realize that some tiger enclosures lend themselves better as a breeding facility while others are more appropriate as holding areas for animals that are not immediately required for the breeding program, though they may still be required in the future. Visits to the various collections took place in 1992, 1994 and 1995.

Ideally each tiger facility should be capable of holding a breeding pair, and contain a suitable separation area for a female to give birth separated from the male as well as holding space for up to three grown cubs from a previous litter. An extra suitably sized holding den for a visiting female or male tiger is also desirable. I have tried to identify what, if anything, each zoo would need to do to bring their tiger facility up to a standard, from the point of view of space, that would allow them to fully realize their role within the program. Some of the individual suggestions may affect other large carnivore species eg sun bears (*Helarctos malayanus*), as space currently allocated to such species is often suitable for tigers and/or located next to the existing tiger facility.

Yogyakarta

This zoo has both large naturalistic and smaller traditional facilities for tigers in different locations within the grounds. All other large carnivores (lions, pumas, etc.) are kept in traditional facilities that are not connected to the two main tiger areas.

The large naturalistic enclosure is a very impressive facility from the exhibition point of view but has a limited number of holding cages. However, due to the traditional cages that currently hold the breeding pair and their three-quarter grown cubs, this zoo is capable of full participation in the breeding program.

Current number of tigers	3.5.0
Recommended carrying capacity for PKBSI breeding	1.1+
Recommended carrying capacity for PKBSI holding	0.0.4

(There are other facilities within the zoo that currently hold single tigers; it is suggested that these are modified and used to house small carnivores.)

Solo

Solo Zoo's tiger facility is of a traditional design with three adjoining, but not interconnected, cages, each with a small built-in shut-off cage. One cage currently houses a leopard (*Panthera pardus*). At present the zoo is not in a position to do more than hold two tigers, but they have a set of excellent plans for a new tiger facility which, with some minor changes, would give them a superb tiger exhibit. The estimated cost of construction is in the region of US \$20,000. It is

suggested that they incorporate the existing tiger cages into the holding area of the proposed new enclosure by building it on the vacant sloping ground behind the current tiger facility.

Current number of tigers	1.1.0
Recommended carrying capacity for PKBSI breeding	0.0.0
Recommended carrying capacity for PKBSI holding	0.0.2

(Incorporation of the existing tiger cages into the proposed new facility might reduce the cost sufficiently to allow for the construction of a new leopard enclosure. If not, then the single leopard would need to be moved to another zoo as there are no appropriate existing enclosures within Solo Zoo.)

Surabaya

Surabaya Zoo has a large natural tiger enclosure and traditional facilities, both of which are very suitable for tigers. Like Yogyakarta, the two types of enclosure are in different parts of the zoo. Due to their range of facilities coupled with their proven track record in breeding the species, they are well placed to participate fully in the breeding program.

Current number of tigers	6.10.0
Recommended carrying capacity for PKBSI breeding	1.1+
Recommended carrying capacity for PKBSI holding	0.0.3

*(It is important that the traditional carnivore house is not overcrowded as this would jeopardize the current Javan leopard (*Panthera pardus melas*) breeding program as well as the new project with clouded leopard (*Neofelis nebulosa nebulosa*). Non-replacement of the single jaguar (*Panthera onca*) and sloth bear (*Melursus ursinus*) would make available additional space within this building. Serious thought should also be given to the number of sun bears that can be housed here as these could compete for space with both tiger and leopard. It is also suggested that the small enclosure currently housing two juvenile tigers would be more appropriately used as housing for a species of small carnivore, for reasons of visitor safety among others.)*

Medan

Medan has a traditional facility with two small holding cages and two exhibit cages; one is fully open to the weather with a grass floor and a small pool. This facility is mirrored by the adjoining area for lions (*Panthera leo*). If the lion area were to be made available for tigers, then Medan could conceivably be in a position to house a breeding pair of tigers with limited additional holding space for surplus individuals.

Current number of tigers	1.1.0
Recommended carrying capacity for PKBSI breeding	0.0.0
Recommended carrying capacity for PKBSI holding	0.0.2

(The existing tiger/lion facility, though adequate for large cats, could be transformed into a superb Javan leopard or clouded leopard facility.)

Jambi

Jambi has a relatively natural tiger exhibit with semi-traditional exhibition cages attached which also house sun bears. For Jambi to play a more complete role within the program, it may be necessary for them to consider modifying an existing enclosure (currently housing a mixture of three reptile species) for their sun bears and devoting all the space presently housing tigers and sun bears to tigers.

Current number of tigers	1.1.0
Recommended carrying capacity for PKBSI breeding	0.0.0
Recommended carrying capacity for PKBSI holding	0.0.2

Taman Safari Indonesia

TSI has extensive holding areas, large natural enclosures and the Sumatran Tiger Captive Breeding Facility; it has also successfully bred the species in the past. It therefore plays a pivotal role within the program as it can hold a large number of tigers as well as accommodate any problem animals that may be captured in Sumatra.

Current number of tigers	9.7.0
Recommended carrying capacity for PKBSI breeding	3.3+
Recommended carrying capacity for PKBSI holding	0.0.15

Bandung

Due to the limited facilities currently available, it is probably most appropriate for Bandung to act as a holding area for one or two tigers. Alternatively, they could consider adapting the facility for a smaller species of carnivore, particularly as they currently have no tigers following the death of their single female.

Current number of tigers	0.0.0
Recommended carrying capacity for PKBSI breeding	0.0.0
Recommended carrying capacity for PKBSI holding	0.0.1 (0.0.2)

Ragunan

Ragunan has a large natural tiger facility with attached night dens and a number of large off-exhibit holding cages. They are therefore well placed to contribute fully to the program.

Current number of tigers	5.2.0
Recommended carrying capacity for PKBSI breeding	1.1+
Recommended carrying capacity for PKBSI holding	0.0.5

Semarang

Due to the limited traditional facilities currently available, it would be appropriate at the present time for Semarang to act as a holding facility. If they were to hold a breeding pair, cubs would need to be moved elsewhere very quickly.

Current number of tigers	1.1.0
Recommended carrying capacity for PKBSI breeding	0.0.0
Recommended carrying capacity for PKBSI holding	0.0.2

Bukittinggi

When visited in 1992, Bukittinggi Zoo was finishing construction of a large tiger enclosure with two to three small holding cages at the rear. Were they to hold a breeding pair, they might have problems in housing the grown cubs, though the old sun bear enclosure opposite the small cat cages could possibly be refurbished for this purpose.

Current number of tigers	0.0.1
Recommended carrying capacity for PKBSI breeding	1.1+
Recommended carrying capacity for PKBSI holding	???

The carrying capacity section of Peter Christie's February 1994 report on the Indonesian Tiger Masterplan Workshop has been used alongside our observations in the compilation of this document.

Summary of Recommendations for Tiger Holdings

Location	Current number of tigers	Recommended capacity for PKBSI breeding	Recommended capacity for PKBSI holding
Yogyakarta	3.5.0	1.1+	0.0.4
Solo	1.1.0	0.0.0	0.0.2
Surabaya	6.10.0	1.1+	0.0.3
Medan	1.1.0	0.0.0	0.0.2
Jambi	1.1.0	0.0.0	0.0.2
TSI	9.7.0	3.3+	0.0.15
Bandung	0.0.0	0.0.0	0.0.1 (or 2)
Ragunan	8.2.0	1.1+	0.0.5
Semarang	1.1.0	0.0.0	0.0.2
Bukittinggi	0.0.1	1.1+	0.0.2

Reproduction and Genome Resource Bank Report

Onnie Byers, IUCN/SSC Conservation Breeding Specialist Group

The PKBSI Sumatran Tiger Genome Resource Bank (GRB) Tigers was established and officially endorsed at the 1994 Sumatran Tiger Masterplan meeting held at Taman Safari Indonesia. At that time it was recognized that a PKBSI Sumatran Tiger Genome Resource Bank could be used as insurance against the loss of more genetic variation from the population, and, in the future, with the use of assisted reproduction techniques such as artificial insemination, gene diversity could be spread more effectively and efficiently among captive and wild tiger populations by transferring germ plasm (frozen sperm) rather than living animals.

That PKBSI Sumatran Tiger GRB has become a reality. It is currently located at Taman Safari Indonesia (TSI) and is coordinated by Jansen Manansang (TSI) and Atje Dimjati Salfifi (KB Ragunan), with reproductive consultation by Ligaya Tumbelaka (TSI). These individuals deserve a lot of credit for coordinating and maintaining the valuable Sumatran tiger samples already in the GRB. Additional tiger samples collected these past two weeks (30 January - 8 February 1995) represent the continued development of the PKBSI Sumatran Tiger GRB toward a goal of representing the wild population.

One of the objectives of this year's Sumatran tiger project was to collect and freeze semen from any genetically valuable Sumatran tigers in captivity that were not collect in 1994, and if possible, to collect a second sample from any founders already stored in the GRB. Of the 15 animals immobilized, 6 males at 4 zoos were electroejaculated and semen collected. The semen samples were analyzed using standard reproductive methodology, diluted with cryoprotectant medium and frozen in pellets on dry ice. These sperm samples were then stored in a liquid nitrogen tank, which in effective is the PKBSI Sumatran Tiger GRB.

In addition, there was a question about the fertility of the Sumatran tiger male at Medan Zoo (studbook number 935). Results of the semen evaluation indicate that this animal is reproductively healthy.

The PKBSI Sumatran Tiger GRB includes not only sperm, but also tissue biopsies, blood serum, plasma, white blood cells (WBCs) and red blood cells (RBCs), that can be used to establish cell lines and produce DNA that is necessary for answering questions about subspecies genetic variation and even offspring parentage. Blood serum will be critical for studying and solving disease problems. This will be particularly important to PHPA in assessing diseases of wild tigers and in developing reintroduction or translocation programs from both wild and captive populations.

During the last two weeks, tissue, hair, and/or blood products were collected from each of the 15 tigers. These samples, along with the sperm pellets, are currently being stored in the PKBSI Sumatran Tiger GRB at Taman Safari Indonesia.

At the 1994 PKBSI Sumatran Tiger Masterplanning Meeting, it was recommended that an official PKBSI Sumatran Tiger Genome Resource Bank be established that would include sperm, tissue, and blood products. This GRB is now established and in order to move toward a formal and functional PKBSI Sumatran Tiger GRB program, the following steps are recommended:

1. It is recommended that a secondary storage site (the primary storage site is currently Taman Safari Indonesia) and contact persons be designated for the PKBSI Sumatran Tiger GRB. The GRB at this site will contain duplicates of samples at TSI. It is critical to have duplicate samples stored at separate facilities to eliminate the risk of a disaster that could destroy the entire GRB collection.
2. We recommend that a minimum of two additional samples be collected and stored from all known wild-caught founders within the next two years. As these tigers are given annual physical examinations, sperm collection and storage in the GRB should be conducted at the same time.
3. It is recommended that sperm, tissue, hair and blood products be collected and stored from every new wild-caught animal as soon as possible after capture. Reports of these collections and their analysis should be given to the appropriate PHPA office.
4. It is recommended that the PKBSI agree to the attached GRB agreement, which simply states "the Indonesian PKBSI and representatives of the IUCN/SSC Conservation Breeding Specialist Group will work together to develop and complete a Genome Resource Banking Action Plan that will contribute to the conservation of Sumatran tigers in Indonesia."

At the 1994 Sumatran Tiger Masterplan meeting draft copies of the IUCN/SSC CBSG *Tiger Genome Resource Bank Action Plan* for North America were distributed. That document has been revised and can be made international by the inclusion of the Indonesian PKBSI Sumatran Tiger Program. This document intends to integrate all regional tiger programs and in its present form would initially link the AZA Tiger SSP program with the PKBSI Sumatran Tiger Program under the CBSG Tiger Global Conservation Strategy (GCS). It would be the first-ever international GRB Action Plan for any species. We anticipate that it would be used as a prototype for the development of GRBs for other species and other regions of the world. The coordination of this program and the production of the GRB document requires cooperation. The North American component of this document is almost complete, and by adding the Indonesian component this year, it will pave the way for incorporating additional tiger range countries into the GRB.

5. It is recommended that in the future, discussion within PKBSI, PHPA and other appropriate Indonesian collaborators takes place regarding issues of ownership, and prioritization of usage, of samples in the PKBSI Sumatran Tiger GRB.