

Inside New Guinea some tendencies are clearly perceptible, namely, the high B and low A-frequencies in some populations of mountain Papuans, and the absence of the S-factor in a large part of Netherlands New Guinea. The best explanation of the last-named phenomenon could be that initially the Papuan race had no S; the gene was imported or it developed by mutation, and natural selection increased the frequency.

A few examples are given of conclusions regarding the existence or non-existence of a close relationship between neighbouring populations.

RESUMEN

Investigación acerca de los grupos sanguíneos como clave de las relaciones entre papúas. El cuadro ofrece un sumario de las frecuencias de los genes más importantes de los grupos sanguíneos del sistema ABO, MNS y Rhesus en la Nueva Guinea holandesa y algunas partes de la Nueva Guinea australiana. La comparación de estas frecuencias con las de las distribuciones en áreas adyacentes llevó a la conclusión que se puede considerar la Nueva Guinea como el centro de Melanesia.

Se notaron influencias ajenas en las áreas marginales de la Nueva Guinea por la frecuencia más alta del factor M y la presencia del gen Rhesus R_2 . Este último factor se lo encontró también en las Montañas Estrelladas, pero en esta región no se pudo explicar su presencia por una importación de fuera de la Nueva Guinea.

Dentro del territorio de la Nueva Guinea se pudo percibir claramente algunas tendencias, a saber, las altas frecuencias del factor B y las bajas de A en unas poblaciones de los papúas de las regiones montañosas, y la ausencia del factor S en una gran parte de la Nueva Guinea holandesa. Para explicar este último fenómeno, el autor pone la hipótesis que originalmente la raza papúa no poseyera el factor S, que este gen fuera importado o que se hubiera desarrollado por mutación, habiéndose incrementado su frecuencia por selección natural.

REFERENCES

- ¹ L. E. NIJENHUIS AND J. A. VAN DER HOEVEN, *Vox Sang (Basel)*, 1 (1956) 241.
- ² L. E. NIJENHUIS, KARI BRATLIE AND A. C. VAN DER GUGTEN, unpublished data.
- ³ L. E. NIJENHUIS AND J. L. DE VRIES, *Amer. J. phys. Anthropol.*, 18 (1960) 193.
- ⁴ J. L. DE VRIES AND L. E. NIJENHUIS, *Amer. J. phys. Anthropol.*, 18 (1960) 125.
- ⁵ D. DUNN, O. KOOPZOFF, A. V. G. PRICE AND R. J. WALSH, *Oceania*, 27 (1956) 56.
- ⁶ H. J. T. BIJLMER, *Ned. T. Geneesk.*, 79 (1935) 2738.
- ⁷ L. E. NIJENHUIS, TH. BEKKERS AND J. L. DE VRIES, *Amer. J. phys. Anthropol.*, 18 (1960) 189.
- ⁸ L. E. NIJENHUIS AND J. A. VAN DER HOEVEN, unpublished data.
- ⁹ R. T. SIMMONS, J. J. GRAYDON, E. F. WOODS, W. A. SMITH AND H. O. LANCASTER, *Med. J. Aust.*, 1 (1949) 537.
- ¹⁰ H. J. OPTNER, O. KOOPZOFF AND R. J. WALSH, *Oceania*, 29 (1958) 123.
- ¹¹ J. J. GRAYDON, N. M. SEMPLE, R. T. SIMMONS AND S. FRANKEN, *Amer. J. phys. Anthropol.*, 16 (1958) 149.
- ¹² Cited by M. GROVES, A. V. G. PRICE, R. J. WALSH AND O. KOOPZOFF, *Oceania*, 28 (1958) 222.
- ¹³ L. E. NIJENHUIS, AND T. ROMEYN, unpublished data.
- ¹⁴ L. E. NIJENHUIS, KARI BRATLIE, S. SMIT AND R. A. DE HAAS, unpublished data.
- ¹⁵ L. E. NIJENHUIS, *Nova Guinea*, 11 (1961) 1.
- ¹⁶ N. W. G. MACINTOSH, R. J. WALSH AND O. KOOPZOFF, *Oceania*, 28 (1958) 173.
- ¹⁷ N. M. SEMPLE, R. T. SIMMONS, J. J. GRAYDON, G. RANDMAE AND D. JAMIESON, *Med. J. Aust.*, 2 (1959) 375.
- ¹⁸ V. IJNSAELS, O. KOOPZOFF, R. J. WALSH AND D. DUNN, *Oceania*, 27 (1956) 143.
- ¹⁹ A. E. MOURANT, *The Distribution of the Human Blood Groups*, Blackwell Scientific Publications, Oxford, 1954.

175

Lit.Nr.184

(Olt 05.02.2021)

PHYSICAL ACTIVITY AND DIETARY PATTERNS
IN THE SAMBURU OF NORTHERN KENYA

A. G. SHAPER AND P. SPENCER

Department of Medicine, Makerere College Medical School and the East African Institute of Social Research, University College of East Africa, Kampala, Uganda

Received June 16th, 1961

INTRODUCTION

A study of the Samburu people of Northern Kenya has recently been undertaken with the purpose of assessing some of the physical and cardiovascular characteristics of a community living on a diet of milk, meat and blood and who are physically very active. The possible significance of this study to current research into cardiovascular disorders seemed apparent, and in addition to this essay in medical anthropology, material has been obtained concerning body build and blood pressure, cardiovascular and electrocardiographic findings and blood-lipid levels.

It has been suggested that populations living to a large extent on milk would be suitable for obtaining additional data on the effects of a high-fat diet in different environmental conditions, and in particular the nomads of Somaliland and Eritrea have been mentioned¹. This present report is in the nature of a pilot survey, an attempt to assess whether more prolonged and elaborate investigations are indicated, either in this particular society or in similar groups still in existence in Africa. We shall describe the social organization, the pattern of physical activity and the dietary habits of the male Samburu and assess the relevance of this material to the study as a whole.

SOCIO-ECONOMIC BACKGROUND OF THE SAMBURU PEOPLE

The Samburu are a nomadic Masai-speaking, Nilo-Hamitic tribe of Northern Kenya and there are perhaps 35,000 people spread out over an area of 10,000 square miles. They own cattle, sheep and goats and their economy and livelihood are based directly on these herds and on the products of these herds. Agriculture and other forms of subsistence are absent from the society although a certain amount of maize meal is nowadays bought with money obtained from the limited sale of stock and of hides and skins. In some areas grazing schemes have been imposed in an attempt to recover land which has been eroded through years of overgrazing, and some thirty five per cent of the society are now affected by movement restrictions. The remainder are allowed to migrate in less restricted limits and their nomadism is governed by stock requirements of water and grass, the distribution of which in turn depend upon the erratic rainfall. The highly unpredictable seasons and rainfall make it almost impossible for the Samburu to predict their movements with any exactitude.

CLIMATE

The section of the Northern Province of Kenya in which the Samburu live is also a National Game Reserve and the vegetation changes from highland forest and grass in the Maralal area where our survey started, through scattered trees and grassland to desert bush and scrub. The rainfall is approximately 20 inches/year, the average temperature 75° F and the humidity about sixty per cent. The area is practically malaria-free except for seasonal malaria near water holes. The country had experi-

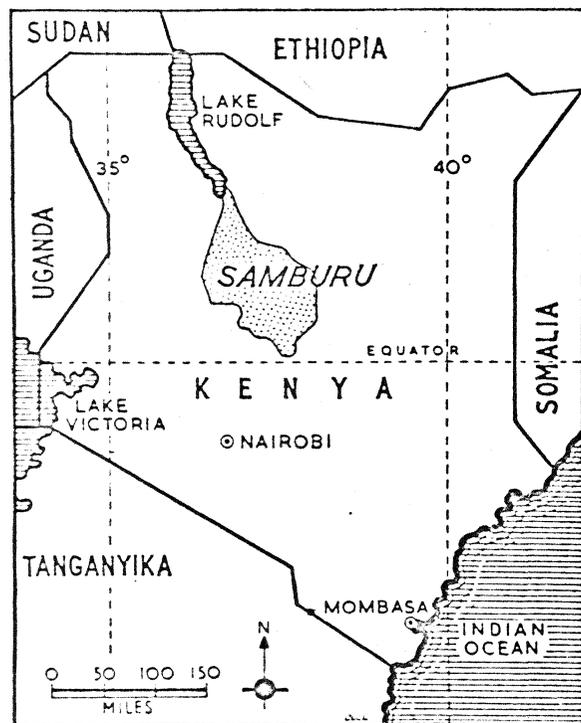


Fig. 1.

enced an exceptionally severe dry period before our visit in April, 1960, with slight rain in December, 1959, and further rain in March and April, 1960. The preceding years' rainfall had in fact been lower than average.

SOCIAL ORGANIZATION

Every adult male belongs to a particular *age-set*, and all males may conveniently be divided into *age-grades*. These age-grades are:

Boyhood: This is the period from birth until he is circumcised at adolescence and enters an age-set. The age of circumcision is usually about 15 years, but it may occasionally be older.

Warriorhood (Moran): A male is a warrior from the time of his circumcision until his marriage about 12 years later. Although nowadays no longer strictly "warriors", they are in a position ritually separate from the rest of their society and for a period

which varies from 8 to 16 years these young men will observe a number of prohibitions affecting their social conduct and their dietary habits. For example, all meat seen by married women is forbidden to them, and under normal circumstances they do not drink beer or alcohol of any kind or eat any imported foods such as maize meal.

Elders: Soon after a warrior marries, or when the majority of his age-set have married, he becomes an elder and the prohibitions he observed as a warrior are



Fig. 2. Physique of a Samburu herdsman.

relaxed. He now finds a family and devotes an increasing amount of time and energy to the welfare of his stock. Once his family is established and he has sons to help him herd his cattle he can participate more freely in the social activities of other elders, mainly debating and gossiping, but the early years of his elderhood are usually harsh and exacting.

PHYSICAL ACTIVITY

These notes will merely comment on qualitative impressions of the activity-patterns of the male Samburu, as no detailed studies have as yet been made. Quite apart from the inevitable movement associated with their nomadism, the impression gained in the Samburu country is one of quiet but constant activity amongst people

of all ages. The stock economy and their nomadism necessitate a considerable amount of activity, particularly walking. Typically, migration takes place every six weeks or so, each journey being usually less than 15 miles, but there is considerable variation in the frequency of migration and in the distance travelled. In their main seasonal migration cattle may be driven to areas 50 or even 100 miles distant and in general nomadism is greater where the rain is scarcer, i.e. in the eastern areas. It is in the dryer seasons that the active males, especially warriors and older boys may take away most of the stock to distant better pastures, leaving the old men, women and children with enough stock for bare subsistence.

Small children (6-8 years) herd small stock and calves close to the settlement. Boys from 8 to 16 years are given the task of herding cattle every day.

Warriors who are living at home regularly water cattle and frequently join in the herding. In the dry season, when they have taken the surplus stock to better land, they are constantly engaged in managing their herd. The rest of their time they spend wandering the countryside, travelling to parts up to 100 miles away, attracted by the company of other warriors of their clan and by a desire to dance and flirt with the girls. They are sufficiently active at most times to walk thirty miles or more a day in the hot sun with little chance of finding water more than once and may repeat this for several days in succession. Individual performances of 70 miles a day under the same conditions have been recorded and may well be authentic.

Junior elders are more primarily concerned with the welfare of their herds and families and until they have dependants who are competent to take over the daily task of herding they may have to spend much of their time and energy with their herds. When they have acquired dependants, these elders will still be frequently involved in the task of watering their herd at watering points which may be from three to seven miles from the settlement, and of repairing or even digging their own personal water holes. At such times the herd boys keep the cattle under control but do not actually water them. They are thus saved the strenuous task of lifting some 500 gallons of water four or more feet by means of a wooden bucket and are kept fresh for the day's herding.

As a man grows older and he can trust his sons to look after the herds competently, so his physically active role becomes less marked although he still directs all policies concerning herding and nomadism. In the search for lost animals, the elders may spend days at a time scouring the countryside and visiting neighbouring settlements, and visits to settlements up to five miles are a regular form of activity.

DIET

Once again these are *qualitative* comments only and no attempt will be made to substantiate quantitative assessments. This must be emphasized as it has become abundantly clear that in a society such as this, where seasonal and day-to-day variations are so great, only a full-scale long-term investigation could arrive at an accurate assessment.

Milk is the staple diet of the males in the community and meat is the only other major item. Vegetables play practically no part at all in the diet and maize-meal ("posho"), while eaten in many settlements is consumed mainly by married women and young children, and more particularly in the dry season. Maize meal is very

rarely eaten by males above the age of eight years and even more rarely by warriors. Speaking of the area as a whole milk is probably abundant for some four months of the year, sufficient for needs during about four months and definitely insufficient during the remaining four months when meat has to be used to supplement the diet.

Infants are put to the breast soon after birth and thereafter on demand. Supplementary feeding with milk starts a week later, or even earlier should the mother have little or no milk of her own. At about 18 months meat is introduced, and thereafter milk and meat form the natural diet.



Fig. 3. Samburu huts under construction.

Boys old enough to herd cattle will drink some five to six pints of milk daily in the wet season, reduced to perhaps four pints/day or less in the dry season. Unlike the warriors however there are no prohibitions on the food they may eat and they may thus be given any food in the homestead, and may also be given meat from beasts slaughtered and eaten by warriors in the bush. Boys do not normally have a chance to eat large quantities of food as warriors do but they can certainly eat more regularly.

The warriors usually drink milk twice a day, and in the wet season this may be from eight to 12 pints at a sitting, diminishing to four to six pints/day in the dry season. Given sufficient quantity a warrior may drink up to 20 pints (11.3 litres) of milk a day in the wet season but he rarely has such an opportunity. There are certain prohibitions concerning meat so that the warrior may get less opportunity of eating meat than do the younger lads or the elders. In the dry season when milk is scarce he may compensate for this by having meat at periodic intervals, perhaps once a week or occasionally, once every three or four days. The amounts available to him on these occasions will vary considerably with the supply and demand. In the wet season it seems that the warrior will subsist quite adequately on milk alone. Owing to the prohibitions on eating any meat seen by a married woman, the warriors cannot

have meat of beasts which have died in the settlement or have been slaughtered there. In the dry season when herding duties permit, a group of warriors may take a fat ox to kill and eat far from the settlement and this will last them several days. If they are unencumbered by herding duties they may kill and eat a sheep or a goat in the bush at night. It may be necessary to kill an animal every second or third day in order to supply a group of warriors or warriors' visitors to the settlement.

The *elders* drink less milk than the moran warriors and by the time a man has been an elder for some ten years or so his milk consumption will be down to three to four pints a day. Elders have rather more meat more regularly than either the boys or the warriors.

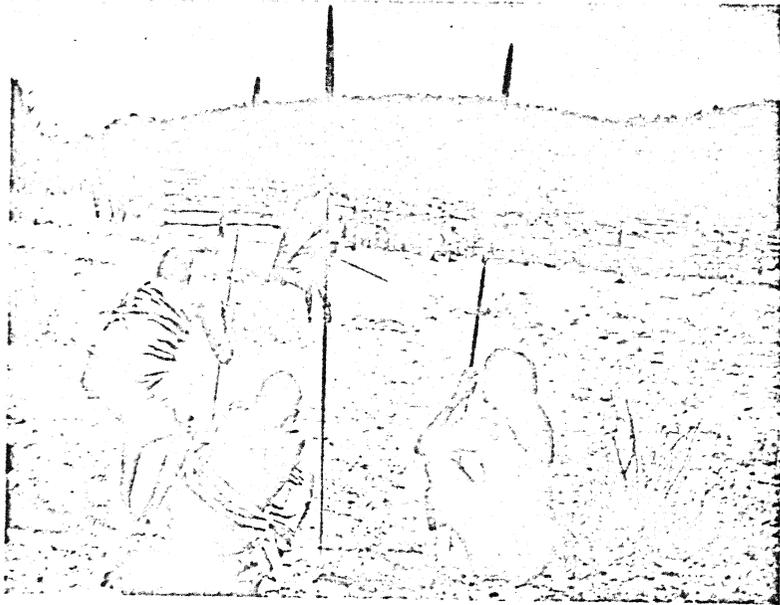


Fig. 4. Samburu with their cattle, at a cattle sale.

It is estimated that the Samburu have an average of six milk-producing cattle per person. In the four months wet season a good cow will produce as much as three pints in excess of what she gives to her calf but in the dry season her surplus supply would regularly be less than one pint and many cattle would supply less than half a pint at this time. This implies that in theory the average Samburu has available in the wet season some 16.8 pints (9.5 litres) a day, and even if only two pints/day were produced by a cow in the wet season, which is probably a more realistic average output, this would still be enough to supply a warrior with up to 20 pints/day and the boys, girls, elders, and wives with up to ten pints a day, there being one warrior to every seven other persons.

Small stock (sheep, goats) are very important to the Samburu patterns of existence and in the dry season these are killed for food, cattle being killed much less frequently. Cattle are only killed when they are so ill that they will almost certainly die in a matter of hours, occasionally at a birth or marriage or when it is absolutely

bearing kids i.e. twice a year, some four months after the wet season; this is conveniently in the middle of the dry period when milk is badly needed.

Milk and meat are not usually taken on the same day as this is thought to produce tapeworm. In a good wet season when there is a small surplus of milk, it may be drunk curdled; in the dry season it is always taken in the fresh state as soon as it has been obtained from the cow. Blood is a variable and minimal part of the diet and is used to any extent only during the dry season. The blood is taken from a living animal and may be added to the milk to increase the quantity of food. This is particularly popular among the warriors, but it is not a regular feature of their diet. None of the male groups described eat bread, rice or eggs, alcohol is taken only on very rare occasions, usually by the elders and in the form of honeybeer, while tea and sugar are popular small luxuries amongst the elders. The warriors take considerable quantities of snuff and the elders chew tobacco frequently but do not smoke it.

The Samburu recognize a considerable number of roots and plants as having medicinal value. Warriors in particular may add certain roots to the broth made when meat is available as they believe these add to their virility. In terms of caloric contribution these vegetable additions can be ignored but their pharmacological actions may be significant.

COMMENT

Age estimation

This is always a major problem in areas where birth registration is not practiced and where the precise age is of no real concern to the group being investigated. On this occasion ages were assessed by one observer (P. S.), who had lived for several years as a member of the Samburu clan and who spoke the language with facility. This was done by ascertaining the age-set and sub-age-set of each subject and calculating his approximate age from known historical data concerning these age-sets. This method was considered accurate to within four years for almost all subjects and to within two years for the majority.

Physical activity

In any consideration of physical activity it is necessary to know the average daily energy expenditure, the environmental conditions under which activities have taken place and the physiological demands the activities have made. Both the pattern and variety of activity should be determined and ideally, information is required over the lifespan. The Samburu would appear to engage in dynamic (as opposed to static) muscular activity, in particular, walking, which requires more energy expenditure than that found for many productive workers in industry. Time studies and accurate records of activities are however essential for an adequate estimation of the average daily energy expenditure of any group over long periods and it is proposed that this be done should further studies of the Samburu be carried out.

Diet

Accurate assessment of the fat, protein or carbohydrate content of the Samburu diet would require detailed daily observations and measurements over long periods and in all seasons. While aware of the inaccuracies inherent in quantitative statements based on qualitative data, we will make some approximations regarding the fat intake

Milk was obtained in different areas on six separate occasions and these samples were possibly mixtures from several cows. Analysis showed an average fat content of 5.6% as compared with average figures of 3.7% for cows milk and 4.1% for goats milk.

Allowing for average daily intakes for boys and elders of six pints and for *moran* and young elders of 12 pints in the wet season this will give daily intakes of 168 and 336 grams fat respectively providing some 60% of total caloric intake. Clearly this high milk intake of the Samburu will not pertain throughout the year, will be higher in the wet season, possibly this estimated level in the intermediate season and lower in the dry season. Further, no allowance has been made for the intake of meat as it has not been possible to make even a rough quantitative assessment; but this is an important source of calories during the dry season, and an additional irregular source during the remainder of the year. It seems likely that for at least four months of the year the milk supply will be more than adequate for all requirements, for a further four months it will, depending on rainfall, be adequate, while for the remainder of the year it will be insufficient. Periods of famine are not uncommon in the Samburu district during exceptionally dry seasons and despite large numbers of cattle and small stock, the cultural pattern is such that stock will only be slaughtered in the most stringent circumstances in the hope that rain will alleviate conditions.

SUMMARY

A brief description has been given of the social organization, dietary habits and patterns of physical activity encountered in the Samburu tribe of Northern Kenya. They are a nomadic Nilo-Hamitic people living on a diet of milk and meat and having a high degree of dynamic physical activity. It seems that this group would be most suitable for obtaining data concerning the effects of a high-fat diet under conditions of considerable physical activity but it must be kept in mind that the dietary pattern is not habitual but is subject to considerable fluctuation due to seasonal variation.

RESUMEN

Actividad física y patrones de dietas en los Samburus de Kenya del Norte. Se ofrece una breve descripción de la organización social de los hábitos dietéticos, así como de la actividad física, observada en la tribu Samburu de Kenya del Norte. Se trata de un pueblo nómada Nilo-Hamitas, que viven a dieta de leche y carne y tienen un alto grado de actividad física.

Parece que este grupo sería muy apropiado para obtener datos concernientes a los efectos de una dieta con un contenido elevado de grasas bajo condiciones de actividad física considerable. Sin embargo, hay que tener presente que tales dietas no son habituales, ya que muestran fluctuaciones notables debido a las variaciones de las estaciones.

ACKNOWLEDGEMENT

The photographs were made available by courtesy of the Kenya Information Service.

REFERENCES

- ¹ A. R. P. WALKER, *Brit. med. J.*, I (1960) 1660.
- ² *Documento Geogr. Scientific Tables, Fifth Edition*, (1956) 238.

SALMONELLAE IN DESICCATED COCONUT AND COCO-PRODUCTS

M. S. M. DANIELS-BOSMAN AND J. HUISMAN

Department of Infectious Diseases, Quarantine and Hygiene and Bacteriological-Epidemiological Laboratory, Municipal Medical and Public Health Service, Rotterdam

Received February 2nd, 1961

WILSON AND MACKENZIE¹ established the probable causative relationship between a Salmonella epidemic in Australia and the use of desiccated coconut, contaminated with Salmonellae; they isolated *S. typhi* phage type E 1, *S. paratyphi* B and a number of other Salmonella types from the patients and samples of coco-meal imported from New Guinea. Other investigators²⁻⁴ also succeeded in demonstrating various types of Salmonella in coco-meal. GALBRAITH *et al.*³ examined 851 samples of desiccated coconut; 78 were infested with, *i.a.*, *S. paratyphi* B (15 samples), *S. bareilly* (15 samples), *S. new port* (six samples), *S. waycross* (six samples) and several other types. WINKLE *et al.*⁴ examined 71 samples of coco-meal; they cultivated Salmonellae from ten samples, *viz.*, *S. paratyphi* B (once), *S. java* (twice) and *S. waycross* (twice).

In 1960 the Port Medical Officer of Liverpool informed us that a lot of desiccated coco, that had been declared unfit for human consumption because of possible infestation with Salmonellae, was about to be shipped to the Netherlands. This decided us, in consultation and in collaboration with the Food Inspection Departments in Rotterdam and The Hague and the Government Public Health Institute, Utrecht, to examine samples taken from various lots of coco-meal that had been declared unfit for human consumption in England. It was decided also to include in our investigation different products prepared wholly or partially from coco-meal, such as coconut sweetmeats, loose coconut meal sold in shops in Rotterdam, coconut-chocolates, coconut-biscuits, and reducing-diets on a coconut basis.

MATERIAL AND METHODS

Four samples of 25 g coco were transferred in sterile Erlenmeyer flasks. Glucose-broth, Osborn medium without sulphapyridin, Leifson water and Difco medium (tetrathionate), respectively, were added to the samples in a quantity of 200 ml. The suspensions were incubated for 18 hours at 37° C. Subsequently, subcultures of the incubated suspensions were made on Leifson, McConkey, Hayna and SS-plates. In addition, Endo-plates, blood-plates and phenol-mannitol plates were inoculated from the glucose broth. The two last-named plates were included in the investigation in order to obtain an information about the total flora of the coco-products.

RESULTS

Eight types of Salmonellae were isolated from 45 samples, *viz.*, *S. perth*, *S. waycross*, *S. java*, *S. kotte*, *S. infantis*, *S. virchow*, *S. typhi murium* and *S. bareilly*: the Salmonellae were typed by the Government Public Health Institute, Utrecht.

Up till now no Salmonellae have been found in coconut sweetmeats, coconut-