Care of Non-human Primates

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NIOSH *National Institute for Occupational Safety and Health*

The employer shall post a copy of this report for a period of 30 calendar days at or near the workplace(s) of affected employees. The employer shall take steps to insure that the posted determinations are not altered, defaced, or covered by other material during such period. [37 FR 23640, November 7, 1972, as amended at 45 FR 2653, January 14, 1980].

Contents

Highlights of the NIOSH Health Hazard Evaluation

In December 2000, the National Institute for Occupational Safety and Health (NIOSH) received a grant to evaluate zoonotic disease risks among individuals working with non-human primates (NHPs). Four facilities were evaluated: California Regional Primate Research Center at the University of California (Davis, California), University of Louisiana at Lafayette (New Iberia, Louisiana), Southwest Foundation Regional Primate Research Center (San Antonio, Texas), and Tulane Regional Primate Research Center (Covington, Louisiana).

What NIOSH Did

- We surveyed employees who worked with or close to NHPs and/or their waste, body fluids, and tissues.
- We interviewed employees about work practices and procedures.
- We reviewed each facility's policies, procedures, training requirements, and injury and illness logs.
- We interviewed employees responsible for occupational safety and health about policies and programs.
- We looked at animal handling and holding areas.

What NIOSH Found

- Some work tasks were associated with exposure incidents.
- Despite knowing the potential health risks, employees often did not report exposure incidents. Many employees said they did not receive appropriate training on use of respirators.
- Many employees said they did not receive appropriate training on use of bite and scratch kits before working with NHPs.
- Having more than 20 hours per week of contact with a NHP is linked with an increased risk of bites; scratches; needle sticks; and splashes in eyes, mouth, or nose with NHP secretions.

What NHP Managers Can Do

- Focus training on employees who have the most direct contact with NHPs.
- Revise training curriculum to include use of bite and scratch kits and respiratory protection.
- Create a procedure for employees to report exposure incidents.
- Continually review work practices to identify opportunities to prevent exposure incidents.

What NHP Employees Can Do

- Use bite and scratch kits as needed.
- Promptly report exposure incidents to management.

Summary

On December 26, 2000, the Centers for Disease Control and Prevention's (CDC) National Institute for Occupational Safety and Health (NIOSH) received a $25,000 grant from the Elizabeth R. Griffin Research Foundation to evaluate risks for acquiring zoonotic disease among those who work with non-human primates (NHPs) in research settings. NIOSH evaluated worker perceptions, attitudes, and general knowledge about safety and health policies and work practices. We made workplace observations and distributed questionnaires at the California Regional Primate Research Center at the University of California, in Davis, California, the University of Louisiana at Lafayette in New Iberia, Louisiana, the Southwest Foundation Regional Primate Research Center in San Antonio, Texas, and the Tulane Regional Primate Research Center in Covington, Louisiana. The voluntary, confidential questionnaire was offered to all primate center employees who worked with or near NHPs, and/or their waste, body fluids, and tissues. Among the four facilities, 476 questionnaires were completed.

From the questionnaire, we determined that a number of work tasks (e.g., giving injections to NHPs) were associated with certain exposure incidents (being bitten, scratched, stuck with needles, etc.). We also found that although employees were aware that most of these incidents were a potential health risk and warranted reporting, actual reporting of the incident to a supervisor or health clinic did not occur. For example, being scratched or cut by dirty equipment or a NHP were among the most commonly occurring incidents, yet this was one of the incidents most commonly not reported to the supervisor. On a percentage basis, being splashed in the eyes, mouth, or nose with NHP secretions was the type of incident most commonly not reported to the supervisor (28 of 69 incidents not reported, 41%). In terms of total numbers, being scratched by an NHP was the most common incident not reported (39 of 129 incidents not reported). The most common choice addressing why the incident was not reported was "did not think it serious enough to report," chosen by 55 (73%). Though much less frequent, some employees reported they were afraid to report exposure incidents.

Employees were asked to report whether or not they received training on eight specific topics prior to working with NHPs, including infectious disease risk, response and reporting, and safety procedures. While responses were positive to most types of appropriate training (typically greater than 90%), positive

Reporting mechanisms need to be re-established and included in pre-assignment and refresher training because unreported exposure incidents occurred at all four facilities evaluated. A number of work practices were significantly associated with exposure incidents, and some groups of workers experienced significantly more incidents, which warrant focused, repeated training.

responses to training in the proper use of bite and scratch kits and respirator training were much lower (e.g., 19% for bite and scratch kits and 37% for respirator training). Only 77 (66%) of employees at the Tulane facility reported receiving refresher training.

Most groups of employees reported experiencing exposure incidents; however, there was variability in reporting rates among workers in the various job groups. Although all employees should be included in appropriate training/education activities, more specific (and possibly more frequent) training/education activities should be focused on those employees with more direct contact with NHPs (such as caretakers). Recognition (by those responsible for health and safety at the NHP facility) that exposure incidents are occurring requires a reliable mechanism for systematic reporting. Recognition and rapid response to these events is important to ensure all necessary medical actions are taken promptly, and that appropriate measures are instituted to prevent future occurrences.

Keywords: NAICS 541712 (Research and Development in the Physical, Engineering, and Life Sciences), Non-human primate, macaque, biosafety, biomedical laboratory, bite, scratch, needle stick, B virus, zoonotic disease.

Introduction

Following her death after being infected with *Cercopithecine herpesvirus* 1 (B virus) while working with non-human primates, Elizabeth Griffin's family established The Elizabeth R. Griffin Research Foundation, Inc. to promote safe research practices and help fund further research in occupational safety and health, specifically zoonotic diseases, associated with animal work. The Foundation supports research regarding the health risks associated with zoonotic diseases, provides a prevention/treatment/information network for research organizations, provides a support network for those who have contracted or are at risk of contracting zoonotic diseases, and promotes safe and responsible scientific research involving the use of animals. On December 26, 2000, the Centers for Disease Control and Prevention's (CDC) National Institute for Occupational Safety and Health (NIOSH) received a $25,000 grant from the Foundation to conduct research on zoonotic disease among those who work with non-human primates (NHPs). This report provides the results of a survey of four National Institutes of Health-funded NHP facilities.

Background

Hazards associated with NHPs and their tissues include exposure to naturally acquired zoonotic agents (e.g., B virus, tuberculosis, filoviruses) or agents used in biomedical research (e.g., simian immunovirus). Routes of exposure to NHP pathogens include inhalation, mucous membrane contact, bites, scratches, or accidental needle sticks and sharps injuries. Outcomes from exposure can be quite severe and even fatal (i.e., B virus from the macaque species). Injuries (e.g., bites, scratches, other trauma) can occur during work with NHPs. NHPs are considered essential for basic and clinical research and their use is expected to continue. The National Institutes of Health (NIH) currently funds research programs in a network of eight National Primate Research Centers (NPRCs) in the United States. Together the NPRCs have more than 26,000 animals representing more than 20 species of NHPs, mostly macaques. NPRC facilities and resources enable NPRC staff scientists and investigators from the host institution and others across the country, including investigators funded by other federal, state, and local agencies, as well as by research foundations and the private sector, to collaborate on research projects. One retrospective examination of two regional primate centers in the United States found an annual incidence for all injuries combined to range from 43.5 to 65.5 per 100,000 person workdays.[1] The highest incidence observed was for animal-inflicted bites and

BACKGROUND (CONTINUED)

scratches. Having more than 20 hours per week of contact with an NHP was associated with a significantly increased risk of bites, scratches, needle sticks, and mucous membrane exposures. Professions potentially at risk for exposure include veterinarians, animal handlers, zookeepers, laboratorians, student researchers, academicians, government quarantine and import regulators, and Animal Welfare Act regulators. Because of the unique hazards associated with the NHP industry, specific criteria for safety and health and medical surveillance of workers are necessary. Although guidelines and recommendations have been developed, these are often focused on a particular agent (e.g., filovirus) or animal (e.g., macaques). Furthermore, a comprehensive assessment of safe work practices, management policies, and use of risk assessment techniques to evaluate activities involving NHPs in NHP-handling facilities has not been conducted.

METHODS

To determine the most appropriate research path, we consulted NIOSH and other CDC (e.g., National Center for Infectious Disease Division of Quarantine) personnel familiar with NHP safety and health issues. Other organizations (Association of Primate Veterinarians, National Research Council Institute of Laboratory Animal Resources (ILAR)) that are involved in NHP worker safety and health or were recipients of Griffin Foundation funds were contacted to ensure that any efforts by NIOSH would be complementary. A general consensus from these discussions was that research to determine management policies, worker attitudes regarding these policies, and actual work practices as related to the care and use of NHPs would be beneficial to NHP-handling organizations.

Although surveying a cross-section of NHP facilities was desirable, time and resource constraints required prioritizing the number and type of facilities that could be evaluated. Therefore, we limited our evaluation to primate facilities receiving funding from the NIH, because this type of research facility involves the largest group of animal handlers. Among these facilities, we selected those housing the largest number of NHPs at the time of our evaluation. These sites included the California Regional Primate Research Center at the University of California in Davis, California (UC Davis), the University of Louisiana at Lafayette in New Iberia, Louisiana (UL Iberia), the Southwest Foundation Regional Primate Research Center in San Antonio, Texas (SW Foundation), and the Tulane

Regional Primate Research Center in Covington, Louisiana (Tulane). On-site surveys were conducted at these facilities to obtain information on facility policies, actual practices, tasks/exposure events, post-exposure procedures, medical management, training, and safety program management. Data were gathered via interviews, work practice observations, facility inspections, and a review of safety procedures and injury and illness logs. A voluntary, confidential questionnaire was offered to all primate center employees who worked with or close to NHPs and/or their waste, body fluids, and tissues. The survey methods were consistent across all four facilities. Other systematic activities during the site visits included reviewing the facility's standard operating procedures and training requirements, reviewing the selection and use of personal protective equipment and other controls, interviewing personnel who were responsible for occupational safety and health, reviewing medical surveillance activities and policies, inspecting animal handling and holding areas, reviewing infectious waste handling procedures, and reviewing injury and illness logs. Of all the data collected, the questionnaire results provided the most useful insight into areas where improvements were warranted, and are the focus of this report. Questionnaire respondents included supervisors, occupational health and safety staff, animal handling personnel, veterinarians, veterinarian technicians, students, laboratorians, maintenance personnel, and custodial staff. Among the four facilities, 469 questionnaires were completed.

Questionnaire Methodology

A self-administered questionnaire was handed out to all employees at each facility; NIOSH representatives were available to answer questions about the questionnaire. The questionnaire covered job title, job tasks, knowledge concerning safety and health related issues, and exposure incidents that occurred in the 5 years prior to the survey.

The goal of the questionnaire was to assess employees' knowledge concerning health and safety issues related to handling NHPs and to assess exposure incidents that occurred in the 5 years prior to the survey. Analysis of the questionnaire data had two primary endpoints: (1) sufficient employee knowledge of pertinent health and safety factors and issues (assessed by whether employees considered a variety of scenarios such as secretions splashed onto skin, into a cut, etc. as infectious disease exposures or health risks),

METHODS (CONTINUED)

and (2) occurrence of exposure incidents (incidents including bites or scratches by an NHP; needle sticks; scratches with equipment; and splash in the eyes, mouth, or nose with NHP secretions).

Some variables, specifically those concerning knowledge of safety and health issues, were considered in different instances as both independent (related to an exposure or risk factor) and dependent (outcome or endpoint) variables.

The magnitude of the relationships analyzed was assessed by the prevalence ratio (PR); a 95% Confidence Interval (95% CI) that excluded one or a significance level of $p = 0.05$, was considered to indicate a statistically significant finding. The PR represents the prevalence of an outcome (for example, the occurrence of a bite) in a group demonstrating a potential risk factor (for example, performing feeding tasks) relative to the prevalence in the group without that potential risk factor. A PR of 1 means there is no association between the outcome and risk factor. A PR of greater than 1 indicates evidence of an association. For example, a PR of 2 would mean that a person in the group with the risk factor was 2 times more likely to have reported the outcome than a person in the group without the risk factor.

EVALUATION CRITERIA

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for the assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects even though their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy). In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increases the overall

exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: (1) NIOSH recommended exposure limits (RELs),[2] (2) the American Conference of Governmental Industrial Hygienists' (ACGIH®) threshold limit values (TLVs®),[3] and (3) the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) [29 CFR* 1910].[4] Employers are encouraged to follow the OSHA limits, the NIOSH RELs, the ACGIH TLVs, or whichever are the more protective criteria.

OSHA requires an employer to furnish employees a place of employment that is free from recognized hazards that are causing or are likely to cause death or serious physical harm [Occupational Safety and Health Act of 1970, Public Law 91–596, sec. 5(a)(1)]. Thus, employers should understand that not all hazardous chemicals have specific OSHA exposure limits such as PELs and short-term exposure limits (STELs). An employer is still required by OSHA to protect their employees from hazards, even in the absence of a specific OSHA PEL.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8- to 10-hour workday. Some substances have recommended STEL or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from higher exposures over the short-term.

Occupational Safety and Health at Non-Human Primate Institutions

When assessing workplace conditions where environmental evaluation criteria have not been developed or are not applicable, NIOSH field staff may use guidelines and recommendations developed by public health agencies or professional associations, accepted industry practice, or criteria for safe work practices published by standard-setting organizations. In some situations, workplace evaluations and recommendations may be based on state of the art industrial hygiene and occupational medicine concepts, principles, and practices, or by analogy to other industrial settings.

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* *Code of Federal Regulations.* See CFR in references.

Evaluation Criteria (continued)

Evaluation criteria may change over the years as new information on the toxic effects of an agent, efficacy of control systems, or safe work practices becomes available.

Although specific regulatory criteria have not been established, guidelines and recommendations for occupational safety and health programs associated with the care and use of research animals are available from a number of sources. The National Research Council (NRC) has published a report prepared by the Committee on Occupational Safety and Health in Research Animal Facilities, under the auspices of the ILAR.[5] This report provides recommendations for implementing a safety and health program in animal research facilities, includes information about B virus and NHPs, and recommends that personnel working with NHPs wear face shields and other protective garments. The report also recommends identifying and eliminating sharp edges on cages and ancillary equipment. A more recent ILAR publication complements the previous publication and expands on topics particularly relevant to facilities where NHPs are housed or where NHP blood or tissues are used.[6] The report describes the hazards associated with work involving NHPs and discusses the components of a successful occupational safety and health program, including hazard identification, risk assessment, applicable safety regulations, risk management, and personnel training. Topics include techniques for assessing the degree of risk of those hazards, options for managing those risks, including engineering controls, worker training, and personal protective equipment; institutional management of workers after suspected exposures; and examples of safety and health programs in both large and small NHP facilities.

The ILAR book is a reference for vivarium managers, veterinarians, researchers, safety professionals, and any other persons involved in developing or implementing an occupational safety and health program in settings with NHPs. Combined with the prior NRC publication and other guidance,[7] these reports provide the basis for industrywide standards for occupational health and safety in the NHP field.

Criteria for activities involving infectious disease work with experimental animals are described in a joint CDC-NIH publication, *Biosafety in Microbiological and Biomedical Laboratories*.[8] Recommendations in this guide include four combinations of work practices, safety equipment, and facilities that are based

on the hazard presented by the infectious agent under study. The four animal biosafety levels described in this document provide for increasing protections, based on the level assigned. According to the this document, Biosafety Level 2 practices are recommended for tasks entailing the manipulation of tissues, body fluids, or primary tissue culture materials from macaques. More stringent Biosafety Level 3 practices are recommended when the use or manipulation of material known to contain B virus is conducted. Biosafety Level 4 criteria apply to the propagation and manipulation of production quantities of the virus.[8]

Most of the regulatory effort and recommendations regarding laboratory animal research address the care and well-being of the animals and research protocols. Regulatory or research funding agencies (e.g., U.S. Department of Agriculture, NIH), may not include detailed occupational safety and health criteria as part of their oversight activities.

Personal Protective Equipment

Protective clothing and equipment are designed to shield or isolate individuals from the chemical, physical, or biological hazards they may encounter during their work.[9] Personal protective equipment (PPE) is generally considered the last line of defense and is used after every effort to eliminate the hazard through feasible engineering or administrative controls has been implemented. PPE places the burden of protection on the employee, and if the equipment fails, exposure could occur. PPE can be an effective control technique for occupational hazards; however, PPE effectiveness depends on proper use by the wearer.[10] PPE is also appropriate in some situations as a backup in the event of an engineering control failure or for jobs of short duration. Selection of PPE appropriate for a given task should be made from assessments of the worksite hazards, which includes an evaluation of each activity. Hazard assessments require a good understanding of the work tasks, knowledge of the potential routes of exposure, the opportunities for exposure in the task assessed (nature and extent of worker contact), and the potential for adverse health outcomes if exposure were to occur. Accident and incident reports should be reviewed to identify those injuries or exposure incidents (whether or not infection occurred) that could have been prevented by the proper use of PPE. Most approaches for selecting the appropriate PPE incorporate the following process:[10]

- Determining the type of hazard most likely to occur
- Assessing the adverse effects of unprotected exposure
- Identifying other control options that can be used instead of protective clothing
- Determining the performance characteristics needed for protection
- Evaluating the need for decontamination
- Assessing constraints that may hinder the use of PPE (ergonomics, safety, vision, dexterity)

Once it is determined that PPE is required for a task, its use should be mandatory. PPE should be individually assigned whenever possible. Written procedures should be in place to ensure consistent selection and use of PPE. Affected users must be informed of the need for PPE; consequences of not wearing the appropriate PPE; and how to properly inspect, wear, maintain, and store the PPE. Users must also be informed of all limitations associated with the use of PPE and must be aware that the equipment does not eliminate the hazard. Finally, periodic inspections and evaluations of the PPE program should be conducted to ensure that procedures are consistently followed, to identify any process changes that may have occurred, and to confirm that the selected PPE is still appropriate for the given task.

Protective Eyewear

The types of protective eyewear vary widely, and appropriate selection should be based on a number of factors, the most important of which is the nature and extent of the hazard. For example, protection against eye impact hazards generated during chipping, grinding, or masonry work may dictate a specific type of protection. For splash hazards, goggles and face shields should be used. Face shields are considered a secondary protector and are only designed to provide limited protection to the face and front part of the neck.[11] Face shields should always be used with suitable primary eye protection such as safety glasses or goggles. Most protective goggles and eyewear are available with an anti-fog lens option to prevent clouding in humid environments. Lens cleaning supplies and anti-fog materials should be available for employee use. Eye protection must be comfortable, allow for sufficient peripheral vision, and be adjustable to ensure a secure fit.

Evaluation Criteria (continued)

Providing several different types, styles, and sizes may be necessary. Protective eyewear should meet or exceed the criteria established by the American National Standard Institute (ANSI) *Standard Practice for Occupational and Educational Eye and Face Protection (ANSI Z87.1-1989).*[11]

Results

The tables below summarize the results across all four facilities evaluated. All results for the individual facilities can be found in the Appendix).

Description of Respondents

Among the four facilities, 476 employees filled out the questionnaire; 469 employees reported contact with NHPs. This latter group of 469 questionnaires was used in the analysis. The number of employees by job category and by facility is presented in Table 1.

Table 1. Questionnaire Results by Job Category and Facility

Job	UC Davis	UL New Iberia	SW Foundation	Tulane	Overall
Caretaker	28	61	26	7	122 (26%)
Technician	8	12	18	26	64 (14%)
Supervisor	2	10	5	4	21 (5%)
Student	9	9	0	1	19 (4%)
Maintenance	5	20	11	19	55 (12%)
Veterinarian	7	3	3	7	20 (4%)
Guest Researcher	0	1	0	0	1 (0.2%)
Manager	3	1	0	2	6 (1%)
Laboratorian	34	0	4	29	67 (14%)
Visiting Scientist	1	0	0	2	3 (0.6%)
Other	40	21	11	19	91 (19%)
Total	137	138	78	116	469

Employees were asked about their work experience, how long they had been at the facility, whether they physically handled NHPs, and whether the animals were sedated or awake when handled. As shown in Table 2, the median time at their respective facilities was 5.4 years, with UL New Iberia employees reporting the least time (median 3.1 years) and Tulane employees reporting the most (median 9.7 years). Most employees (295, 63%) reported physically handling NHPs (as opposed to cleaning cages, etc.). Of these, 228 (77%) reported handling NHPs while alone, and while the NHPs were awake/alert.

Table 2. Experience/Work Tasks

Facility	Time at facility[1]	Handle NHPs[2]	Handle awake NHPs[3]
UC Davis	3.8	87 (64%)	80 (92%)
UL New Iberia	3.1	95 (69%)	64 (68%)
SW Foundation	5.0	55 (71%)	52 (95%)
Tulane	9.7	58 (50%)	32 (55%)
Overall	5.4	295 (63%)	228 (77%)

[1] Median time (years) employed at the facility
[2] Physically handle NHPs
[3] Of those who handle NHPs, reported physically handling awake/alert NHPs while alone

The most commonly reported tasks included handling tissues/body fluids, handling/holding animals, feeding, giving injections/drawing blood, cleaning cages, and behavior observations. The four most common tasks at each facility and the numbers of employees performing these tasks are shown by facility in Table 3.

Table 3. Four Most Commonly Reported Tasks at Each Facility

Task	Facility			
	UC Davis	UL New Iberia	SW Foundation	Tulane
Handling tissues/fluid	96 (70%)	68 (49%)	—	77 (66%)
Handling/holding animals	60 (44%)	73 (53%)	50 (64%)	41 (35%)
Feeding	58 (42%)	76 (55%)	51 (65%)	36 (31%)
Giving injections/drawing blood	49 (36%)	—	—	42 (36%)
Cleaning cages	—	69 (50%)	45 (58%)	—
Behavior observation	—	—	41 (53%)	—

Employee Knowledge of Health and Safety Risks

The questionnaire asked employees about six potential exposure incidents that can be considered as high risk for infectious disease exposure (NHP secretions on non-intact skin, puncture by a dirty needle, NHP bite breaking the skin, scratch with dirty equipment, NHP secretions in the mouth or nose, and NHP secretions in the eye). Also listed were four incidents (NHP secretions on the skin, puncture by a clean needle, NHP bite not breaking the skin, and scratch with clean equipment) that could represent a deficiency in the safety and health practice of the facility. Skin puncture with a clean needle, while not likely to represent an increased risk of infectious disease transmission, may be an indicator or a procedural problem because the incident may have easily have occurred with a dirty needle. From the list of ten incidents, employees were asked which they would consider an infectious disease exposure or health risk that would need to be reported.

Nearly all employees at the UC Davis and UL New Iberia facilities recognized the six exposure incidents that can be considered as high risk for infectious disease. However, 6%–14% of employees at the Tulane and SW Foundation facilities did not identify these potential incidents as risks needing to be reported (Table 4).

Table 4. Knowledge of Potential Risk, by Type of Incident[1]
All Facilities

Incident	# (%) Reporting incident to be infectious disease risk that would need to be reported				
	UC Davis	Tulane	SW Foundation	UL New Iberia	Overall
NHP secretions on wound	134 (98%)	108 (93%)	68 (86%)	135 (97%)	445 (95%)
NHP secretions in mouth	135 (99%)	105 (91%)	69 (87%)	132 (95%)	441 (94%)
NHP secretions in eye	133 (97%)	104 (90%)	70 (88%)	133 (96%)	440 (93%)
Puncture by dirty needle	134 (98%)	105 (91%)	68 (86%)	133 (96%)	440 (94%)
NHP bite breaking skin	135 (99%)	105 (91%)	72 (91%)	132 (95%)	444 (95%)
Scratch with dirty equipment	132 (96%)	109 (94%)	70 (89%)	132 (95%)	443 (95%)
NHP secretions on intact skin	59 (43%)	73 (63%)	38 (48%)	68 (49%)	238 (51%)
Puncture by clean needle	35 (26%)	32 (28%)	27 (34%)	76 (55%)	170 (36%)
NHP bite not breaking skin	82 (60%)	67 (58%)	40 (51%)	96 (69%)	285 (61%)
Scratch with clean equipment	63 (46%)	52 (45%)	41 (52%)	103 (74%)	259 (55%)

[1] Responses to questions concerning whether participants would consider these types of incidents to be infectious disease exposures or health risks needing to be reported.

Responses to the four incidents that could represent a deficiency in the safety and health practices of the facility are presented in Table 5 by job title. By far, the least recognized hazard was being stuck with a clean needle (only 36% of employees recognized it as a potential hazard). Positive responses to the other three incidents (bite not breaking the skin, scratch with clean equipment, and secretions on intact skin) ranged between 50% and 60%. Veterinarians (39%) and technicians (38%) had the lowest overall positive response rate to the four incidents, while students and maintenance workers had the highest (65%).

Table 5. Knowledge of Potential Risk by Job Title
All Facilities

Job	#	# (%) Reporting incident to be infectious disease risk that would need to be reported				
		Bite[1]	Needle stick[2]	Scratch with clean equipment[3]	Exposure to secretions[4]	Overall
Caretaker	122	69 (57%)	44 (36%)	75 (61%)	59 (48%)	51%
Technician	64	29 (45%)	18 (28%)	23 (36%)	28 (44%)	38%
Supervisor	21	11 (52%)	4 (19%)	12 (57%)	9 (43%)	43%
Student	19	13 (68%)	11 (58%)	14 (74%)	11 (58%)	65%
Maintenance	55	40 (73%)	31 (56%)	39 (71%)	39 (71%)	68%
Veterinarian	20	10 (50%)	7 (35%)	10 (50%)	4 (20%)	39%
Visiting Scientist	3	2 (66%)	1 (33%)	2 (66%)	1 (33%)	50%
Colony Manager	6	5 (83%)	5 (83%)	3 (50%)	1 (17%)	43%
Laboratorian	67	49 (73%)	23 (34%)	28 (42%)	40 (60%)	52%
Other	91	48 (53%)	24 (26%)	51 (56%)	47 (52%)	47%
Total	469	281 (60%)	169 (36%)	257 (55%)	240 (51%)	50%[5]

Positive responses for "Knowledge of potential risk" are indicated by the respondent (469 responding to the question) reporting affirmatively that:
[1] NHP bites that do not break the skin are exposures/health risks that would need to be reported.
[2] Punctures with a clean needle are infectious disease exposures or health risks that would need to be reported.
[3] Scratches or cuts from clean animal equipment are an infectious disease exposure or health risk that would need to be reported.
[4] Exposures to NHP secretions (saliva, blood, urine, feces) splashed onto skin are infectious disease exposures or health risks that would need to be reported.
[5] Weighted average

The possible associations between characteristics of the participant (including frequency of work with NHP, being a supervisor, having received training prior to working with NHP, receiving refresher training) and knowledge about these four incidents as potential risks were assessed. UL New Iberia employees without

training prior to working with NHPs were about twice as likely as those with training not to consider puncture with a clean needle and scratch with clean equipment as health risks that need to be reported (Table 6). Tulane employees without refresher training on infectious disease risks were about twice as likely as those with refresher training not to consider NHP secretions splashed onto skin as an infectious disease exposure or health risk (Table 7). No other associations between training and knowledge of potential risks were statistically significant

Table 6. Relationship between Knowledge of Potential Risk of Puncture by a Clean Needle and Receipt of Refresher Safety and Health Training
University of Louisiana at Lafayette, New Iberia, Louisiana

Training on NHP-related infectious disease risks prior to working with NHP	Puncture with clean needle as a health risk		
	Not considered as a risk	Considered as a risk	Total
Without training	6	3	9
With training	35	81	116
Total	41	84	

Prevalence Ratio = 2.2; 95% Confidence Interval 1.3 – 3.8

Table 7. Relationship between Receipt of NHP-related Infectious Disease Training and Knowledge of Potential Risk of NHP Secretions Splashed onto Skin
Tulane Regional Primate Research Center, Covington, Louisiana

Training on infectious disease risks from NHPs experimentally infected	NHP secretions splashed onto skin as an infectious disease exposure or health risk		
	Not considered as a risk	Considered as a risk	Total
Without training	18	9	27
With training	25	64	89
Total	43	73	

Prevalence Ratio = 2.4; 95% Confidence Interval 1.5 – 3.6

Employee Training

Employees were asked to report whether they received training on eight specific topics before they worked with NHPs. The topics and the number (%) reporting that they had received training are shown in Table 8.

Table 8. Employee Training Prior to Working with NHPs

Training Topic	Facility				
	UC Davis	UL New Iberia	SW Foundation	Tulane	Overall
NHP disease risk	123 (90%)	116 (84%)	62 (80%)	88 (76%)	83%
Risk/experimentally infected	115 (84%)	108 (78%)	61 (78%)	89 (77%)	80%
Task-specific precautions	127 (93%)	113 (82%)	64 (82%)	93 (80%)	85%
Responding to an exposure	125 (91%)	116 (84%)	64 (82%)	83 (72%)	83%
Bite/scratch kit	66 (48%)	23 (17%)	64 (82%)	87 (75%)	51%
Seeking medical care	121 (88%)	103 (75%)	65 (83%)	74 (64%)	77%
Reporting	121 (88%)	114 (83%)	66 (85%)	82 (71%)	82%
Respirator use	48 (35%)	63 (46%)	33 (42%)	31 (27%)	37%
Total	77%	69%	77%	78%	

The UC Davis, SW Foundation, and Tulane facilities were essentially equal in the level of employee training prior to handling NHPs, with an overall training response of 77%–78%. New UL New Iberia facility employees reported the least training, with an overall response of 69%. By far, area with the lowest level of training was respiratory protection (only 37% of employees overall), followed by use of bite and scratch kits (51%). Positive responses to receiving training on the other six topics ranged from 77% (procedures for seeking medical care) to 85% (task-specific precautions). All employees reported having refresher training at the UC Davis, UL New Iberia, and SW Foundation facilities; only 77 (66%) of Tulane employees reported refresher training.

Reported Incidents in 5 Years Prior to the Survey

Employees were asked to report incidents that occurred in the 5 years prior to the survey while working with NHPs. Incidents included being bitten by an NHP; scratched by an NHP; stuck by a non-sterile needle; scratched or cut by dirty equipment; or splashed in the eyes, mouth, or nose with NHP secretions (Table 9). Being scratched or cut by dirty equipment and being scratched by an NHP were the two most commonly reported incidents. On a percentage basis, being splashed in the eyes, mouth, or nose with NHP secretions was the type of incident most commonly not reported to the supervisor (28 of 69 incidents not reported,

41%); in terms of total numbers, being scratched by an NHP was the most common incident not reported (39 of 129 incidents not reported).

Table 9. Reported Incidents Occurring in the 5 Years Prior to the Survey While Working with NHPs

All Facilities

Incident	# (%) employees reporting incident occurring in the last 5 years	Among those reporting incident	
		Median (range) of # times incident occurred	Number (%)[1] reporting that not all incidents reported to supervisor
Bitten by NHP	71 (15%)	1 (1–10)	6 (8%)
Scratched by NHP	129 (26%)	2.5 (1–30)	39 (30%)
Needle stick	73 (16%)	1.3 (1–9)	13 (18%)
Scratched/cut by dirty equipment	135 (29%)	1.75 (1–15)	32 (24%)
Splashed in eyes, mouth, or nose with NHP secretions	69 (15%)	1.6 (1–10)	28 (41%)

[1] Percentage among those experiencing an incident who stated that they had not reported at least one of these incidents to a supervisor.

In a follow-up question, employees were asked to describe why incidents were not reported. Among the 75 persons stating that they had not reported at least one of these five types of incidents, the most common answer was "did not think it serious enough to report," chosen by 55 (73%). Among all 469 respondents, 17 (4%) reported that they were reluctant/afraid to report injuries or exposures to supervisors. When asked to whom would employees report exposures or other incidents, 375 (80%) said they would report first to a supervisor, 71 (15%) said they would report first to the occupational safety and health officer, and 32 (7%) said they would report to some other person (participants could choose more than one response).

Information concerning these five types of incidents is presented by job title in Table 10. Among the jobs with 10 or more employees, technicians experienced the most (percentage) incidents, followed closely by supervisors. The most common type of incident was being scratched or cut with dirty equipment, followed closely by being scratched by an NHP.

**Table 10. Occurrence of Incidents by Job Title
All Facilities**

Job	#	Incident # (%) employees reporting incident occurring in the last 5 years					
		Bitten, resulting in broken skin	Needle stick	Scratched by NHP	Scratched/ cut by dirty equipment	Splashed in eyes, nose, or mouth with NHP secretions	Overall
Caretaker	122	34 (28%)	13 (11%)	43 (35%)	53 (43%)	21 (17%)	27%
Technician	64	13 (20%)	25 (39%)	34 (53%)	23 (36%)	16 (25%)	35%
Supervisor	21	8 (38%)	6 (29%)	10 (48%)	5 (24%)	5 (24%)	33%
Student	19	0 (0%)	1 (5%)	2 (11%)	0 (0%)	0 (0%)	3%
Maintenance	55	0 (0%)	2 (4%)	2 (4%)	19 (35%)	9 (16%)	9%
Veterinarian	20	3 (15%)	9 (45%)	5 (25%)	5 (25%)	3 (15%)	25%
Researcher	1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0%
Visiting Scientist	3	0 (0%)	1 (33%)	0 (0%)	0 (0%)	0 (0%)	0%
Colony Manager	6	0 (0%)	0 (0%)	2 (33%)	1 (17%)	0 (0%)	0%
Laboratorian	67	1 (2%)	4 (6%)	4 (6%)	9 (13%)	3 (5%)	6%
Other	91	4 (4%)	11 (12%)	26 (29%)	20 (22%)	12 (13%)	16%
Total	469	63 (13%)	72 (15%)	128 (27%)	135 (29%)	69 (15%)	20%

Further evaluation of work tasks versus the occurrence of incidents at each facility reveals that at the UC Davis facility:

- Employees reporting daily work with NHPs had a higher prevalence of all five incidents compared to those working with NHPs weekly or less, although the differences were not statistically significant.
- Persons reporting bites in the 5 years prior to the survey had spent more time working with NHPs (median 7.2 years) than those not reporting bites (median 3.3 years; p= 0.048).

Specific work tasks were evaluated as potential exposures or risk factors for these five types of incidents at the UC Davis facility; these analyses are presented in Table 11. All work tasks except handling tissues or fluids were associated with an increased prevalence of at least one of the five incidents. Giving injections was the one work task associated with an increased prevalence of all five incidents. Working with awake/alert NHPs (versus sedated/ anesthetized NHPs) by itself was not associated with an increased prevalence of any of the five incidents.

Table 11. Prevalence Ratios and 95% Confidence Intervals for Associations Between Work Tasks and Incidents California Regional Primate Research Center at the University of California, Davis, California

Task	Incident									
	Bitten by NHP		Scratched by NHP		Stuck by needle		Scratched/ cut by dirty equipment		Splashed in eyes, mouth, nose with secretions	
	PR[1]	95% CI[2]	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Feeding	**6.8**	**2.1–22.4**	**3.7**	**1.9–7.0**	1.0	0.4–2.4	1.4	0.8–2.4	1.9	0.6–5.7
Drawing blood	**4.8**	**2.0–11.3**	**3.6**	**2.1–6.0**	**4.3**	**1.8–10.5**	1.7	1.0–3.0	**4.2**	**1.4–12.5**
Handling NHP	**6.4**	**1.9–21.2**	**3.0**	**1.6–5.6**	**3.1**	**1.1–8.3**	1.1	0.7–2.0	**3.9**	**1.1–13.6**
Handling tissues or fluids	1.5	0.5–4.3	2.2	1.0–4.9	6.8	0.9–49.3	0.8	0.4–1.3	0.9	0.3–2.7
Making behavior observations	1.3	0.5–3.1	**2.7**	**1.6–4.6**	0.9	0.3–2.3	**2.0**	**1.2–3.5**	2.0	0.7–6.0
Cleaning cages	**2.5**	**1.1–6.0**	1.7	1.0–3.0	0.1	0.02–0.9	**2.3**	**1.3–4.0**	1.0	0.3–3.2
Giving injections	**6.3**	**2.2–18.0**	**2.6**	**1.5–4.6**	**3.3**	**1.3–8.4**	**2.2**	**1.3–3.9**	**3.6**	**1.1–11.3**

Bold text represents statistically significant findings

[1] PR = prevalence ratio

[2] CI = 95% Confidence Interval

At the UL New Iberia facility:

- Employees reporting daily work with NHPs had a higher prevalence of all five incidents compared to those working with NHPs weekly or less, although the differences were not statistically significant.
- Persons reporting all incidents (except being scratched/ cut by dirty NHP equipment) in the 5 years prior to the survey had spent more time working with NHPs than those not reporting bites. For example, those reporting bites had worked at the facility a median of 6 years compared to those not reporting bites who had worked a median of 3 years ($p = 0.005$).

Specific work tasks were evaluated at this facility as potential exposures or risk factors for these five types of incidents; these analyses are presented in Table 12. All work tasks were associated with an increased prevalence of at least one of the five incidents. Working with awake/alert NHPs (versus sedated/anesthetized NHPs) by itself was not associated with an increased prevalence of any of the five incidents.

Table 12. Prevalence Ratios and 95% Confidence Intervals for Associations Between Work Tasks and Incidents University of Louisiana at Lafayette, New Iberia, Louisiana

Task	Incident									
	Bitten by NHP		Scratched by NHP		Stuck by needle		Scratched/cut by dirty equipment		Splashed in eyes, mouth, nose with secretions	
	PR[1]	95% CI[2]	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Feeding	2.6	1.0–6.7	1.8	1.0–3.0	0.8	0.4–1.8	**1.9**	**1.2–3.1**	0.9	0.4–2.2
Drawing blood	0.7	0.3–1.8	1.5	0.9–2.4	**3.3**	**1.5–7.2**	0.9	0.5–1.5	**2.6**	**1.1–6.2**
Handling NHP	**5.3**	**1.6–17.3**	**3.7**	**1.8–7.4**	2.4	1.0–6.0	**2.1**	**1.3–3.4**	1.6	0.6–4.2
Handling tissues or fluids	1.4	0.6–3.0	1.3	0.8–2.2	**2.8**	**1.2–6.7**	1.0	0.6–1.5	1.9	0.7–4.8
Making behavior observations	0.9	0.4–2.1	1.7	1.0–2.8	1.8	0.8–3.8	**1.8**	**1.2–2.8**	1.2	0.5–2.9
Cleaning cages	2.5	1.0–6.1	1.7	1.0–3.0	0.7	0.3–1.5	**1.9**	**1.2–3.1**	0.9	0.4–2.2
Giving injections	1.0	0.4–2.4	1.6	1.0–2.8	**3.0**	**1.4–6.5**	0.9	0.5–1.4	**3.0**	**1.2–7.2**

Bold text represents statistically significant findings
[1] PR = prevalence ratio
[2] CI = 95% Confidence Interval

At the SW Foundation facility:

- Employees reporting daily work with NHPs had a statistically significantly higher prevalence of being scratched by an NHP compared to those working with NHPs weekly or less.
- No statistically significant relationships were found between the length of time working with NHPs and the number of incidents reported.

Specific work tasks were evaluated at the SW Foundation facility as potential exposures or risk factors for the five types of incidents on which information was gathered in the questionnaire; these analyses are presented in Table 13. All tasks except handling tissues or fluids were associated with an increased prevalence of at least one of the five incidents. Working with awake/alert NHPs (versus sedated/anesthetized NHPs) by itself was not associated with a statistically significantly increased prevalence of any of the five incidents.

Table 13. Prevalence Ratios and 95% Confidence Intervals for Associations Between Work Tasks and Incidents SW Foundation Regional Primate Research Center in San Antonio, Texas

Task	Incident									
	Bitten by NHP		Scratched by NHP		Stuck by needle		Scratched/ cut by dirty equipment		Splashed in eyes, mouth, nose with secretions	
	PR[1]	95% CI[2]	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Feeding	**6.0**	**1.5–23.8**	**2.4**	**1.1–5.1**	1.4	0.6–3.6	2.5	0.9–6.6	0.8	0.5–1.4
Drawing blood	1.4	0.7–2.7	**2.1**	**1.2–3.6**	**5.7**	**2.1–15.8**	1.4	0.7–2.8	0.9	0.5–1.5
Handling NHP	1.4	0.7–3.0	**2.1**	**1.0–4.2**	**4.6**	**1.1–18.8**	1.5	0.7–3.5	1.0	0.6–1.7
Handling tissues or fluids	1.0	0.5–2.0	1.7	1.0–3.0	2.7	1.0–6.8	1.0	0.5–2.1	0.7	0.4–1.2
Making behavior observations	1.5	0.8–3.1	**1.2**	**0.7–2.0**	0.9	0.4–2.1	0.9	0.5–1.9	1.1	0.6–1.8
Cleaning cages	2.3	1.0–5.1	**1.7**	**0.9–3.0**	1.5	0.6–3.6	**2.6**	**1.1–6.3**	0.9	0.5–1.5
Giving injections	1.3	0.6–2.4	**2.1**	**1.2–3.7**	**6.3**	**2.0–20.0**	1.5	0.7–3.1	0.9	0.5–1.5

Bold text represents statistically significant findings

[1] PR = prevalence ratio

[2] CI = 95% Confidence Interval

At the Tulane facility:

- Employees reporting daily work with NHPs had a statistically significantly higher prevalence of three of the five incidents (NHP bite, NHP scratch, and scratched/cut by dirty NHP equipment) compared to those working with NHPs weekly or less.
- Persons reporting bites in the 5 years prior to the survey had spent more time working with NHPs (median: 15 years) than those not reporting bites (median 7 years; $p < 0.01$).

Specific work tasks were evaluated at the Tulane facility as potential exposures or risk factors for the five types of incidents on which information was gathered in the questionnaire; these analyses are presented in Table 14. All tasks except handling tissues or fluids were associated with an increased prevalence of at least one of the five incidents. Working with awake/alert NHPs (versus sedated/ anesthetized NHPs) by itself was associated with an increased prevalence of being scratched by an NHP (PR 13.8; 95% CI 2.0-97).

Table 14. Prevalence Ratios and 95% Confidence Intervals for Associations Between Work Tasks and Incidents Tulane Regional Primate Research Center, Covington, Louisiana

Task	Incident									
	Bitten by NHP		Scratched by NHP		Stuck by needle		Scratched/ cut by dirty equipment		Splashed in eyes, mouth, nose with secretions	
	PR[1]	95% CI[2]	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Feeding	Undefined	p<0.001	4.8	2.0–1.5	2.2	0.9–5.3	1.9	1.0–3.6	0.7	0.2–3.4
Drawing blood	12.2	1.5–95.5	3.8	1.5–9.2	7.4	2.2–24.6	2.0	1.0–4.0	1.0	0.3–4.1
Handling NHP	3.0	0.8–12.0	3.9	1.6–9.5	4.0	1.5–10.9	2.1	1.1–4.1	1.8	0.5–6.8
Handling tissues or fluids	0.5	0.1–1.9	1.9	0.6–5.2	3.5	0.8–14.6	2.1	0.8–5.1	1.5	0.3–7.0
Making behavior observations	3.0	0.8–11.1	**4.1**	**1.8–9.1**	2.3	0.9–5.6	**2.2**	**1.1–4.2**	1.0	0.2–4.6
Cleaning cages	**8.9**	**1.9–41.7**	**2.7**	**1.2–5.9**	1.3	0.5–3.5	1.6	0.8–3.1	0.4	0.1–3.3
Giving injections	**15.4**	**2.0–120.3**	**3.0**	**1.3–6.9**	**2.8**	**1.1–6.9**	1.9	1.0–3.6	0.7	0.2–3.4

Bold text represents statistically significant findings

[1] PR = prevalence ratio. In cases where the PR is undefined (0 cell), Fisher's exact test was used to determine the p value.

[2]CI = 95% Confidence Interval. In cases where the PR is undefined (0 cell), Fisher's exact test was used to determine the p value.

DISCUSSION & CONCLUSION

We assessed the extent to which workers were educated concerning possible occupational health risks related to various types of exposures, which we termed "knowledge of infectious disease exposure or health risks." In this assessment, we found that in situations that clearly represented potential infectious disease risks (such as NHP bites that break the skin), there was near 100% recognition of the potential for infectious disease exposure at the California Regional Primate Research Center, and the University of Louisiana. SW Foundation Regional Primate Research Center and Tulane Regional Primate Research Center employees reported a lesser degree of recognition of these clear health risks, indicating a need for additional training. Other types of incidents (NHP bites that do not break the skin, needle puncture with a clean needle, scratch from clean equipment, or NHP secretions splashed onto

skin) showed a much lower degree of recognition. Being stuck with a clean needle was the least recognized by veterinarians (39%) and technicians (38%). When these incidents were analyzed as dependent variables to determine if they were associated with other characteristics of the participant or the participants' work/training history, significant associations were found between two outcomes and a lack of training. Although these four types of incidents may not, by themselves, represent an infectious disease risk they could represent a deficiency in the safety and health practice of the facility that might in other circumstances lead to increased risk of infectious disease exposure. For example, a needle puncture with a sterile needle (not likely to represent an increased risk of infectious disease transmission from the needle) might also easily have been a puncture with a dirty needle. This type of event may represent a deficiency in work practices, education, or some other factor(s); the same principle may hold for the other three events noted above (bites not breaking skin, NHP secretions splashed onto intact skin, and scratch from clean equipment). Recognition (by those responsible for health and safety at the NHP facility) that these events are occurring depends on some mechanism for reporting these events. Recognition of these events is important so that measures can be instituted to minimize their occurrence.

In our questionnaire we asked participants to report work tasks that they perform at least once per week. Our univariate (single variable) analyses show that many of the work tasks are identified with increased prevalence of incidents such as being bitten by an NHP. These findings make sense, and call for continued review of work practices to minimize incidents that may be associated with infectious disease transmission.

Our analysis of the occurrence of potential exposure incidents by job title shows that most groups of employees have reported exposure incidents, but that there is some variability across job groups. Therefore, although all employees should be included in appropriate training/education activities, more specific training/education activities (and perhaps training/education at increased frequency) might be focused on those employees with more direct contact with NHPs (such as caretakers). On a percentage basis, being splashed in the eyes, mouth, or nose with NHP secretions was the type of incident most commonly not reported to the supervisor (28 of 69 incidents not reported, 41%—the type of

Discussion & Conclusion (continued)

exposure that resulted in the death of Ms. Griffin). In terms of total numbers, being scratched by an NHP was the most common incident not reported (39 of 129 incidents not reported). The most common choice addressing why the incident was not reported was "did not think it serious enough to report," chosen by 55 (73%). Among all 469 respondents, 17 (4%) reported that they were reluctant/afraid to report injuries or exposures to supervisors. Although a small percentage, this is an important deficiency to correct.

Our analyses are subject to at least three limitations. First, no determination of which of the work tasks might be the most important (relative to the others) in terms of infectious disease risk was performed in the evaluation. Additionally, persons who perform one work task (such as drawing blood) may also routinely perform a second work task (such as giving injections). Our analyses did not take these interrelationships into account. Lastly, we do not know the extent to which the participants in our surveys were representative of all employees at each facility.

Recommendations

The following recommendations are provided to reduce infectious disease risks among employees working with NHPs. These recommendations were based on conditions at the facilities at the time of our evaluations in 2001.

1. Determine which employees, or employee groups, have the most direct contact with NHPs, and focus training/education activities on these groups.
2. Revise the training curriculum to include use of bite and scratch kits and respiratory protection.
3. Emphasize recognition of infectious disease potential during training.
4. Establish a mechanism for continued review of work practices to identify those that lead to potential exposure incidents.
5. Establish and actively maintain a mechanism for reporting exposure incidents.
6. Ensure that all managers are aware of the reporting mechanism and that they encourage its use among their employees.

Recommendations (continued)

7. Reassure employees that there will be no penalty for reporting incidents.
8. Make bite and scratch kits readily available to employees.

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Table A1. Knowledge of Potential Risk, by Type of Incident
California Regional Primate Research Center at the University of California, Davis, California

Incident	# (%) Reporting incident to be infectious disease risk that would need to be reported
NHP secretions on skin	59 (43%)
NHP secretions on cut, abrasion, or other wound	134 (98%)
NHP secretions in mouth or nose	135 (99%)
NHP secretions in eye	133 (97%)
Puncture by dirty needle	134 (98%)
Puncture by clean needle	35 (26%)
NHP bite breaking skin	135 (99%)
NHP bite not breaking skin	82 (60%)
Scratch with dirty equipment	132 (96%)
Scratch with clean equipment	63 (46%)

Table A2. Relationship Between Knowledge of Potential Risk of Puncture by a Clean Needle and Receipt of Refresher Safety and Health Training
California Regional Primate Research Center at the University of California, Davis, California

	Puncture with clean needle as a health risk		
Refresher Training	Not considered as a risk	Considered as a risk	Total
Without training	34	14	48
With training	68	21	89
Total	102	35	

Prevalence Ratio = 0.9; 95% Confidence Interval 0.7 – 1.1

Table A3. Knowledge of Potential Risk by Job Title
California Regional Primate Research Center at the University of California, Davis, California

Job	#	# (%) Reporting incident to be infectious disease risk that would need to be reported			
		Bite[1]	Needle Stick[2]	Scratch with clean equipment[3]	Exposure to secretions[4]
Caretaker	28	15 (54%)	8 (29%)	14 (50%)	14 (50%)
Technician	8	2 (25%)	0 (0%)	0 (0%)	2 (25%)
Supervisor	2	2 (100%)	0 (0%)	1 (50%)	0 (0%)
Student	9	6 (67%)	2 (22%)	5 (56%)	6 (67%)
Maintenance	5	2 (40%)	2 (40%)	2 (40%)	1 (20%)
Veterinarian	7	3 (43%)	0 (0%)	1 (14%)	0 (0%)
Visiting Scientist	1	0 (0%)	0 (0%)	1 (100%)	0 (0%)
Colony Manager	3	2 (67%)	2 (67%)	2 (67%)	0 (0%)
Laboratorian	34	29 (85%)	13 (38%)	16 (47%)	21 (62%)
Other	40	21 (53%)	7 (18%)	21 (53%)	15 (38%)

Positive responses for "Knowledge of potential risk" are indicated by the respondent reporting affirmatively that:
[1] NHP bites that do not break the skin are exposures/health risks that would need to be reported.
[2] Punctures with a clean needle are infectious disease exposures or health risks that would need to be reported.
[3] The scratch or cut from clean animal equipment is an infectious disease exposures or health risks that would need to be reported.
[4] Exposures to NHP secretions (saliva, blood, urine, feces) splashed onto skin are infectious disease exposures or health risks that would need to be reported.

Table A4. Reported Incidents Occurring in the 5 Years Prior to the Survey While Working with NHPs
California Regional Primate Research Center at the University of California, Davis, California

Incident	# (%) employees reporting incident occurring in the last 5 years	Among those reporting incident	
		Median (range) of # times incident occurred	Number (%)[1] reporting that not all incidents reported to supervisor
Bitten by NHP	18 (13%)	1 (1–3)	0 (0%)
Scratched by NHP	37 (27%)	2 (1–10)	18 (49%)
Needle stick	17 (12%)	1 (0–6)	4 (21%)
Scratched/cut by dirty equipment	36 (26%)	2 (1–6)	12 (33%)
Splashed in eyes, mouth, or nose with NHP secretions	12 (9%)	1 (1)	1 (8%)

[1] Among those experiencing an incident, percentage who stated that they had not reported at least one of these incidents to a supervisor.

Table A5. Occurrence of Incidents by Job Title
California Regional Primate Research Center at the University of California, Davis, California

Job	#	# (%) employees reporting incident occurring in the last 5 years				
		Bitten, resulting in broken skin	Needle stick	Scratched by NHP	Scratched/ cut by dirty equipment	Splashed in eyes, nose, or mouth with NHP secretions
Caretaker	28	8 (29%)	1 (4%)	10 (36%)	14 (50%)	5 (18%)
Technician	8	2 (25%)	4 (50%)	5 (63%)	2 (25%)	3 (38%)
Supervisor	2	1 (50%)	0 (0%)	1 (50%)	0 (0%)	0 (0%)
Student	9	0 (0%)	1 (11%)	1 (11%)	0 (0%)	0 (0%)
Maintenance	5	0 (0%)	0 (0%)	1 (20%)	5 (100%)	1 (20%)
Veterinarian	7	2 (29%)	3 (43%)	2 (29%)	2 (29%)	2 (29%)
Visiting Scientist	1	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)
Colony Manager	3	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Laboratorian	34	1 (3%)	2 (6%)	3 (9%)	6 (18%)	1 (3%)
Other	40	4 (10%)	5 (13%)	14 (35%)	7 (18%)	0 (0%)

Table A6. Prevalence Ratios and 95% Confidence Intervals for Associations Between Work Tasks and Incidents
California Regional Primate Research Center at the University of California, Davis, California

Task	Incident									
	Bitten by NHP		Scratched by NHP		Stuck by needle		Scratched/ cut by dirty equipment		Splashed in eyes, nose or mouth with secretions	
	PR[1]	95% CI[2]	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Feeding	**6.8**	**2.1–22.4**	**3.7**	**1.9–7.0**	1.0	0.4–2.4	1.4	0.8–2.4	1.9	0.6–5.7
Drawing blood	**4.8**	**2.0–11.3**	**3.6**	**2.1–6.0**	**4.3**	**1.8–10.5**	1.7	1.0–3.0	**4.2**	**1.4–12.5**
Handling NHP	**6.4**	**1.9–21.2**	**3.0**	**1.6–5.6**	**3.1**	**1.1–8.3**	1.1	0.7–2.0	**3.9**	**1.1–13.6**
Handling tissues or fluids	1.5	0.5–4.3	2.2	1.0–4.9	6.8	0.9–49.3	0.8	0.4–1.3	0.9	0.3–2.7
Making behavior observations	1.3	0.5–3.1	**2.7**	**1.6–4.6**	0.9	0.3–2.3	**2.0**	**1.2–3.5**	2.0	0.7–6.0
Cleaning cages	**2.5**	**1.1–6.0**	1.7	1.0–3.0	0.1	**0.02–0.9**	**2.3**	**1.3–4.0**	1.0	0.3–3.2
Giving injections	**6.3**	**2.2–18.0**	**2.6**	**1.5–4.6**	**3.3**	**1.3–8.4**	**2.2**	**1.3–3.9**	**3.6**	**1.1–11.3**

Bold text represents statistically significant findings
[1] PR = prevalence ratio
[2] CI = 95% Confidence Interval

Table A7. Knowledge of Potential Risk by Type of Incident
University of Louisiana at Lafayette, New Iberia, Louisiana

Incident	# (%) Reporting incident to be infectious disease risk which would need to be reported
NHP secretions splashed on skin	68 (49%)
NHP secretions splashed on cut, abrasion, or other wound	135 (97%)
NHP secretions splashed in mouth or nose	132 (95%)
NHP secretions splashed in eye	133 (96%)
Puncture by dirty needle	133 (96%)
Puncture by clean needle	76 (55%)
NHP bite breaking skin	132 (95%)
NHP bite not breaking skin	96 (69%)
Scratch with dirty equipment	132 (95%)
Scratch with clean equipment	103 (74%)

Table A8. Relationship between Knowledge of Potential Risk of Puncture by a Clean Needle and Receipt of Refresher Safety and Health Training
University of Louisiana at Lafayette, New Iberia, Louisiana

Training on NHP-related infectious disease risks prior to working with NHP	Puncture with clean needle as a health risk		
	Not considered as a risk	Considered as a risk	Total
Without training	6	3	9
With training	35	81	116
Total	41	84	

Prevalence Ratio = 2.2; 95% Confidence Interval 1.3 – 3.8

Table A9. Knowledge of Potential Risk by Job Title
University of Louisiana at Lafayette, New Iberia, Louisiana

Job	#	# (%) Reporting incident to be infectious disease risk that would need to be reported			
		Bite[1]	Needle stick[2]	Scratch with clean equipment[3]	Exposure to secretions[4]
Caretaker	61	35 (57%)	26 (43%)	43 (70%)	26 (42%)
Technician	12	9 (75%)	7 (58%)	8 (67%)	3 (25%)
Supervisor	10	6 (60%)	3 (30%)	5 (50%)	5 (50%)
Student	9	6 (67%)	9 (100%)	9 (100%)	4 (44%)
Maintenance	20	19 (95%)	18 (90%)	19 (95%)	17 (85%)
Veterinarian	3	2 (67%)	2 (67%)	3 (100%)	0 (0%)
Researcher	1	0 (0%)	1 (100%)	0 (0%)	1 (100%)
Colony Manager		1 (100%)	1 (100%)	0 (0%)	0 (0%)
Other	21	17 (81%)	9 (43%)	15 (71%)	11 (52%)

Positive responses for "Knowledge of potential risk" are indicated by the respondent reporting affirmatively that:
[1] NHP bites that do not break the skin are exposures/health risks that would need to be reported.
[2] Punctures with a clean needle are infectious disease exposures or health risks that would need to be reported.
[3] The scratch or cut from clean animal equipment is an infectious disease exposures or health risks that would need to be reported.
[4] Exposures to NHP secretions (saliva, blood, urine, feces) splashed onto skin are infectious disease exposures or health risks that would need to be reported.

Table A10. Reported Incidents Occurring in the 5 Years Prior to the Survey While Working with NHPs
University of Louisiana at Lafayette, New Iberia, Louisiana

Incident	# (%) employees reporting incident occurring in the last 5 years	Among those reporting incident	
		Median (range) of # times incident occurred	Number (%)[1] reporting that not all incidents reported to supervisor
Bitten by NHP	21 (15%)	1 (1–10)	2 (10%)
Scratched by NHP	41 (30%)	2 (1–15)	7 (18%)
Needle stick	22 (16%)	1 (1–9)	2 (9%)
Scratched/cut by dirty equipment	50 (36%)	1 (1–10)	9 (20%)
Splashed in eyes, mouth, or nose with NHP secretions	17 (12%)	2 (1–5)	7 (37%)

[1] Percentage among those experiencing an incident who stated that they had not reported at least one of these incidents to a supervisor.

Table A11. Occurrence of Incidents by Job Title
University of Louisiana at Lafayette, New Iberia, Louisiana

Job	#	# (%) employees reporting incident occurring in the last 5 years				
		Bitten, resulting in broken skin	Needle stick	Scratched by NHP	Scratched/ cut by dirty equipment	Splashed in eyes, nose, or mouth with NHP secretions
Caretaker	61	14 (23%)	7 (11%)	21 (34%)	30 (49%)	7 (11%)
Technician	12	1 (8%)	5 (42%)	6 (50%)	4 (33%)	3 (25%)
Supervisor	10	3 (30%)	3 (30%)	6 (60%)	3 (30%)	4 (40%)
Student	9	0 (0%)	0 (0%)	1 (11%)	0 (0%)	0 (0%)
Maintenance	20	0 (0%)	1 (5%)	1 (5%)	5 (26%)	1 (5%)
Veterinarian	3	1 (33%)	3 (100%)	2 (67%)	2 (67%)	0 (0%)
Researcher	1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Colony Manager	1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Other	21	2 (10%)	2 (10%)	4 (19%)	6 (29%)	2 (10%)

Table A12. Prevalence Ratios and 95% Confidence Intervals for Associations Between Work Tasks and Incidents
University of Louisiana at Lafayette, New Iberia, Louisiana

Task	Incident									
	Bitten by NHP		Scratched by NHP		Stuck by needle		Scratched/cut by dirty equipment		Splashed in eyes, mouth, nose with secretions	
	PR[1]	95% CI[2]	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Feeding	2.6	1.0–6.7	1.8	1.0–3.0	0.8	0.4–1.8	**1.9**	**1.2–3.1**	0.9	0.4–2.2
Drawing blood	0.7	0.3–1.8	1.5	0.9–2.4	**3.3**	**1.5–7.2**	0.9	0.5–1.5	**2.6**	**1.1–6.2**
Handling NHP	**5.3**	**1.6–17.3**	**3.7**	**1.8–7.4**	2.4	1.0–6.0	**2.1**	**1.3–3.4**	1.6	0.6–4.2
Handling tissues or fluids	1.4	0.6–3.0	1.3	0.8–2.2	**2.8**	**1.2–6.7**	1.0	0.6–1.5	1.9	0.7–4.8
Making behavior observations	0.9	0.4–2.1	1.7	1.0–2.8	1.8	0.8–3.8	**1.8**	**1.2–2.8**	1.2	0.5–2.9
Cleaning cages	2.5	1.0–6.1	1.7	1.0–3.0	0.7	0.3–1.5	**1.9**	**1.2–3.1**	0.9	0.4–2.2
Giving injections	1.0	0.4–2.4	1.6	1.0–2.8	**3.0**	**1.4–6.5**	0.9	0.5–1.4	**3.0**	**1.2–7.2**

Bold text represents statistically significant findings
[1] PR = prevalence ratio
[2] CI = 95% Confidence Interval

Table A13. Knowledge of Potential Risk by Type of Incident
SW Foundation Regional Primate Research Center in San Antonio, Texas

Incident	# (%) Reporting incident to be infectious disease risk which would need to be reported
NHP secretions on skin	38 (48%)
NHP secretions on cut, abrasion, or other wound	68 (86%)
NHP secretions in mouth or nose	69 (87%)
NHP secretions in eye	70 (89%)
Puncture by dirty needle	68 (86%)
Puncture by clean needle	27 (34%)
NHP bite breaking skin	72 (91%)
NHP bite not breaking skin	40 (51%)
Scratch with dirty equipment	70 (89%)
Scratch with clean equipment	41 (52%)

Table A14. Relationship between Receipt of NHP-related Infectious Disease Training and Knowledge of Potential Risk of NHP Secretions Splashed Onto Skin
SW Foundation Regional Primate Research Center in San Antonio, Texas

Training on infectious disease risks from NHPs experimentally infected	NHP secretions splashed onto skin as an infectious disease exposure or health risk		
	Not considered as a risk	Considered as a risk	Total
Without training	8	9	17
With training	33	29	62
Total	41	38	

Prevalence Ratio = 0.9; 95% Confidence Interval 0.5 – 1.5

Table A15. Knowledge of Potential Risk by Job Title
SW Foundation Regional Primate Research Center in San Antonio, Texas

Job	#	# (%) Reporting incident to be infectious disease risk that would need to be reported			
		Bite[1]	Needle stick[2]	Scratch with clean equipment[3]	Exposure to secretions[4]
Caretaker	26	15 (58%)	9 (35%)	15(58%)	14 (54%)
Technician	18	6 (33%)	6 (33%)	8 (44%)	9 (50%)
Supervisor	5	0 (0%)	0 (0%)	3 (60%)	1 (20%)
Maintenance	11	8 (73%)	5 (45%)	6 (55%)	6 (55%)
Veterinarian	3	0 (0%)	2 (67%)	2 (67%)	1 (33%)
Laboratorian	4	3 (75%)	2 (50%)	2 (50%)	2 (50%)
Other	11	5 (45%)	3 (27%)	4 (36%)	8 (73%)

Positive responses for "Knowledge of potential risk" are indicated by the respondent reporting affirmatively that:
[1] NHP bites that do not break the skin are exposures/health risks that would need to be reported.
[2] Punctures with a clean needle are infectious disease exposures or health risks that would need to be reported.
[3] The scratch or cut from clean animal equipment is an infectious disease exposures or health risks that would need to be reported.
[4] Exposures to NHP secretions (saliva, blood, urine, feces) splashed onto skin are infectious disease exposures or health risks that would need to be reported.

Table A16. Reported Incidents Occurring in the 5 Years Prior to the Survey While Working with NHPs
SW Foundation Regional Primate Research Center in San Antonio, Texas

Incident	# (%) employees reporting incident occurring in the last 5 years	Among those reporting incident	
		Median (range) of # times incident occurred	Number (%)[1] reporting that not all incidents reported to supervisor
Bitten by NHP	24 (30%)	1 (1–6)	4 (17%)
Scratched by NHP	32 (41%)	4 (1–30)	13 (41%)
Needle stick	18 (23%)	1.5 (1–5)	5 (28%)
Scratched/cut by dirty equipment	22 (28%)	2 (1–10)	9 (41%)
Splashed in eyes, mouth, or nose with NHP secretions	32 (41%)	2.5 (1–9)	18 (56%)

[1] Percentage among those experiencing an incident who stated that they had not reported at least one of these incidents to a supervisor.

Table A17. Occurrence of Incidents by Job Title
SW Foundation Regional Primate Research Center in San Antonio, Texas

Job	#	# (%) employees reporting incident occurring in the last 5 years				
		Bitten, resulting in broken skin	Needle stick	Scratched by NHP	Scratched/ cut by dirty equipment	Splashed in eyes, nose, or mouth with NHP secretions
Caretaker	26	12(46%)	4 (15%)	10 (38%)	8 (31%)	9 (35%)
Technician	18	5 (28%)	10 (56%)	12 (67%)	6 (33%)	8 (44%)
Supervisor	5	2 (40%)	2 (40%)	2 (40%)	1 (20%)	1 (20%)
Maintenance	11	0 (0%)	0 (0%)	0 (0%)	4 (36%)	5 (45%)
Veterinarian	3	0 (0%)	0 (0%)	1 (33%)	0 (0%)	1 (33%)
Laboratorian	4	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Other	11	4 (36%)	2 (18%)	6 (55%)	3 (27%)	8 (73%)

Table A18. Prevalence Ratios and 95% Confidence Intervals for Associations Between Work Tasks and Incidents
SW Foundation Regional Primate Research Center in San Antonio, Texas

Task	Incident									
	Bitten by NHP		Scratched by NHP		Stuck by needle		Scratched/ cut by dirty equipment		Splashed in eyes, mouth, nose with secretions	
	PR[1]	95% CI[2]	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Feeding	**6.0**	**1.5–23.8**	**2.4**	**1.1–5.1**	1.4	0.6–3.6	2.5	0.9–6.6	0.8	0.5–1.4
Drawing blood	1.4	0.7–2.7	**2.1**	**1.2–3.6**	**5.7**	**2.1–15.8**	1.4	0.7–2.8	0.9	0.5–1.5
Handling NHP	1.4	0.7–3.0	**2.1**	**1.0–4.2**	**4.6**	**1.1–18.8**	1.5	0.7–3.5	1.0	0.6–1.7
Handling tissues or fluids	1.0	0.5–2.0	1.7	1.0–3.0	2.7	1.0–6.8	1.0	0.5–2.1	0.7	0.4–1.2
Making behavior observations	1.5	0.8–3.1	**1.2**	**0.7–2.0**	0.9	0.4–2.1	0.9	0.5–1.9	1.1	0.6–1.8
Cleaning cages	2.3	1.0–5.1	**1.7**	**0.9–3.0**	1.5	0.6–3.6	**2.6**	**1.1–6.3**	0.9	0.5–1.5
Giving injections	1.3	0.6–2.4	**2.1**	**1.2–3.7**	**6.3**	**2.0–20.0**	1.5	0.7–3.1	0.9	0.5–1.5

Bold text represents statistically significant findings
[1] PR = prevalence ratio
[2] CI = 95% Confidence Interval

Table A19. Knowledge of Potential Risk by Type of Incident
Tulane Regional Primate Research Center, Covington, Louisiana

Incident	# (%) Reporting incident to be infectious disease risk which would need to be reported
NHP secretions on skin	73 (63%)
NHP secretions on cut, abrasion, or other wound	108 (93%)
NHP secretions in mouth or nose	105 (91%)
NHP secretions in eye	104 (90%)
Puncture by dirty needle	105 (91%)
Puncture by clean needle	32 (28%)
NHP bite breaking skin	105 (91%)
NHP bite not breaking skin	67 (58%)
Scratch with dirty equipment	109 (94%)
Scratch with clean equipment	52 (45%)

Table A20. Relationship between Receipt of NHP-related Infectious Disease Training and Knowledge of Potential Risk of NHP Secretions Splashed onto Skin
Tulane Regional Primate Research Center, Covington, Louisiana

Training on infectious disease risks from NHPs experimentally infected	NHP secretions splashed onto skin as an infectious disease exposure or health risk		
	Not conisdered as a risk	Considered as a risk	Total
Without Training	18	9	27
With Training	25	64	89
Total	43	73	

Prevalence Ratio = 2.4; 95% Confidence Interval 1.5 – 3.6

Table A21. Knowledge of Potential Risk by Job Title
Tulane Regional Primate Research Center, Covington, Louisiana

Job	#	# (%) Reporting incident to be infectious disease risk which would need to be reported			
		Bite[1]	Needle stick[2]	Scratch with clean equipment[3]	Exposure to secretions[4]
Caretaker	7	4 (57%)	1 (14%)	3(43%)	5 (71%)
Technician	26	12 (46%)	5 (19%)	7 (27%)	14 (54%)
Supervisor	4	3 (75%)	1 (25%)	3 (75%)	3 (75%)
Student	1	1 (100%)	0 (0%)	0 (0%)	1 (100%)
Maintenance	19	11 (58%)	6 (32%)	12 (63%)	15 (79%)
Veterinarian	7	5 (71%)	3 (43%)	4 (57%)	3 (43%)
Visiting Scientist	2	2 (100%)	1 (50%)	1 (50%)	1 (50%)
Colony Manager	2	2 (100%)	2 (100%)	1 (50%)	1 (50%)
Laboratorian	29	17 (59%)	8 (28%)	10 (34%)	17 (59%)
Other	19	10 (53%)	5 (26%)	11 (58%)	13 (68%)

Positive responses for "Knowledge of potential risk" are indicated by the respondent reporting affirmatively that:
[1] NHP bites that do not break the skin are exposures/health risks that would need to be reported.
[2] Punctures with a clean needle are infectious disease exposures or health risks that would need to be reported.
[3] The scratch or cut from clean animal equipment is an infectious disease exposures or health risks that would need to be reported.
[4] Exposures to NHP secretions (saliva, blood, urine, feces) splashed onto skin are infectious disease exposures or health risks that would need to be reported.

Table A22. Reported Incidents Occurring in the 5 Years Prior to the Survey While Working with NHPs
Tulane Regional Primate Research Center, Covington, Louisiana

Incident	# (%) employees reporting incident occurring in the last 5 years	Among those reporting incident	
		Median (range) of # times incident occurred	Number (%)[1] reporting that not all incidents reported to supervisor
Bitten by NHP	8 (7%)	1.5 (1–10)	0 (0%)
Scratched by NHP	19 (16%)	2 (1–10)	1 (5%)
Needle stick	16 (14%)	1 (1–2)	2 (13%)
Scratched/cut by dirty equipment	27 (23%)	2 (1–15)	2 (7%)
Splashed in eyes, mouth, or nose with NHP secretions	8 (7%)	1 (1–10)	2 (25%)

[1] Percentage among those experiencing an incident who stated that they had not reported at least one of these incidents to a supervisor.

Table A23. Occurrence of Incidents by Job Title
Tulane Regional Primate Research Center, Covington, Louisiana

Job	#	# (%) employees reporting incident occurring in the last 5 years				
		Bitten, resulting in broken skin	Needle stick	Scratched by NHP	Scratched/ cut by dirty equipment	Splashed in eyes, nose, or mouth with NHP secretions
Caretaker	7	0 (0%)	1 (14%)	2 (29%)	1 (14%)	0 (0%)
Technician	26	5 (19%)	6 (23%)	11 (42%)	11 (42%)	2 (8%)
Supervisor	4	2 (50%)	1 (25%)	1 (25%)	1 (25%)	0 (0%)
Student	1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Maintenance	19	0 (0%)	1 (5%)	0 (0%)	5 (26%)	2 (11%)
Veterinarian	7	0 (0%)	3 (43%)	0 (0%)	1 (14%)	0 (0%)
Visiting Scientist	2	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Colony Manager	2	0 (0%)	0 (0%)	2 (100%)	1 (50%)	0 (0%)
Laboratorian	29	0 (0%)	2 (7%)	1 (3%)	3 (10%)	2 (7%)
Other	19	1 (5%)	2 (11%)	2 (11%)	4 (21%)	2 (11%)

Table A24. Prevalence Ratios and 95% Confidence Intervals for Associations Between Work Tasks and Incidents
Tulane Regional Primate Research Center, Covington, Louisiana

Task	Incident									
	Bitten by NHP		Scratched by NHP		Stuck by needle		Scratched/ cut by dirty equipment		Splashed in eyes, mouth, nose with secretions	
	PR[1]	95% CI[2]	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Feeding	Undefined	**p<0.001**	**4.8**	**2.0–11.5**	2.2	0.9–5.3	1.9	1.0–3.6	0.7	0.2–3.4
Drawing blood	**12.2**	**1.5–95.5**	3.8	1.5–9.2	7.4	2.2–24.6	2.0	1.0–4.0	1.0	0.3–4.1
Handling NHP	3.0	0.8–12.0	3.9	1.6–9.5	4.0	1.5–10.9	**2.1**	**1.1–4.1**	1.8	0.5–6.8
Handling tissues or fluids	0.5	0.1–1.9	1.9	0.6–5.2	3.5	0.8–14.6	2.1	0.8–5.1	1.5	0.3–7.0
Making behavior observations	3.0	0.8–11.1	**4.1**	**1.8–9.1**	2.3	0.9–5.6	**2.2**	**1.1–4.2**	1.0	0.2–4.6
Cleaning cages	**8.9**	**1.9–41.7**	**2.7**	**1.2–5.9**	1.3	0.5–3.5	1.6	0.8–3.1	0.4	0.1–3.3
Giving injections	**15.4**	**2.0–120.3**	**3.0**	**1.3–6.9**	**2.8**	**1.1–6.9**	1.9	1.0–3.6	0.7	0.2–3.4

Bold text represents statistically significant findings
[1] PR = prevalence ratio. In cases where the PR is undefined (0 cell), Fisher's exact test was used to determine the p value.
[2] CI = 95% Confidence Interval. In cases where the PR is undefined (0 cell), Fisher's exact test was used to determine the p value.

Table A25. Knowledge of Potential Risk, by Type of Incident[1]
All Facilities

Incident	# (%) Reporting incident to be infectious disease risk which would need to be reported				
	UC Davis	Tulane	SW Foundation	UL New Iberia	Overall
NHP secretions on skin	59 (43%)	73 (63%)	38 (48%)	68 (49%)	238 (51%)
NHP secretions on wound	134 (98%)	108 (93%)	68 (86%)	135 (97%)	445 (95%)
NHP secretions in mouth	135 (99%)	105 (91%)	69 (87%)	132 (95%)	441 (94%)
NHP secretions in eye	133 (97%)	104 (90%)	70 (88%)	133 (96%)	440 (93%)
Puncture by dirty needle	134 (98%)	105 (91%)	68 (86%)	133 (96%)	440 (94%)
Puncture by clean needle	35 (26%)	32 (28%)	27 (34%)	76 (55%)	170 (36%)
NHP bite breaking skin	135 (99%)	105 (91%)	72 (91%)	132 (95%)	444 (95%)
NHP bite not breaking skin	82 (60%)	67 (58%)	40 (51%)	96 (69%)	285 (61%)
Scratch with dirty equipment	132 (96%)	109 (94%)	70 (89%)	132 (95%)	443 (95%)
Scratch with clean equipment	63 (46%)	52 (45%)	41 (52%)	103 (74%)	259 (55%)

[1] Responses to questions concerning whether participants would consider these types of incidents to be infectious disease exposures or health risks needing to be reported.

Table A26. Knowledge of Potential Risk by Job Title
All Facilities

Job	#	# (%) Reporting incident to be infectious disease risk which would need to be reported			
		Bite[1]	Needle stick[2]	Scratch with clean equipment[3]	Exposure to secretions[4]
Caretaker	122	69 (57%)	44 (36%)	75 (61%)	59 (48%)
Technician	64	29 (45%)	18 (28%)	23 (36%)	28 (44%)
Supervisor	21	11 (52%)	4 (19%)	12 (57%)	9 (43%)
Student	19	13 (68%)	11 (58%)	14 (74%)	11 (58%)
Maintenance	55	40 (73%)	31 (56%)	39 (72%)	39 (72%)
Veterinarian	20	10 (50%)	7 (35%)	10 (50%)	4 (20%)
Visiting Scientist	3	2 (66%)	1 (33%)	2 (66%)	1 (33%)
Colony Manager	6	5 (83%)	5 (83%)	3 (50%)	1 (17%)
Laboratorian	67	49 (73%)	23 (34%)	28 (42%)	40 (60%)
Other	91	48 (53%)	24 (26%)	51 (56%)	47 (52%)

Positive responses for "Knowledge of potential risk" are indicated by the respondent (469 responding to the question) reporting affirmatively that:
[1] NHP bites that do not break the skin are exposures/health risks that would need to be reported.
[2] Punctures with a clean needle are infectious disease exposures or health risks that would need to be reported.
[3] The scratch or cut from clean animal equipment is an infectious disease exposures or health risks that would need to be reported.
[4] Exposures to NHP secretions (saliva, blood, urine, feces) splashed onto skin are infectious disease exposures or health risks that would need to be reported.

Table A27. Reported Incidents Occurring in the 5 Years Prior to the Survey While Working with NHPs
All Facilities

Incident	# (%) employees reporting incident occurring in the last 5 years	Among those reporting incident	
		Median (range) of # times incident occurred	Number (%)[1] reporting that not all incidents reported to supervisor
Bitten by NHP	71 (15%)	1 (1–10)	6 (8%)
Scratched by NHP	129 (26%)	2.5 (1–30)	39 (30%)
Needle stick	73 (16%)	1.3 (1–9)	13 (18%)
Scratched/cut by dirty equipment	135 (29%)	1.75 (1–15)	32 (24%)
Splashed in eyes, mouth, or nose with NHP secretions	69 (15%)	1.6 (1–10)	28 (41%)

[1] Percentage among those experiencing an incident who stated that they had not reported at least one of these incidents to a supervisor.

Table A28. Occurrence of Incidents by Job Title
All Facilities

Job	#	# (%) employees reporting incident occurring in the last 5 years				
		Bitten, resulting in broken skin	Needle stick	Scratched by NHP	Scratched/ cut by dirty equipment	Splashed in eyes, nose, or mouth with NHP secretions
Caretaker	122	34 (28%)	13 (11%)	43 (35%)	53 (43%)	21 (17%)
Technician	64	13 (20%)	25 (39%)	34 (53%)	23 (36%)	16 (25%)
Supervisor	21	8 (38%)	6 (29%)	10 (48%)	5 (245%)	5 (24%)
Student	19	0 (0%)	1 (5%)	2 (11%)	0 (0%)	0 (0%)
Maintenance	55	0 (0%)	2 (4%)	2 (4%)	19 (35%)	9 (16%)
Veterinarian	20	3 (15%)	9 (45%)	5 (25%)	5 (25%)	3 (15%)
Researcher	1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Visiting Scientist	3	0 (0%)	1 (33%)	0 (0%)	0 (0%)	0 (0%)
Colony Manager	6	0 (0%)	0 (0%)	2 (33%)	1 (17%)	0 (0%)
Laboratorian	67	1 (2%)	4 (6%)	4 (6%)	9 (13%)	3 (5%)
Other	91	4 (4%)	11 (12%)	26 (29%)	20 (22%)	12 (13%)

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Acknowledgments and Availability of Report

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