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Karyological diagnosis of *Cebus* (Primates, Platyrrhini) in captivity: Detection of hybrids and management program applications

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Abstract

Genetic data are very important for conservation programs in wild population as well as in captive conditions. Primates in zoos or breeding centers are often maintained in groups without geographic origin or genetic heritage information. These lead to the incorrect assignment of species and introduce an artificial reproductive barrier, which in turn constitutes inadequate management of the colonies. A karyological analysis of specimens from a Primate Reproduction Center, considered as *Cebus apella* (Platyrrhini), was performed. Cell cultures were conducted from peripheral blood samples following standard cytogenetic methods. A fluorescence *in situ* hybridization (FISH) procedure was applied in mitotic metaphases using two probes: A specific probe of the extracentromeric heterochromatin (He+) of *Cebus*, and a human chromosome 21 probe. The latter was chosen due to the known homeology with the euchromatic region limiting with 11qHe+ of *Cebus*. The species status was determined for at least half of the animals and identified a hybrid specimen using this combined FISH protocol. This procedure is an accurate diagnostic

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methodology for taxonomic determinations and, therefore can be used for management of reproduction in colonies.

Keywords: Cytogenetic diagnosis; Primate taxonomy; *Cebus*; Heterochromatin; FISH

1. Introduction

Besides species captive management and conservation, the correct taxonomic identification of colonies is essential for experimental studies in general and biomedical research in particular. An incorrect diagnosis of animals increases variance of research data (Schreiber et al., 1998). According to international recommendations, all the animals used in biomedical research must be well defined in terms of their genetic constitution through genetic monitoring that ensures reproducibility and scientific validated results (Zúñiga et al., 2001; Benavides and Guénet, 2003). These recommendations apply particularly when the experimental protocols require starting or maintaining a reproductive colony. In these cases there is an institutional compromise of characterize the pedigree of the animals and the responsibility of provide taxonomic, ethological, and biological classified specimens.

With laboratory animal populations, inbred lines of rodents are prevalent. Repeatedly brother–sister mating maintains these strains over generations so, the inbreeding is continuous. However, close inbreeding is considered unusual in natural populations of mammals (Hartl, 2001). Regarding genetics, highly inbred lines lack variability from one individual to the next, in each generation. Considering another experimental model, the non-human primates, the Home Office Science Research & Statistics indicates the use of these mammals in biomedical research is less than 1%, and decreasing each year (Zúñiga et al., 2001). In zoos these animals are often maintained in colonies arranged without information of geographic origin or are of unknown genetic heritage (Fogle, 1990).

Taxonomy and cytogenetics

Over the last two decades the genus *Cebus* (Cebidae) has been considered to include four species, recognizing two groups: the "tufted" group consisting of just one species, *Cebus apella* (brown, black-capped or hooded capuchin); and the "untufted" group that includes *Cebus capucinus* (white-faced, white-throated or black and white capuchin), *C. albifrons* (cinnamon or white-fronted capuchin) and *C. olivaceus* = *nigrivittatus* (wedge capped) (Hershkovitz, 1949). Among the *C. apella* group, there is a current controversy over the species or subspecies status of taxa (Rylands et al., 2005). The black or black horned capuchin *C. nigritus*, formerly considered a subspecies of *C. apella* was elevated to species by Groves (2001) and Silva Jr. (2001), and also adopted by us taking in consideration the peculiararities of its karyotype. Regarding the external phenotype, it has a very dark brown or even blackish body with almost no dorsal stripe. Its limbs are darker than its body and its underside is deep reddish with a black overlay. The face is white and contrasts with the rest of the body. The cap is dark and tufts, if present, can be erected or directed sideways or ahead. Another "tufted", the black-striped capuchin, is considered by Groves (2001) as *C. libidinosus paraguayanus*. During the last 20 years we adopted Cabrera (1958) a classification of *Cebus*, so, we accepted this species as *C. apella paraguayanus*. Considering karyotype and phenotype, every "tufted" species has a distinguishing karyotype, in addition to