The Chromosome Complement of *Nasalis larvatus* (Wurm 1781)[1]

During my recent stay at the Yerkes Laboratory in Atlanta as a guest of Dr. OSMAN HILL, I had the opportunity of studying the caryotype of a female *Nasalis larvatus*[2]. This extremely rare monkey is of great interest in the taxonomy and phylogeny of the Old World monkeys.

The chromosome count carried out on 20 metaphase plates was found to be $2n = 48$ (see Figure 1). Since the animal studied was a female it was impossible to identify the X chromosomes. The homologues have been divided into 4 groups of chromosomes similar in dimension and morphology (Figure 2). The division is to be considered provisional until it is possible to study a male subject.

The first group (A) contains 7 pairs of metacentric chromosomes. Chromosome pairs Nos. 6 and 7 are of the same size and distinctly smaller than chromosome pair No. 5. The second group (B) contains 9 pairs of chromosomes, all of which are submetacentric. The third group (C) contains 7 pairs of small chromosomes, all submetacentric. The fourth group (D) consists of only 1 pair of chromosomes marked by a large achromatic region on one of the arms (see Figure 3).

The chromosome number would lead us to think immediately that *N. larvatus* is related to the anthropoid apes[3]. On the other hand, the chromosome morphology reveals a remarkable difference. The *Nasalis* caryotype is indeed similar to those of *Presbytis*, *Colobus* and *Hylobates*, all of which exhibit 44 chromosomes[4]. There is only a slight or nearly non-existent similarity to the caryotype of the other Old World primate species.

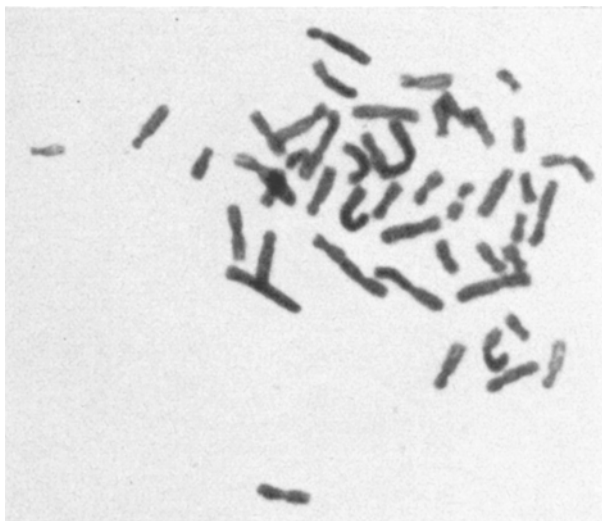

Fig. 1. Metaphasic plates of the chromosomes of *Nasalis larvatus* female.

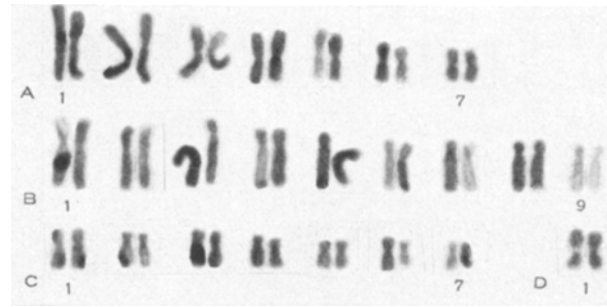

Fig. 2. Reconstruction in pairs of homologous chromosomes of *Nasalis larvatus* female.

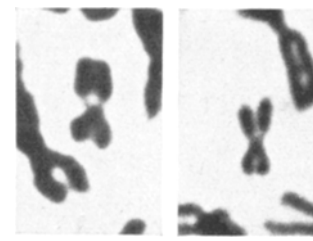

Fig. 3. Chromosome marked by the achromatic region from caryotype of *Nasalis larvatus*.

Riassunto. I cromosomi di *Nasalis larvatus* presentano un numero diploide di $2n = 48$. Il cariotipo presenta molte similitudini con quello delle altre *Colobinae* e con le *Hylobatinae*.

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[2] I wish to thank Dr. J. EGOZCUE and Dr. A. K. EUGUSTER who provided the material for the tissue cultures, and the Yerkes Primate Center staff for the laboratory facilities.

[3] B. CHIARELLI, Caryologia *15*, 99 (1962).

[4] B. CHIARELLI, Caryologia *16*, 637 (1963).

A Unitarian Hypothesis of Altered Reactivity to Stress Mediated by *Bordetella pertussis*

Diverse activities of pertussis vaccine that affect the reactivity of the mouse or rat to stress have been the subject of many studies, summarized in recent reviews by PITTMAN[1], KIND[2], and MUNOZ[3]. Investigators have attributed these activities to various parts or chemical components of the bacterial cell. It appeared to us that a unifying concept might be derived from the existing data which lie in an area where such diverse fields as immunology, pathology and pharmacology intersect. Using both published evidence and as yet unpublished studies of our own, we have sought to determine whether the factor or factors responsible for the various activities associated with pertussis vaccine have certain physicochemical properties in common. 3 such properties were studied; namely, effect of heat, effect of tryptic digestion, and parallel fractionation. By parallel fractionation we mean

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Properties of various biological activities of pertussis vaccine in the mouse or rat

Activities	Heat labile		Trypsin susceptible		Parallel fractionation[a]	
	Our work	Other workers	Our work	Other workers	Our work	Other workers
Immunogenicity	Yes [4]	Yes [3]	Yes [4]	Yes [5]	Yes [6]	Yes [3,5,7] No [8,9,23]
Histamine sensitization	Yes [10]	Yes [11]	Yes [6]	Yes [12]	Yes [6]	Yes [3,5,7] No [8,9,23]
Peptone shock enhancement	Yes [13]		Yes [13]		Yes [13]	
Active anaphylaxis enhancement		Yes [11]			Yes [4]	Yes [3]
Precocious immunity induction		Yes [14]			Yes [4]	
Adjuvance for protein antigens	Yes [15]				Yes [4]	Yes [3]
Hyperacute experimental allergic encephalomyelitis induction		Yes [16]			Yes [4]	Yes [17]
Endotoxin lethality enhancement		Yes [11]	Yes [24]		Yes [24]	
Lymphocytosis induction	Yes [4]	Yes [18]				

[a] The activity in question is found only in the same fractions as one or more of the other activities when at least one method of vaccine fractionation is carried out. Numbers are literature references.

that the various activities distribute similarly among fractions when one or more fractionation methods are applied to pertussis vaccine. Activities that have been studied by us or others with respect to at least one of these properties include the following: immunogenicity, induction factors for histamine sensitivity, lymphocytosis, precocious immunity, adjuvance for protein antigens, and enhancement factors for peptone shock, hyperacute experimental allergic encephalomyelitis, endotoxin lethality and active anaphylaxis. We have summarized the combined results in the Table. In the more intensively studied areas the references are representative rather than exhaustive.

The evidence tends to indicate that in so far as these activities have been tested, they are heat labile (100 °C for 30 min) and they are degraded by trypsin. With respect to the third property, parallel fractionation, the evidence is conflicting in the case of 2 activities, the immunogen and the histamine sensitizing factor (HSF). Although agreement is general that the separation of these 2 activities is exceedingly difficult, the question of the possibility of their separation is undecided at present. We feel the negative findings may be based on a differential lability of the 2 activities in the same molecule. Hence we feel justified, on the basis of the total evidence thus far accumulated, to propose the hypothesis that all of these activities, as well as others for which there is as yet no physicochemical data (enhancement of stress to cold [19], anoxia [20], irradiation [21], among others) are attributable to one proteinaceous heat labile substance, presumably the whooping cough immunogen. We feel it would violate the law of parsimony, and perhaps also that of probability, to assume that different substances of this bacterium have these properties in common. The blank spaces of the Table suggest one avenue of experimental approach to the verification of this hypothesis which we are actively pursuing. If verification should be achieved, the result would be a useful simplification of a complex field of investigation.

When we first considered this concept, we omitted the well-known adjuvance of pertussis vaccine for unrelated antigens from the list of activities because of the prevailing assumption that the endotoxin of the organism was responsible. However, repeated experiments demonstrated that the adjuvant activity of pertussis vaccine for mice at least was heat labile at levels that do not affect the endotoxin [15]. We subsequently found that the adjuvant activity underwent parallel fractionation with the immunogen [4]. The endotoxin has also been implicated in histamine sensitization [22], but we have shown that this is a minor source of sensitizing activity, differing in degree and kind from the classical HSF of pertussis vaccine [10,25].

Résumé. Chez la Souris et le Rat, les variations de l'activité sensibilisante du vaccin anticoquelucheux peuvent être dues à une seule substance, étroitement apparentée ou identique à l'immunogène. Cette hypothèse se base sur l'évidence des propriétés qu'ont en commun la labilité calorifique, la protolyse et le fractionnement parallèle.

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