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Methodology and geneticist's responsibility facing sociological aspects and specificities of a multiethnic society: The case of Reunion Island (Indian Ocean)

Vincent Dubut¹, Thierry Malbert², François Cartault³, Pascal Murail¹

¹Université Bordeaux 1 -France, ²Université de La Réunion –France, ³ Service de Génétique, CHD Félix Guyon –France

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ABSTRACT

Reunion Island, a French '*département*' located in the Indian Ocean, is a multiethnic and multicultural society. Through a process of creolisation, it was shaped by biological and cultural contributions from Africa, Madagascar, Europe, and Asia (mainly India and China). The events involved in its settlement are highly documented by historical, archival, and genealogical sources and studies. Thus, concerning population genetics, this population appears to be a favourable field in order to study the formation processes of a population stemming from numerous admixtures. Nevertheless, through the example of Reunion, we show in this paper how it is important to take into consideration the ethno-social context of a multiethnic society, when one wants to study its shaping processes. The anthropologist has to take into account numerous sociological elements, such as folk knowledge and representations about DNA or race, and the socio-economic context of the society formation. Indeed, the anthropologist has to reduce the potential gap between folk culture and scientific knowledge to be able to explain his aims and the methods he uses. In this way, the anthropologist will minimise the negative impact his work might have on the studied population. Lastly, in order to make the methodology more suited to the local specificities, we also show how the molecular anthropologist has to consider the cognitive anthropological and sociological studies dealing with the inquired population.

“[...] An expanded literacy in the evolutionary and genetic sciences will be crucial in the coming decades if societies are to address the growing technical challenges in biology”.

John C. Avise, 2003

“[...] Science is a validation mechanism in modern society, and scientists bear a responsibility for what they say about the scientific analysis of our species”.

Jonathan Marks, 1995.

Introduction

Through the analysis of human molecular data (proteins or DNA) and the comparison of allelic frequencies across populations, Molecular Anthropology permits a better understanding concerning (i) the stemming processes of the human species, (ii) the processes implicated during the colonisation of nearly all the available global environments by Man (for a global review, see Klein & Takahata, 2002), and (iii) the biological interactions between human populations, i.e. ancient or recent admixtures (ex: Chikhi et al., 2002; Helgason et al., 2000). While rarely carried out by anthropologists, this type of study *does* belong to the anthropological realm.

Moreover, although they aim at studying mankind, works that describe how exactly these researches are carried out are rare. Particularly rare are those which detail the human aspects involved in their elaboration and their development. But yet, in practice, the sampling period cannot be reduced to a neutral collection of blood, hair roots or buccal swabs. It is worth enlightening this period by socio-anthropological studies. Indeed, beyond what these samples represent for the scientist (a source of DNA, and thus the core element of all his work), they stem from conscious persons, who live in a singular socio-cultural and familial milieu. These factors will act when these persons will be faced with a study that aims to enlighten the past using archives situated at the heart of their cells, at the heart of their privacy: DNA. The work about the settlement history of Reunion Island (Indian Ocean) we began on April 2003 gave rise to a reflection about these socio-anthropological aspects.

Studying the settlement of Reunion Island presents a fundamental interest in understanding the mechanisms implicated in the formation of a new population. Indeed, genetic markers [Y-chromosome and mitochondrial DNA (mtDNA) polymorphisms in our case] and statistical methods used to reconstitute migratory and admixture events usually are handled while detailed historical data are lacking. The Reunionese framework, being historically highly documented, appears relevant to test the validity of these markers and methods by confronting them with historical and genealogical data. Moreover, our study aims at better understanding the processes of diffusion of some genetic diseases. While not linked to the genes implicated in the diseases, Y-chromosome and mtDNA polymorphisms revealed to be good indicators in this perspective (McElreavey & Quintana-Murci, 2002). Then, the information these markers will provide could help to target and facilitate the genetic counselling.

Nevertheless, which socio-cultural elements must be taken into account when a study dealing with DNA polymorphisms is carried out? Especially when one considers a multiethnic population. What can this account contribute to the methodology, notably to the sampling design, and to the way of exposing and explaining the project and the results from it? We could identify these elements through the difficulties we met during the sampling period, but also through the ambiguities that such a work can generate within the studied population. Before dealing with this analysis, we expose here the historical and socio-economical context of the formation of the Reunionese population. We also describe the sampling methodology we used. Indeed, the way Reunionese people reacted confronted with our study intimately is bound to these elements.

I Reunion Island: historical and ethno-social context

I-a The settlement: chronology and components

In 1642, the *Compagnie Française des Indes Orientales* became the owners of Reunion Island which then was named Bourbon, as a tribute to the dynasty of the Kings of France. The first colonists populated this French territory only from 1663. Among these first colonists were Europeans (mainly originating from France), but also some Malagasy servants. The settlement started rather slowly, and admixtures initially were accepted. Afterwards, ethnically dual marriages were forbidden (Jacob de La Haye's ruling, 1674, reinforced by the application of the *Code Noir* in Bourbon on 1723; Scherer, 1998). During the 18th century and until 1848 (when slavery was abolished), numerous slaves were imported from Africa (mainly from the Eastern and South-Eastern coasts, but also from the Gulf of Guinea), from Madagascar and India.

Additionally, from the beginning of the 19th century, but intensively after 1848, Reunion called for workers who freely –at least formally– had signed a working contract: the *engagés* (literally, the 'hired', i.e. contractual workers). This workforce came from regions previously concerned by slavery, notably Madagascar and the Eastern and Southeastern coasts of Africa, but they were primarily Indians, especially originating from Southwestern and Southeastern coasts of India. Furthermore, by the end of the 19th century, and for the first part of the 20th century, a more or less free immigration took place, primarily involving people originating from South-Eastern China, and from Northwestern India.

Currently, the population of Reunion is made up of about 740,000 inhabitants. During its 350 years of history, the Reunionnese population was deeply affected by admixtures between groups stemming from sharply contrasting parts of the world. Admittedly, these admixtures were bound to the vicinity of the different groups. But these admixtures were predominantly the result of the imbalance of genders that can be noticed for all the arriving groups. At least in the first stage of the flow, men came in first (one way or another) and many of them joined women stemming from a different ethnic group.

I-b The Reunionnese ethnic groups

In Reunion, redistributing the genetic variation across the different ethnic groups, cultural and socio-economic factors contributed both to the recombination of the involved genetic pools, and to the (relative) maintaining of endogamy. As a result, a complex combination between different immigrations, and cultural and social interactions led to the emergence of six principal ethnic groups.

We considered as a basic definition of the Reunionnese groups the ‘nomenclature’ used by Reunionnese themselves (ex: Médéa, 2002). The *Créoles Blancs*, sometime called *Yab*, are identified as descendants from the European colonists. The *Malbar* are identified as descendants from workers enlisted during the 19th century and originating principally from Southern India. The *Shinoi* are identified as descendants from immigrants originating primarily from the Chinese Province of Guangzhou. The *Zarab* are identified as descendants from the Muslim Indian immigrants primarily from Gujarat. The *Kaf* are identified as descendants from slaves or *engagés* originating from Africa and Madagascar. The *Créoles Métis* could be identified as one-seventh group. Nevertheless, following Ghislaine Bessière’s definition of the *Kaf* group (2003), the majority of individuals that declared themselves *Créoles Métis* were clustered within the *Kaf* group. Insofar as most of the *Créoles Métis* had identified across their genealogy some persons that were descendants from Afro-Malgasy slaves or *engagés*.

I-c Creolisation and identity processes in Reunion

The Reunionnese society was built through a creolisation process. Creolisation is a local-scale phenomenon that leads to the emergence of a new socio-cultural entity by means of cultural and biological admixtures. The cultural and ethnic diversity is a central parameter in this process (Glissant, 1997). Creolisation in Reunion is described as synthetic (Médéa, 2002), since it leads to the emergence of a new identity. Nonetheless, the Reunionnese society preserves an ethno-cultural segmentation to some extent.

Through creolisation, two types of forces can be distinguished that are involved in the Reunionnese identity construction. On the one hand, centrifugal-type forces consist of the affirmation of each group’s specificities, each group being in pursuit of ties with the country of origin. On the other hand, centripetal-type forces tend to merge Reunionnese together around their shared culture, history, traditions, values, and therefore around a shared identity.

Since the 1960’s, and even moreso since the 1980’s, the Reunionnese groups left an identity formation stage, a conflicting, involuntary, contradictory, and non-concerted historical process, and entered an identity construction stage, a conscious and deliberate process (Médéa, 2003). Two types of situation are found in the processes of identity reconstruction. The first occurs when the links with the country of origin could have been more or less maintained since the ancestors’ arrival time –through the survival of some traditions, of religion, etc.. In such cases, the cultural re-appropriation is easier, the country of origin, its culture, its rites, etc., being clearly identified. This situation currently occurs among the *Zarab*, the *Shinoi*, as well as in upper classes and some middle classes of the *Malbar* and of the *Créoles Blancs* (reviewed in Médéa, 2003). On the contrary, the identity of the ethnic group must be entirely re-constructed when the cultural and religious bonds with the country of origin were broken on the immigrants arrival in Reunion. The *Kaf* are in this case: until the beginning of the 1980’s almost nothing was said about slavery among Reunionnese, it has been almost denied

(Bessi re, 2002). Since the 1980's, the *Kaf* are attempting to recover their Afro-Malagasy identity. Notably, several cultural associations have been created that militate in favour of the recognition of slaves as historical actors.

Chronologically, the first centripetal force was the catholic religion. By advocating the non-catholic people to drop their initial traditions in favour of those of Christianity, Catholicism clustered the different ethnic groups around common values and hierarchy. Then, from this first shared identity substrate, the formation of the Reunionnese cultural identity could start. Occurring primarily from the lower classes, this identity formation started between 1900 and 1940, the first cultural and cultural interactions being noted at this time (M d a, 2003). In 1946, Reunion gained the status of a French *d partement*. The French administration then began to pursue assimilationist socio-cultural politics by imposing French culture, and denying the values, the language, and the culture of Reunionnese people. In reaction to this politics, several ideological movements successively appeared (*Cr olit , Cr olie, Batarisit , R unionnit *) that assert the right to regain and valorise the Creole language, the Reunionnese identity and its cultural plurality (reviewed in M d a, 2002). This Reunionnese (or Creole) identity is conceived as being based on interculturality and multiethnicity. Therefore, the Reunionnese engaged in this process tend to reject all the ethnic identity claims. These claims are seen as a threat, as a factor that could divide the Reunionnese society (Labache, 1999). Since the Afro-Malagasy component is still underestimated in the Reunionnese society, as well as the original rejection, some Reunionnese of Afro-Malagasy origin reject as well the African part of their identity (M d a, 2003).

Additionally, biological and cultural admixture is recognised as a central force involved in the creolisation process (Barat et al., 1986). This centripetal-type phenomenon joins and combines the members from different ethnic groups, cultures and traditions. In creole societies, the *M tis* is thus led to construct an original, often hybrid identity. Sometimes, he can feel uneasy to identify himself to any particular group. This lack of well-recognised identity leads to three types of identity positioning (that do not exclude one another): (i) some Reunionnese choose to use the various identities they received from their parents (or other members of their family) alternatively (Benoist, 1992; Fuma & Poirier, 1992) in order to adapt their identity positioning according to the familial, social, professional or religious milieu, or according to their objectives (Labache, 2002), (ii) the plural origin can generate among some other Reunionnese an identity 'vagueness' stage, rather in absentia they thus define themselves as Creole or Reunionnese (observed especially among young Reunionnese; Labache, 1999), and (iii) some Reunionnese prefer claiming their *Cr olit * or *R unionnit *.

II Sampling methodology

II-a The Reunionnese groups: a inevitable ‘stereotype’?

Most of the methods used in population genetics more often than not lead to a categorisation process. Indeed, through the study of their frequencies and their phylogenetic nature, the comparison of alleles across the populations make it possible to infer the genetic history of, and the relations between the populations under consideration. Through elements indicating a potential structure of the population's genetic pool, taking the diversity of a population into account is decisive for the validity of the obtained or inferred information. Though only ecological and/or geographical criteria can be integrated in the process of structure inference for the other living organisms, as regards the human species, some other elements, notably ethno-historical elements, have to be considered in order to evaluate the potential genetic diversity and structure of a population. Concerning Reunion Island, the ethno-historical data highlight two types of parameters that influenced the formation and the evolution of the population: (i) some historical and socio-economical factors favoured admixtures, and tended to homogenise the involved genetic pools, and, (ii) at the same time, some other social, economical, and cultural elements put up barriers in front of this homogenisation. While geographical factors had limited impacts –and ecological ones had none–, some complex socio-economical factors (deeply acting on the Reunionnese society building; Cherubini, 2002, chapter 9) contributed simultaneously to the recombination of the genetic pools and to the (relative) maintaining of endogamy. Consequently, they contributed all together to the drafting of one singular biological history for each group. Once again, one can realise that within our species, these are social and cultural factors that pattern biology, not the opposite (Marks, 1995; Cavalli-Sforza, 1997; Macbeth, 1997). Therefore, if the Reunionnese population had been considered as a homogenous whole, a bias would have been introduced at the sampling stage level. Afterwards, this bias would have had consequences on the data processing and on the results interpretation. Indeed, we could previously demonstrate how the sampling procedure can act on the qualitative and quantitative results obtained from the analysis of mtDNA data (Dubut et al., 2004). In this previous case, regional sampling revealed essential to both study the history of a population at a micro-geographical scale, and enhance the phylogeographical resolution of the samples. In Reunion, regional parameters are supposed to have a lesser influence on the pattern of the genetic pools. Rather, these are the ethno-social parameters that seem to have had the stronger impact on the genetic pattern.

We thus rapidly faced the methodological problem related to the boundaries between the Reunionnese groups. Indeed, these groups being largely overlapping (culturally and genealogically; Barat, 1990), their boundaries are then blurred. In order to better define these boundaries, we entered a categorisation process concerning the Reunionnese population. Deschamps (1992) described two types of categorisation: this leading to stereotype, and this leading to social discrimination. The stereotype allocates some similar characteristics to the different members of a same group, and it tends not to take into account inter-individual differences. On the contrary, the social discrimination

opposites the categories it generated by emphasizing the differences between individuals belonging to different groups. Through focusing on cultural, religious or genealogical parameters, we enter a conscious stereotypical process. This focus helped us in delineating groups among which Reunionnese who participated could recognise themselves.

II-b The sampling: ethical and legal views

The North American Regional Committee of the Human Genome Diversity Project¹ (NARCHGDP, 1997) recommends sparing time for making contacts and evaluating the ethno-social characteristics and specificities of the population one plans to study before the sampling stage. In April and May 2003, our project was exposed to and discussed with Reunionnese historians, anthropologists and sociologists whose field of research is related to the history of the Reunionnese population and/or its socio-cultural implications. Taking into account the historical context, as well as its consequences into the current structure of the Reunionnese society, this period ensured to finalise or modify the strategy that would be used in order to study the genetic variability of the Reunionnese population.

Before we met the potential volunteers, we contacted some associations and some moral or religious authorities. We explained to them in detail the aims, scopes, and methodology we were going to use. Subsequently, the aims of the study and the questionnaire were expressed in Creole language to volunteers when necessary. The biological sampling procedure –cheek scraping– was selected because it minimises folk representations as regards to heredity (as for blood) or as regards to occult or magical practises (as for hair).

We did not decide to which group each volunteer belonged. These were asked to identify themselves according to the panel of the Reunionnese ethnic groups (see above). It has to be noted that many Reunionnese have ascendants belonging to different groups. In order to compensate for these recent admixtures, the interview protocol included questions about the ethnic affiliation of the volunteer's ascendants (if possible, up to the great grand-parents). Indeed, before the second half of the 20th century, the boundaries between the ethnic groups under study were less easily crossed than they are today. Moreover, the genetic markers we studied are uni-parentally transmitted. MtDNA is transmitted by women only, and its polymorphisms thus recount the cognatic (strictly maternal) descent. The Y-chromosome solely is transmitted from father to son, and its polymorphisms recount the agnatic (strictly paternal) descent. Therefore, during the statistical analysis stage, we solely considered the ethnic affiliation of the older but known volunteers' ancestors from whom the cognatic and agnatic descents originated.

¹ Our study is not included within the framework of the Human Genome Diversity Project (HGDP). Nevertheless, the NARCHGP (1997) proposed several ethical and legal rules concerning the collection of human biological samples within the framework of the HGDP. The Committee also pointed out that these rules could be extended to any study dealing with the human genetic variability.

Moreover, if an individual's agnatic and cognatic origins differ, his Y and mitochondrial chromosomes independently could be classified into two different groups.

It has to be noted that in France, computerising nominative data related to racial, ethnic, political or philosophical affiliations is forbidden, *except if the concerned person deliberately consented to* (République Française, 1978). As regards to the studies, which deal with this type of data, a request for recommendation has to be sent to the CNIL (Commission Nationale de l'Informatique et des Libertés). After examination, the CNIL provided a favourable recommendation concerning our project.

III Discussion: when Molecular Anthropology meets people

III-a DNA in folk culture

Highlighting the folk culture of the USA, Nelkin & Lindee (1995) pointed out the vigorous essentialism attributed to DNA and genes. As suggested by Jacques Testard (1998), their conclusions can be extended to many occidental societies. Moreover, one decade after the publication of *The DNA mystique*, the points raised by its two authors are unfortunately still topical. While since the end of the World War II human culture and behaviour was considered as primarily conditioned by the (familial and social) milieu, they showed that the occidental societies embraced genetic essentialism since the 1990's. Henceforth, in folk representations 'genes' had replaced the milieu in its deterministic role. Therefore, studying someone's DNA can be seen as a sort of divinatory practise, since DNA contains this person's past, present, and future (Nelkin & Lindee, 1995). Consequently, the study of DNA can be seen as a type of breach of privacy. Moreover, another concept interferes between scientific works dealing with genetics and folk knowledge: hereditarianism. Hereditarianism "is the idea that one can reasonably posit a gene for virtually any human condition that can be expressed by a noun" (Marks, 1995:151) from Tay-Sachs syndrome to intelligence. Genetic essentialism and hereditarianism consequently generate discrepancies between scientific and folk knowledge. Often against their wishes, the media and scientists can be involved in the maintaining of confuse, even catastrophist, views about techniques and applications of genetics. Over and above, the media and scientists can contribute to maintain the socio-politic power that genetics is thought to generate (Nelkin & Lindee, 1995). Moreover, within the framework of our study, we observed several hotchpotches that cluster cloning, GMOs, and population and medical genetics all together.

The results from a very recent work suggest that "the majority of newspaper articles accurately convey the results and reflect the claims made in scientific journal articles" (Bubela & Caufield, 2004:1403). Nevertheless, in order to popularise the genetic knowledge, that is ultra-specific and of progressive nature, these papers tend to simplify by summarising and/or truncating the information and use metaphors to expose scientific results (see Marks, 2003, chapter 6). Lay people receive the information with their own culture and education, and rarely with the scientist's or reporter's hindsight.

Therefore, once passed through the filter of popularisation, the information has not to be necessarily misleading in essence to be misinterpreted. During the fieldwork, we had to face these types of representations. All the more so as the French parliament voted a law at this time (République Française, 2003) that notably allowed the police departments to dramatically extend the genetic files on persons that were involved in criminal and sex cases. Mistrust toward all persons sampling DNA was then exacerbated by politico-judicial events.

Nevertheless, folk representations about DNA are not all negative or misleading. Rather they appear balanced, including promise and risk (Jallinoja & Aro, 2000; Condit, 2001). Notably, various studies indicated that medical applications of genetics are (cautiously) supported by public opinion insofar as they permit to diagnose or anticipate hereditary diseases (Condit, 2001). In the case of Reunion, a particularity has to be noted with regard to DNA: autosomal recessive diseases are known to be quite frequent and numerous (ex: Pécontal, 1991; Lavier, 1994; Maréchal; 2001). This knowledge is shared by medical, social, and scientific actors, but also by lay people, who are aware of this specificity since families in which at least one of their members is suffering are quite numerous. Therefore, representations associating genetics and disease are specially strong within the Reunionese population. In most cases, this association favoured the contact with the volunteers, even if we systematically first exposed our proximate aim (i.e. studying the settlement processes of Reunion Island). Indeed, numerous volunteers considered that participating in helping works that attempt to solve problems related to genetic diseases is important. Nevertheless, in some few cases, the association genetics/diseases rendered our approach rather difficult. We were seen as coming to inquire about the diseases people potentially were bearing, and our project was then seen as a reappraisal of their medical integrity.

Discrepancies between scientific knowledge and lay knowledge can generate mistrust or reluctance within the population under study. This point is not specific to multiethnic societies, and concern many occidental societies –we notably met them during our previous French metropolitan study (Dubut et al., 2004). The gap can be situated at the level of the thought abilities of DNA techniques: What is done with DNA? What can be done with it? and what can not be done, technically, but also legally?... Depending on whether geneticists or the public, the answers to these questions seldom are equal.

III-b ‘Race’ concept and multiethnic context

In occidental societies, the folk representations of ‘race’ keep an intrinsic biological component. Therefore, studying the genetic constitution of a multiethnic population could be seen as an endeavour for validate this concept. Within post-colonial, multiethnic societies, over and above its biological component, ‘race’ presents a particular echo: These societies have inherited from their history (notably from the plantation society) a hierarchisation of the involved ethnic groups, and its associated value judgments. For instance, until the 1970’s, in Reunion the hierarchisation pressure was seen as very strong. In order to either attempt to move up through this hierarchy or

keep their ‘privileges’, and to escape the pressure of the value judgements, some families handled marriage strategies in order to ‘whiten’ their descent (Bonniol, 1992). One of the primary methodological aspects of our study was based on the possibility to describe the Reunionese society as the combination between several ethnic groups which exchange their ‘genes’ through more or less intensive admixtures. Amid the population under study, this methodological categorisation could be seen as the vehicle for a racial or even racist ideology. In a multiethnic context, a genetic study thus could be seen as being able to be misinterpreted as a discriminatory project.

However, even if from the point of view of sociology ‘race’ is considered as potentially acting on the human interactions (ex: Marks, 1995; Duster, 2003), race revealed impossible to validate according to biological data. Indeed, the average genetic variation recorded between human populations is very weak –far weaker than this recorded between the other large-bodied mammals populations (Templeton, 1998)– and encompasses about 15% of the total variation, 85% of the variation being the result from inter-individual differences within one same population (Lewontin, 1972; Barbujani et al., 1997). Then, the (weak) variation that exists between populations is the result from a balance between, on the one hand, population movements and associated range expansions, and, on the other hand, the genetic flows between adjacent populations (Templeton, 2002). The members of one population have more opportunities to mate within their own population or with members of the neighbouring populations than with members of remote populations. Consequently, the pattern of genetic data is geographically clinal, and does not reveal discrete groups separated by clear boundaries (Livingstone, 1962). All together, these findings demonstrate that there are no races in the human species; instead, human species is a combination of numerous populations that are not biologically isolated.

III-c Identity-seeking in a multiethnic society

On whatever the level they act –the individual or the society– identity-seeking and identity construction can generate various reactions in front of the methodology and the aims of a genetic study. Two types of reactions were observed when the centrifugal-type forces are predominant in identity construction.

Firstly, when links between the country of origin and the people that originate from have been more or less perpetuated since the arrival of the ancestors, a genetic research aiming to decipher the settlement and its processes is not obligatory seen as fundamental. Indeed, genetics proposes to reconstruct a part of the history of the population, although this history is considered as known for some of the persons we met. These persons know where they come from, how their ancestors arrived, and they don’t need DNA to teach them. In order to show them that their participation would not totally be in vain, one can expose them the historical problems that genetics could precise (admixture quantification, founder effects, etc.). But also, it could be opportune to expose the reasonably predictable consequences of the study for public health. In our case, these consequences consist in a better understanding of the spread of genetic

diseases within the population. On completion, this understanding will lead to being able to design better the strategies of information and prevention.

Secondly, when links between the country of origin and the people that originate from have been erased since the arrival of the ancestors, the identity construction reveals difficult. In this case, genetics can generate many expectations, and can appear as a major solution (Elliot & Brodwin, 2002). Since genetics represents the possibility to biologically link people with their ancestral country, genetics could allow the identity they claim to become legitimate. Moreover, while some commercial firms that propose to retrieve one's origins from DNA are currently springing up (see Brown, 2002) it appears important to inform people that just a very little part of their genome is investigated, and that conclusions concern only a minute part of their ancestry (agnatic and cognatic descent in most cases). Also, even for these very few ancestors, current techniques are unable to systematically assert that the exact region these ancestors originate from will be recovered. It depends on both the nature of their DNA polymorphisms (pan-continental vs. very localised) and the state of exhaustivity of the data banks (as for the 'mtradius' system; Röhl et al., 2001).

Furthermore, in the identity-seeking context of creolisation, the ethnic categorisation of a population is to address the ideologies related to creoleness (see above) since it can generate distrust from the desire of uniting by constructing a common new identity that transcends all the previous ethnic identities. Although used in everyday life, when used within an academic frame this categorisation is seen as a reappraisal of this wished unity, and it's difficult for some people to consider that it lacks socio-political signification.

Additionally, as previously exposed, we pointed out identity indeterminations and/or alternative identities that is observed among some Reunionnese. This phenomenon seems to be one of the constant consequences of creolisation, since it has been observed in other multicultural and multiethnic societies, as in Hawaii (reported by Olson, 2002) or Haiti (d'Ans, 1986). In practice, it revealed somewhat difficult for these people to answer the questions about ethnicity. To tackle this problem, very soon we benefited from the experience and the works about folk representations of heredity in Reunion of one of us (T.M.). Using the cognitive anthropology approach, these works demonstrated that, calling for phenotypic and/or psychological inherited features, it is far easier for an individual to determine the ethnic identity of his ascendants than his own. Nevertheless, in most cases, these workings of genealogical reconstitution make the individual aware of his own heredity: he will select within his ancestors' characteristics those that fit his affective, cultural and politic motivations, this selection will help him with his own identity construction (Malbert, 2001). In Reunion, heredity can be thought in terms of ethnicity and thus can involve an ethnic self-qualification of the individual. Nonetheless and alternatively, as he becomes aware of his heredity, the individual can refute all ethnic affiliations. This positioning frequently reveals the strength of the hereditary stamp of *métissage* in the process of identity construction (Malbert, 2001).

Conclusion

While most of the molecular genetics studies dealing with multiethnic societies never report the conditions in which the biological samples were collected, and the socio-ethnic mood the study was carried out (but see Sans, 2000; and Parra et al. 2003), recently Jonathan Marks (2002) pointed out what differs between molecular geneticists and molecular anthropologists. On top of biological perspectives, the latter integrate socio-political data, worry about the ethical and social implications of their work, and specially wonder about the human parameters that lead biological phenomenon. Indeed, as underlined by the NACHGDP (1997), when one wants to study the genetics of a human population, it appears necessary to take into account potentially available works from cognitive anthropology or sociology that concern the population under study, and to immerse oneself in the local socio-cultural mood (that can be done through interviews with local scientific, cultural and cultural actors). Indeed, following Marks' recommendation, it is to the advantage of the molecular anthropologist not to get rid of the holistic purpose of Anthropology. A detailed understanding of the ethno-social and historical context, and of the folk representations related to the matters of his work are important. These elements, first of all, will enable the anthropologist to optimise his methodology (both at the level of the recruitment and, afterwards, at the level of the statistical analyses), and secondly, will potentialise his ability to expose and explain his project unambiguously to the members of the population under study. The provided information will contribute to preventing the objectives of the project being misinterpreted, and will enlighten some sensitive points of the methodology (in this case the ethnic categorisation of the population), and thus will tend to minimise the negative impact the study could have on the cohesion of the multiethnic society under study. Indeed, the molecular anthropologist has to come the terms with a moral responsibility in exposing the results stemming from his work in an enlightening way (Marks, 1995; NACHGDP, 1997). Discrepancies exist between the scientific knowledge and the folk understanding, and, within the framework of a study that deals with DNA as a historical source, they potentially are harmful since they can generate incomprehension and ambiguities concerning both the methods and the objectives among the persons and the organisations approached. The molecular anthropologist has to reduce the gap, notably by clearly informing people about the scientific reality (or unreality) of DNA and 'race', in order to guarantee that his work will not be able to be used to promote any political or social discriminatory theories.

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