

Design, Validation and Application of an Instrument for Assessing Animal Welfare, Public Health and Environmental Health in Non-Human Primates in Captivity

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■ Abstract

Introduction. Currently, assessments performed on establishments where non-human primates (NHP) are captive are partial and their compliance is limited. At the international level, assessment instruments have been applied to zoos in a comprehensive way and just some of them have been published in scientific journals. **Objective.** In order to assess the animal welfare (AW), public health (PH) and environmental health (EH) in nonhuman primates (NHP) in captivity, an instrument, which could be useful as an indicator of compliance of the different assumptions evaluated, was designed. **Materials and methods.** For the design of this instrument the following aspects, stated in the Official Mexican Standards and in the legislation on the matter in our country, were considered: indicators of success, quality standards in shelters and assumptions about AW, PH and EH. The instrument consists of 38 items for AW, 47 for PH and 16 for EH, the measuring scale of the degree of compliance for each of the assumptions evaluated was: high, medium, low and non-existent, according to the scores obtained. The instrument was applied to a total of 63 NHP of different species in three establishments located in the States of México, Puebla and Quintana Roo. **Results.** The instrument presented substantial agreement between establishments, resulting in Kappa index: $K = 0.70$, $K = 0.88$ and $K = 0.75$ for each of the assumptions assessed. **Conclusions.** The analysis of results in the three establishments allowed the issuing of a series of recommendations for each organization. Finally, the validated instrument was applied in the CIVS in Bacalar. Parque Loro, Puebla, had the best score in the three categories assessed, followed by the CIVS Bacalar and the last one being Zacango Zoo.

Key words: assessment, animal welfare, public health, environmental health.

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Diseño, Validación y Aplicación de una Herramienta para Evaluar Bienestar Animal, Salud Pública y Salud Ambiental en Primates No Humanos en Cautiverio

■ Resumen

Introducción. Actualmente, las evaluaciones llevadas a cabo en establecimientos donde hay primates no humanos cautivos son parciales y su cumplimiento es limitado. A nivel internacional, los instrumentos de evaluación han sido aplicados en zoológicos de una manera integral y solo algunos de ellos han sido publicados en revistas científicas. **Objetivo.** Con el fin de evaluar el bienestar animal (BA), la salud pública (SP) y la salud ambiental (SA) en primates no humanos (PNH), fue diseñada una herramienta que puede ser un indicador útil de la concordancia de los diferentes aspectos evaluados. **Materiales y métodos.** Para el diseño de esta herramienta se tuvieron en cuenta los siguientes aspectos contemplados en los Estándares Oficiales de México y en la legislación de este país: indicadores de éxito, estándares de calidad de los refugios y aspectos de BA, SP y SA. La herramienta está compuesta de 38 ítems para BA, 47 para SP y 16 para SA, la escala de medición del grado de cumplimiento para cada aspecto evaluado fue: alto, medio, bajo o no existente, de acuerdo con los puntajes obtenidos. La herramienta fue aplicada a un total de 63 PNH de diferentes especies en tres establecimientos ubicados en los Estados de México, Puebla y Quintana Roo. **Resultados.** La herramienta presentó una coincidencia importante entre establecimientos, resultando en un índice Kappa de 0.70, 0.88 y 0.75, para cada uno de los establecimientos evaluados. **Conclusiones.** El análisis de los

resultados de los tres establecimientos permitió la formulación de una serie de recomendaciones para cada organización. Finalmente, la herramienta validada fue aplicada en el CIVS en Bacalar, Parque Loro, Puebla, y tuvo el mejor puntaje en los tres aspectos evaluados, seguido del CIVS Bacalar, siendo el último el Zoológico Zacango.

Palabras clave: evaluación, bienestar animal, salud pública, salud ambiental.

Desenho, Validação e Aplicação de uma Ferramenta para Avaliar Bem-estar Animal, Saúde Pública e Saúde Ambiental em Primatas Não Humanos em Cativeiro

■ Resumo

Introdução. Atualmente, as avaliações levadas a cabo em estabelecimentos onde há primatas não humanos cativos são parciais e seu cumprimento é limitado. A nível internacional, os instrumentos de avaliação foram aplicados em zoológicos de uma maneira integral e só alguns deles foram publicados em revistas científicas. **Objetivo.** Com o fim de avaliar o bem-estar animal (BA), a saúde pública (SP) e a saúde ambiental (SA) em primatas não humanos (PNH), foi desenhada uma ferramenta que pode ser um indicador útil da concordância dos diferentes aspectos avaliados. **Materiais e métodos.** Para o desenho desta ferramenta se tiveram em conta os seguintes aspectos contemplados nos Padrões Oficiais do México e na legislação deste país: indicadores de sucesso, padrões de qualidade dos refúgios e aspectos de BA, SP e SA. A ferramenta está

composta de 38 itens para BA, 47 para SP e 16 para SA, a escala de medição do grau de cumprimento para cada aspecto avaliado foi: alto, meio, baixo ou não existente, de acordo com as pontuações obtidos. A ferramenta foi aplicada a um total de 63 PNH de diferentes espécies em três estabelecimentos localizados no Estados de México, Puebla e Quinta Roo. **Resultados.** A ferramenta apresentou uma coincidência importante entre estabelecimentos, resultando num índice Kappa de 0.70, 0.88 e 0.75, para cada um dos estabelecimentos avaliados. **Conclusões.** A análise dos resultados dos três estabelecimentos permitiu a formulação de uma série de recomendações para cada organização. Finalmente, a ferramenta validada foi aplicada no CIVS em Bacalar, Parque Papagaio, Povia, e teve a melhor pontuação nos três aspectos avaliados, seguido do CIVS Bacalar, sendo o último o Zoológico Zacango.

Palavras importantes: avaliação, bem-estar animal, saúde pública, saúde ambiental.

■ Introduction

Currently, assessments performed on establishments where non-human primates (NHP) are captive are partial, and at the same time judgments about their results are made and their compliance is limited on the one hand to observing the application of the law concerning the legal origin of the captive species (Wild Life General Law, 2011), and on the other hand to the compliance of the reference terms for non-industrial organizations (Sepúlveda, Philippe, Chávez et al., 2009), both leave verifying processes open. It is true that an extensive norm does not exist regarding this, and also that there is a lack of coordination between the environmental party and the Public Health (PH) and the Animal Welfare (AW) parties involved. Nowadays, efforts are being carried out to perform comprehensive assessments

by the Association of Zoological Breeding and Aquariums (Asociación de Zoológicos, Criaderos y Acuarios de México AZCARM, 2011). Their instruments must be validated so they can be considered reliable.

At the international level, assessment instruments have been applied to zoos in a comprehensive way (Agoramoorthy & Harrison, 2002; Agudelo & Villamil, 2009; Association of Zoos and Aquariums AZA, 2011a), and just some of them have been published in scientific journals. The principles of AW in a comprehensive way have been considered partially in a variety of assessment instruments, if we consider that AW can be measured and it is acknowledged that there is a range in the spectrum that goes from very bad to very good, then this does not allow moral considerations to be set apart for a better scientific work, regarding exclusively the state of physical and psychosocial health of the animals (Broom, 2001). We have to consider that AW refers to the individual and that it can vary amongst the different members of the same species, even when the conditions of their surroundings for all of them are the same (Hosey, Melfi & Pankhurst, 2009).

PH in the establishments where animals are captive should be observed in the evaluations that are carried out, as an integral part of a good practices program, which should be followed with the purpose of avoiding risks to the physical integrity of the people working there or who have contact with animals, as they risk contracting illnesses transmitted by the animals (Briceño, 2000). It is mandatory to consider the zoonoses related to NHP, considering their origin, as pathologies inherent to primates of the New World and others of the Old World are known (Pujol, 2006).

Environmental Health (EH) is a constant in the evaluations issued by the corresponding authorities, that is, the Secretariat of Environment



and Natural Resources (SEMARNAT), using the terms of reference (Sepúlveda, et. al., 2009), which consider management plans of the organizations. However, many of these organizations lack any adequate plans or they do not even have one. The Federal Bureau of Environmental Protection (PROFEPA), has released an Environmental Self-Evaluation Guide (PROFEPA, 2006), which considers several indicators of environmental compliance based on the current norms. Nevertheless, it does not consider AW, and many of the indicators do not apply, which led to discarding those indicators in order to integrate them to the instrument, in conjunction with others that have to do with the environment.

In a globalized world certification of organizations' procedures, where NHP are captive, is mandatory in order to make them competitive and not just that but also make them efficient, prioritizing AW, the well-being of people and of the environment, as the main assumptions to be assessed, in a comprehensive, reliable and impartial way, instruments like the one here presented, will be of great help. The evaluation of the processes of the organizations mentioned must be carried out according to the legal principles of each country, Mexico, specifically, has a Regulations handbook issued by the General Law of Ecological Balance and Environmental Protection (LEEGEPA) regarding Environmental Audit, which states in Article 11 (VI), the condition of confidentiality during the process of assessment of the organizations (Regulations of LEEGEPa regarding Environmental Audit, 2000).

■ Materials and methods

For the design of the instrument several scientific articles were considered as well as books related to the three areas of study, guides, laws, regulations and Official Mexican Norms, plus guidelines from the *International Primatological*

Society (IPS, 2007) and from the *World Association of Zoos and Aquariums* (WAZA, 2005). For AW the instrument is based basically on the 5 freedoms proposed by Brambell (1965), reformed by the *Farm Animal Welfare Council* in 1979, also considered are the indicators of the European Union's Animal Welfare Quality project (see annex), from the European Commission, and with criteria according to the appropriate taxonomic order of the study subject, as well as with modifications that are based on the protocol of primatologists Wolfensohn and Honess (2005) (see annex). The grading scale and recommendations for AW resulted in the following: a) 0 - 4: minimal recommendations; its level of compliance is **high** and it is graded with a number 1. b) 5 - 9: monitoring captive animals is recommended as well as considering treatment; the level of compliance is **medium** and it is graded with a number 2. c) 10 - 14: suffering exists, provide attention, enrichment and observe periodically; level of compliance is **low** and it is graded with a number 3. d) 15 - 20: severe damage, consider euthanasia; the level of compliance of standards, handling and caring protocols as well as those of space are not accomplished and therefore, it is given the value of 4 which means **non-existent**. For PH the following areas are considered: a) Organization staff: veterinarians, biologists, handlers, keepers and other staff related to the area of non-human primates and visiting public, or users (external researchers or students); b) Preventive medicine; calendar of vaccines, worming calendar, routine medical assessment according to the IPS protocols or to the organization's Management Plan; c) Levels of sanitary risk (Cediell and Villamil, 2004); documents like certificates of free from zoonotic illnesses like the tuberculin test, Mexican official norms (see annex). For PH previous studies were considered (Briceño, 2000; Agoramoorthy et al., 2002; Sánchez & Echeverry, 2004; Wolfensohn & Honess, 2005; InfoZoo, 2006) which served as a basis for the design of the following grading scale: a) 0 - 4:

minimal recommendations; level of compliance is **high**, it is graded with a number 1. b) 5 - 9: it is necessary to implement training programs; level of compliance is **medium** and it is graded with a number 2. c) 10 - 14: hire trained staff, implement security and handling of NHP programs; level of compliance is **low** and it is graded with a number 3. d) 15 - 20: the organization merits closure, mandatory issuing of zoonoses report, and it is graded with a number 4, which means **non-existent**. For EH, the following areas were proposed: a) Water: drinking water, wastewater; b) emissions; c) waste: non-hazardous waste, solid waste, municipal waste, specially handled waste, hazardous waste, infectious biologic waste and disposal of bodies; d) ground and underground; e) environmental risk and environmental impact; f) noise; and g) environmental management systems. The grading scale for Environmental Health is based mainly on the Environmental Self-Evaluation Guide proposed by The Federal Bureau of Environmental Protection (PROFEPA) (2006), the items that are non-applicable for establishments that house NHP were discarded (see annex). The grading scale for EH is: a) 90 - 100: minimal recommendations, level of compliance is **high** and it is given a number 1. b) 70 - 89: Accidents Prevention Program (APP) must be implemented, level of compliance is **medium** and it is given a number 2. c) 60 - 69: promote analysis of Environmental Impact Statement (MIA) and APP, level of compliance is **low** and it is given a number 3. d) <60 the organization merits closure, level of compliance is **non-existent** and it is awarded a number 4.

The species studied are the following: 4 wedge-capped capuchin monkeys (*Cebus nigrivittatus*); 4 ring-tailed lemurs (*Lemur catta*); 21 black-handed spider monkeys (*Ateles geoffroyi*); 2 patas monkeys (*Erithrocebus pata*); 3 common squirrel monkeys (*Saimiri sciureus*); 4 black-tufted marmosets (*Callithrix pencillata*); 2 saddleback tamarins (*Saguinus fuscicollis*); 2 mustached tamarins (*Saguinus mixtax*); 5

golden-handed tamarins (*Saguinus midas*); 4 cotton-headed tamarins (*Saguinus Oedipus*); 2 pygmy marmosets (*Callithrix pygmaea*); 2 common marmosets (*Callithrix jacchus*); 5 Rhesus macaques (*Macaca mulatta*); and 3 mantled howler monkeys (*Alouatta palliate*), which make a total of 63 NHP, distributed over three organizations: Parque Loro, in Atlixco, Puebla, Zacango Zoo, in Zacango, State of Mexico and the CIVS, San Felipe Bacalar, in Bacalar, Quintana Roo.

In order to validate the instrument, it was applied in Parque Loro with expert personnel, of whom there were three assessors, one of them belongs to the organization. Afterwards, there was a second assessment (applied twice). To measure the degree of agreement between the assessors (observers) a Kappa test was run; the confusion matrix is the most adequate structure to control the agreements and disagreements between two observers, but when there are more than two, as is the present case, the possible combinations of two-to-two, make the control difficult (Ministry of Quality and Consumption, 2006).

Cohen's Kappa coefficient was used for the test of concordance amongst the assessors, the degree of agreement between the first and the second application of each of the assessors was calculated.

Afterwards a variant of Cohen's Kappa was used: the Fleiss' Kappa (Fleiss et al, 1981), which is a statistical measure to assess the reliability of an agreement between a fixed number of assessors in the assigning of categorical grades to a series of items or elements of classification. This is contrasted with kappa such as Cohen's Kappa, which only works when the agreement between two assessors is evaluated. The measure calculates the degree of agreement in the classification and it is written down like a number between 0 and 1. Landis and Koch (1997), summarized the following criteria, for the interpretation of the



values of K: <0 corresponds to *poor agreement*; 0,0 – 0,20 *slight agreement*; 0,21 to 0,40 *fair agreement*; 0,41 to 0,60 *moderate agreement*; 0,61 to 0,80 *substantial agreement*; and 0,81 to 1,00 *almost perfect agreement*. For the statistical analysis a spreadsheet was generated and the statistics program SPSS™ was used.

■ Results

Table 1 shows the results of the concordance agreement between expert and non-expert assessors. Indexes of concordance between the non-expert assessors, regarding AW were moderate as well as those for PH, in the items related to behavior, which implies a certain expertise about the topic for the application of the instrument, especially when verification of processes, conduct pathologies, verification of preventive medicine programs, amongst others, is desired. In the case of experts, the agreements are considered to be substantial for AW and EH and almost perfect for PH. This indicates that expertise in the area permits criteria to be more uniform in order to assess; in AW and EH assessed by experts the agreement was substantial and the most notable differences were established between the expert assessor of the same organization and the external assessors; even when they tried to favor their organization, the agreement obtained was substantial, therefore the results of the grade for that organization are reliable. In Table 2, the index of concordance amongst the non-expert assessors can be seen, that is to say, after applying the instrument in two different occasions, and without any influence from the first exercise, we can see the degree of agreement in the grades each assessor assigned on the different occasions and amongst them. The concordance index for each of the non-expert assessors ranged from moderate to substantial, which indicates that even after applying the instrument in two different occasions, the criteria of evaluation were similar. It is worth mentioning

that non-expert assessors with a substantial index of concordance where the ones that had been in contact with wild animals in zoos as part of their internship.

Tabla 1. Kappa concordance coefficient amongst assessors in each of the assessed organizations

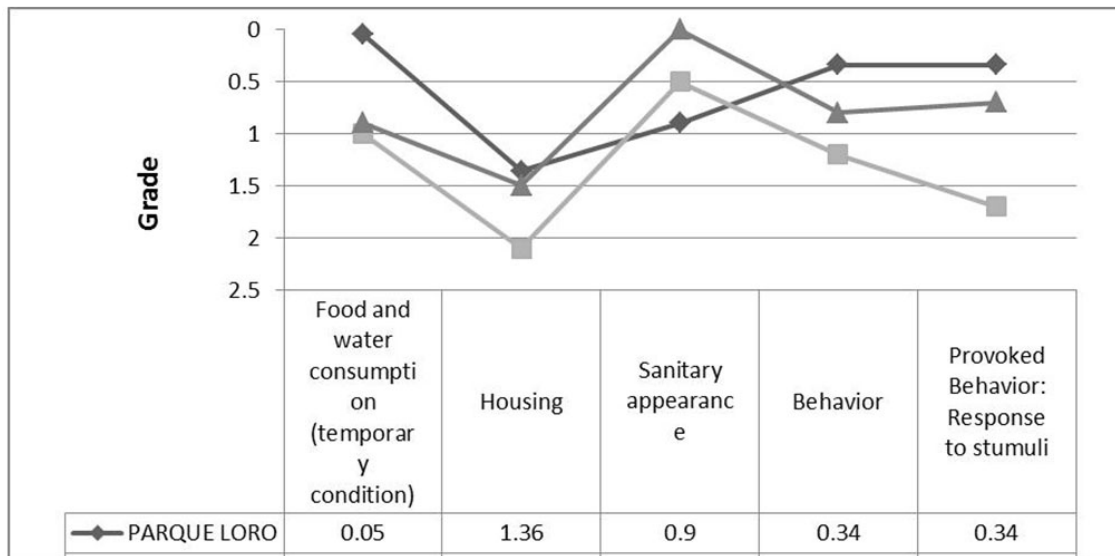
	AW	PH	EH
PARQUE LORO (Expert Assessors)	0.7	0.88	0.75
ZACANGO (Non-expert Assessors)	0.55	0.57	0.77

Tabla 2. Kappa concordance coefficient amongst non-expert assessors in Zacango

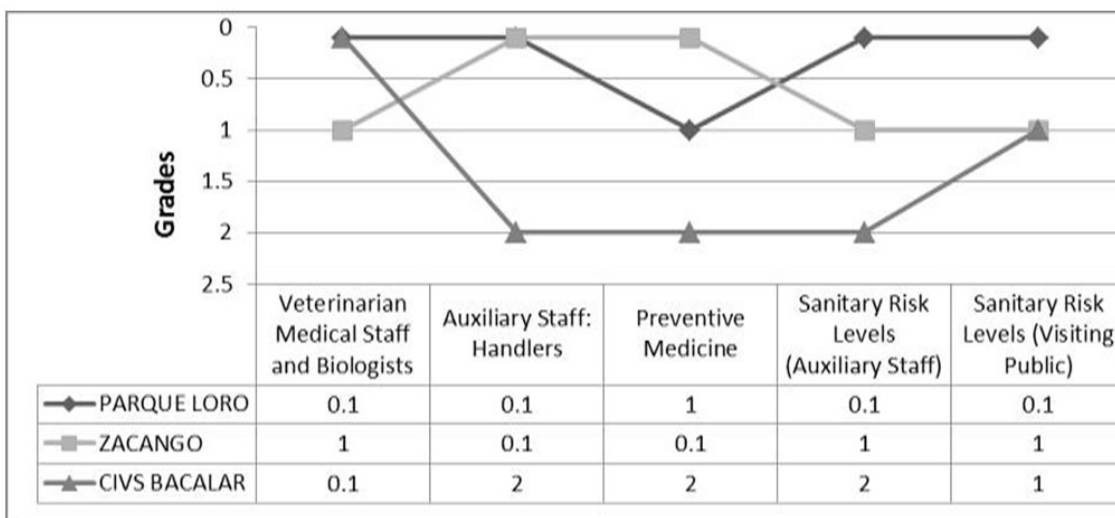
	AW	PH	EH
Assessor A	0.63	0.70	0.96
Assessor B	0.60	0.75	0.94
Assessor C	0.94	0.89	0.96
Assessor D	0.89	0.90	0.96

Finally, the results for each one of the organizations and which are described in **Graph 1** for AW,

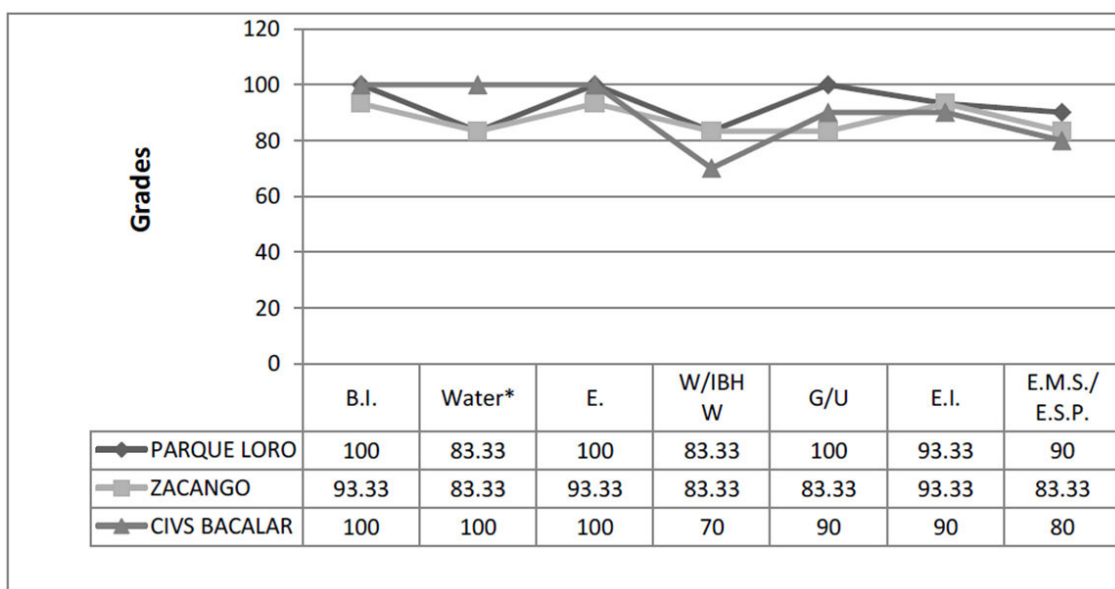
Graph 2 for PH and **Graph 3** for EH, allowed to submit several recommendations for each of them, and they gave as a result that Parque Loro obtained the best grades, followed by CIVS,



Graph 1. Grades for AW in the three organizations assessed.



Graph 2. Grades for PH in the three organizations assessed



Graph 3. Grades for EH in the three organizations assessed



Bacalar and in the last place Zacango Zoo.

B.I.- Basic Information; *Water.- wastewater, sources of water; E.- Emissions; W/IBHW.- Waste / Infectious Biological Hazardous Waste; Ground / Underground; E.I.- Environmental Impact; E.M.S.- Environmental Management Systems / E.S.P.- Energy Saving Programs.

■ Discussion

When comparing the instrument designed with the protocols used for the assessment of zoos with the ones carried out by InfoZoo (2006) in Europe where only some aspects are observed, especially those regarding other legislations, the instrument assessed in this study involves various legal criteria specific to our country. Furthermore, the assessment carried out by Agudelo et al. (2009) in five zoos in Colombia, correspond to aspects of EH and PH, leaving out the assessment of AW. In that sense the assessment of a Cuban zoo (Dulzaines, Cepero & Lazo, 2010), also centers on aspects of biosecurity. Contrariwise, the assessment carried out by Agoramoorthy et al. (2002) and Almazan et al. (2005) in various Asian zoos, includes criteria of AW (the Five Freedoms) and ethics, although they are not mentioned in the papers and contrarily, they do not incorporate sanitary aspects. Regarding the comparison between the accreditation manual from the AZCARM (2011), it is difficult to make one as the criteria of evaluation mentioned here are more objective, reducing as far as possible subjective appreciations by allowing a scale of values and following a valid methodology for this type of tests. Baschetto (2000) proposes an assessment method similar to the one of the InfoZoo (2006). In order to attain the best handling and animal welfare standards, currently several zoos around the world are going through an accreditation process. For example, the Animal Welfare Committee from the Association of Zoos and Aquariums in the USA established in 2000 (Barber, 2009), has developed a framework

that allows the recommendation of animal care programs. By September 2011, this association had accredited 225 zoos, most of them in the USA, 3 in Canada, 2 in Mexico (Africam Safari in Puebla and the Zoological Park in León, Guanajuato), 1 in Bahamas, 1 in Argentina, and one more in Hong Kong (AZA, 2011b). Currently the AZA works on standards by Taxon with the aim of publishing guides for the proper function of zoos, which obey to international principles, and especially according to the legislation of the USA. In Mexico we will have to follow the national legislation code, which means that adopting guidelines from other countries, without exhaustive revision, is inadequate. It is vital to design adequate instruments for Mexico, and not repeat the experiences of copying without considering cultural, geographical, economic and legal aspects. Traditionally, like in all professions, programs are accredited, that is, institutions, in this case, shelters for NHP, whether zoos, parks, Vivariums, or UMAS (Handling Units for the Conservation and Sustainable Exploitation of Wild Life) and professionals are certified, that is, all members of the Organization. Certification, thus, ensures that animals visited receive an excellent treatment every day. A certified zoological organization ensures the visitors that the organization complied with legal rigor and professionalism the standards of animal welfare, and with the handling, veterinary care, environmental enrichment, nutrition and staff training (AZA, 2011a). The Pan-American Health Organization, records that zoonoses represent an important threat to the well-being of the world's population. On the other hand, several anthroozoonoses also exist, in the case of NHP, for example, chickenpox, which can be transmitted from children to primates (McNamara and Cook, 1995). Hence, the need to increase improved sanitary measures to reduce the risk of interspecies disease transmission.

Primates are used in diverse projects, including research on infectious diseases, cancer,

neurosciences, heart disease, nutrition and reproduction, the development of drugs and the assessment of security and behavior studies (Sibal & Samson, 2001). Constant and generalized use of NHP firmly suggests that they will continue to be used as animal models in the research of human diseases. According to annual reports published by the United States Department of Agriculture, the number of non-human primates used or destined to be used in research, has been stable in the last decade, around 52,000 animals per year. In Mexico, the number varies and reliable data is not available (Sibal et al., 2001). Certification for laboratories where NHP are used, focuses on the assessment of processes compliance established in the current official norms in our country, leaving out other essential indicators related to animal welfare, as there does not exist a clear norm and instruments to evaluate them (BIRMEX, ISO-9001:2008 certification; <http://www.certification-iso.com/9001-2008/>). Concern for the use of NHP in research will exist as long as they cannot be replaced by other models.

■ Conclusion

In the validation process and with the help of experts several corrections were made to the instrument until there was a final version. The validity tests, of appearance and content were appropriate; also, the corrected instrument was sensitive to the different conditions of the organizations. The application of the corrected instrument by different people in the Zacango Zoo, provided results comparable to those of Parque Loro, indicating an adequate reliability. Usability determination showed that the average time of application of the instrument that requires the presence of the director or of the veterinarian in charge of the area was of 60 minutes and of the one applied to the workers was of 15 minutes. No special conditions were required from the people surveyed and the surveyors did not require

any training beyond the full understanding of the instrument and of its manuals or application guides. The average time for the grading of the instrument was of one hour and thirty minutes.

■ References

- Agoramoorthy, G., Harrison, B. (2002). Ethics and animal welfare evaluations in South East Asian zoos: A case study of Thailand. *J. Appl. Anim. Welf. Sci.*, 5 (1): 1-13.
- Agudelo, S. A., Villamil, J. L. (2009). Evaluación de la salud pública en algunos zoológicos de Colombia. Fase I: diseño y validación de instrumentos. *Rev. salud pública*, 11(5): 774-783.
- Almazan, R. R., Rubio, R. P., Agoramoorthy, G. (2005). Welfare evaluations of nonhuman animals in selected zoos in the Philippines. *J. Appl. Anim. Welf. Sci.*, 8 (1): 59-68.
- Association of Zoos and Aquariums AZA. (2011a). Accredited by the Association of Zoos & Aquariums. Recovered [10-12-2011]: <http://www.aza.org/uploadedFiles/Accreditation/accred-rack-card.pdf>
- Association of Zoos and Aquariums AZA. 2011b. *Current Accreditation List*. USA: Association of Zoos & Aquariums. Recovered [10-12-2011]: <http://www.aza.org/current-accreditation-list/>
- Asociación de Zoológicos, Criaderos y Acuarios de México AZCARM. (2011). *Manual de Acreditación*. México: Asociación de Zoológicos, Criaderos y Acuarios de México, A. C.
- Barber, J. C. (2009). Programmatic approaches to assessing and improving animal welfare in zoos and aquariums. *Zoo Biol.*, 28: 519-530.
- Briceño, I. C. (2000). Diseño, Aplicación y



Evaluación de un Plan Educativo sobre Seguridad Ocupacional para los Trabajadores de la Unidad de Manejo y Salud Animal del Parque Zoológico y Botánico Bararida en Barquisimeto, Estado Lara. Thesis for Specialty Degree. Occidental University "Lisandro Alvarado", Colombia. pp. 2-4. Recovered: <http://bibmed.ucla.edu/ve/DB/bmucla/edocs/textocompleto/TWA440B752000.pdf>

Broom, D. M. (2001). Coping, stress and welfare. In: Broom, D. M. (Ed.). *Coping with Challenge: Welfare in Animals Including Humans*. Berlin: Dahlem University Press. pp. 1-9.

Dulzaines, C. T., Cepero, R. O., Lazo, P. L. (2010). Propuesta de una metodología para la evaluación de la bioseguridad en zoológicos tradicionales. *RedVet*, 11 (03B): 9.

Fleiss, L. J., Levin, B., Paik, C. M. (1981). *Statistical Methods for Rates and Proportions*. 3th ed. USA: Wiley-Interscience. John Willey & Sons, Inc. Pub. pp. 608-610.

Hosey, G., Melfi, V., Pankhurst, S. (2009). *Zoo Animals: Behaviour, Management and Welfare*. Oxford: Oxford Univ. Press.

InfoZoo. (2006). La Salud de los Zoos. Adecuación de los Parques Zoológicos Españoles. Protocolo de Evaluación. Adecuación de los Parques Zoológicos Españoles al Real Decreto 31/2003, Born Free, For Eurogroup Animals Depana España. [*Health in Zoos. Adjustment of Spanish Zoo Parks. Assessment Protocol. Adequacy of the Spanish Zoo Parks to the Royal Decree 31/2003, Born Free, For Eurogroup Animals Depana Spain.*]

International Primatological Society IPS. (2007). *International Guidelines for the Acquisition, Care and Breeding of Non-Human Primates*. 2nd ed. Spain. 76 pp. Recovered : [http://www.internationalprimatologicalsociety.org/](http://www.internationalprimatologicalsociety.org/docs/IPS%20International%20Guidelines%20for%20the%20Acquisition%20Care%20and%20Breeding%20of%20Non%20human%20Primates__Second%20Edition%202007_Spanish.pdf)

[docs/IPS%20International%20Guidelines%20for%20the%20Acquisition%20Care%20and%20Breeding%20of%20Non%20human%20Primates__Second%20Edition%202007_Spanish.pdf](http://www.internationalprimatologicalsociety.org/docs/IPS%20International%20Guidelines%20for%20the%20Acquisition%20Care%20and%20Breeding%20of%20Non%20human%20Primates__Second%20Edition%202007_Spanish.pdf)

Landis, J. R., Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33: 159-174.

Ley General de Vida Silvestre. (2011). [General Law of Wild Life. 2011.] Recovered: <http://www.diputados.gob.mx/LeyesBiblio/pdf/148.pdf>

McNamara, T. S., Cook, R. A. J. (1995). Clinical challenge case 3. *Zoo Wildlife Med.*, 26(1): 167-169.

Ministerio de Calidad y Consumo. (2006). Informes de Estudio de Investigación. Elaboración y Validación de Instrumentos Metodológicos para la Evaluación de Productos de las Agencias de Evaluación de Tecnologías Sanitarias. Ministerio de Salud Español. pp. 31-52. [Ministry of Quality and Consumption. 2006. Research Study Reports. Elaboration and Validation of Methodological Instruments for the Assessment of Products from the Assessment of Sanitary Technology Agencies. Spanish Health Ministry. pp. 31-52.]. Recovered : <http://www.madrid.org/cs/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobheadername1=Content-Disposition&blobheadervalue1=filename%3DUE+TS+2006-01.pdf&blobkey=id&blobtable=MungoBlobs&blobwhere=1220448334526&ssbinaray=true>

PROFEPA. (2006). Guía de Autoevaluación Ambiental. México: Procuraduría Federal de Protección al Ambiente. [*Environmental Self-Evaluation Guide*. Mexico: Federal Bureau of Environmental Protection.] Recovered: <http://www.videsacom.mx/legislacion/ambiental/GUIA.pdf>

Pujol, F. H. (2006). Virus en primates no humanos: zoonosis, antropozoonosis y biodiversidad. *Interciencia*, 31 (6): 396-402.

Reglamento de la Ley General de Protección al Ambiente en Materia de Auditoría Ambiental. (2000). Cap. 2: Desarrollo de Auditorías Ambientales. Artículo 10, numerales V-VI. [General Law Regulations for the Protection of the Environment in Environmental Audit Matters. 2000. Ch. 2: Development of Environmental Audits. Article 10 (V-VI).] Recovered: http://www.conagua.gob.mx/CONAGUA07/Noticias/Reg_LGEEPA_MAA.pdf

Sánchez, R., Echeverry, J. (2004). Validación de escalas de medición en salud. *Rev. Salud Públ.*, 6(3): 302-318.

Sepúlveda, J., Philippe, S., Chávez, F., Chang,

L., Ortega, H. (2009). Términos de Referencia para Organizaciones no Industriales. [Terms of Reference for Non-Industrial Organizations] Recovered: <http://www.profepa.gob.mx/innovaportal/file/534/1/PFPA-SAA-152-DTR-01.pdf>

Sibal, L. R., Samson, K. J. (2001). Non-human primates: A critical role in current disease research. *Lab. Anim. Res. J.*, 42: 74-84.

World Association of Zoos and Aquariums WAZA. (2005). Building a Future for Wildlife. The World Zoo and Aquarium Conservation Strategy. Bern, Switzerland, WAZA Executive Office.

Wolfesohn, S., Honess, P. (2005). Handbook of Primate Husbandry and Welfare. UK: Blackwell Pub. Ltd. pp. 25-27 and pp. 61-64.

■ Annexes

Annex 1. Animal Welfare Criteria Established for the Welfare Quality Project®

Good feeding	Absence of prolonged hunger Absence of prolonged thirst	Animals should not suffer prolonged hunger Animals should not suffer prolonged thirst
Good housing	Comfort around resting Thermal comfort Ease of movement	Animals should have comfort around resting Animals should have thermal comfort Animals should have enough space to move around freely
Good health	Absence of injuries Absence of disease Absence of pain induced by management procedures	Animals should be free of physical injuries Animals should be free of disease Animals should not suffer pain induced by inappropriate handling.
Appropriate behavior	Expression of social behaviors Expression of other welfare related behaviors Positive emotional state (General absence of fear)	Animals should be able to express normal, non-harmful social behaviors. Animals should be able to express other normal non-harmful behaviors such as foraging and playing. Negative emotions such as fear, distress, frustration and apathy

Source: European Union Animal Welfare Quality Program. Available from: <http://www.welfarequality.net/everyone/43148/9/0/22>.



Annex 2. Animal Welfare in Non-Human Primates Assessment*

Parameter	Assessment Criteria	Score
Food and water intake (Physical condition)	Weight range within the species, sex and age; diet according to the NRC for NHP (2003)	0
	Underweight or overweight: +/- 5%	1
	Underweight or overweight 10 to 15%	2
	No food or water intake	3
Housing	In compliance with standards for the specific species (IPS, WAZA).	0
	Partially in compliance with minimal standards for the species.	1 - 2
	Does not comply with minimal standards for the species.	3
Sanitary Appearance	Absence of disease symptoms.	0
	Moderate symptoms of disease.	1
	Disheveled coating, ocular and nasal discharges	2
	Piloerection and hunched up	3
Behavior	Absence of psychological disease symptoms	0
	Minor symptoms of psychological disorders	1
	Very little movement, hyperesthesia, isolation, zoothotic behavior	2
	Vocalization, apparent self-mutilation, restless or still	3
Provoked Behavior: Response to stimuli	Within the parameters according to its species.	0
	Minor depression or exaggerated response to stimulus.	1 - 2
	Reacts violently or very weak and precomatose.	3
SCORE	If you have scored a 3 more than once, score an extra point for each 3	2 - 5
	TOTAL	0 - 20

*Based on the protocol proposed by Wolfensohn S. and Honess P. (2005)

Annex 3. Assessment of Public Health in Non-Human Primates

Indicator	Criteria	Score
Veterinarian Medical Staff and Biologists	3 or more years' experience in the handling of captive non-human primates	0
	Less than 2 years' experience in the handling of captive non-human primate	1
	No experience in the handling of captive non-human primate	2
	Veterinarian with immunodepressive disease / There is no veterinarian	3
Auxiliary Staff: Handlers	Experience in the handling and physical restraint of non-human primates	0
	No experience in the handling and restraint of non-human primates	1 - 2
	Suffers from immunodepressive disease	3
Preventive Medicine	Programs of preventive medicine exist and are in full compliance with NOM-166-SSA1, (1997), NOM-062-ZOO (1999) and with the IPS (2007) guidelines.	0
	Preventive medicine programs exist but are partially applied	1
	Some staff are tuberculosis or other immunodepressive disease positive	2
	Reports of tuberculosis positive cases and of other zoonoses in non-human primates as well as in other species housed in the same establishments	3
Sanitary Risk Levels: Auxiliary Staff	Low: Activity or stage that does not imply in itself exposure to blood or other body fluids	0
	Medium: Activity or stage where contact with blood or other body fluids is permanent	1 - 2
	High: Stage where there is direct or permanent contact with potentially hazardous blood or other body fluids	3
Sanitary Risk Levels: Visiting Public and other Users	Low: Activity or stage that does not imply on its own exposure to blood or other body fluids	0
	Medium: Activity or stage where contact with blood or other body fluids is permanent	1 - 2
	High: Stage where there is direct or permanent contact with potentially hazardous blood or other body fluids	3
SCORE	If you have scored a 3 more than once, score an extra point for each 3	2 - 5
	TOTAL	0-20

Annex 4. Assessment of Environmental Health in Non-Human Primates

Grade	Recommendations	Level Of Compliance
90 - 100	Minimal	HIGH 1
70 - 89	An Accidents Prevention Pprogram (APP) needs to be implemented	MEDIUM 2
60 - 69	Promote analysis of Environmental Impact Statement (MIA) and APP	LOW 3
<60	Organization merits closure	NON-EXISTENT 4