# Experiences and findings of a medical officer on Tristan da Cunha, February 1994 - February 1995

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*Design.* A descriptive report on Tristan da Cunha, the most remote inhabited island in the world, with emphasis on changes in health parameters since the eruption of the volcano in 1961 necessitated the evacuation of the entire island population to the UK.

*Results.* Results of a retrospective 6-month consultation analysis are given as well as the results of screening programmes, particularly for risk factors for ischaemic heart disease.

*Findings.* The high prevalence of asthma among the islanders, possibly the highest in the world, and the management thereof are described.

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It is now 35 years since the volcanic eruption on Tristan da Cunha in 1961 prompted Samuels[1] to report his experiences as medical officer there at the time. The eruption in 1961 forced the evacuation of the entire population to the UK via Cape Town. This event thrust Tristan da Cunha into the world news, and the population of the island from an essentially pastoral existence, on what has been described as the most remote inhabited island in the world, into the midst of the 20th century.

The changes caused by that exposure have had an undeniable influence on both the lifestyle and health of the islanders ever since. This article attempts to give some idea of the changes that have occurred, and of current medical practice on the island.

## Tristan da Cunha

Tristan da Cunha is one of a group of 3 volcanic islands situated slightly east of the mid-Atlantic ridge, in the middle of the south Atlantic Ocean, some 2 900 km from Cape Town, the nearest city, and some 3 200 km from Cape Frio, the nearest point of South America. The Tristan group of islands comprises Tristan da Cunha and the smaller Nightingale and Inaccessible islands; Tristan is the only island with a permanent population. Three hundred and seventy kilometres to the south of Tristan lies Gough Island which is a wildlife sanctuary and has a weather station manned by a small South African meteorological team. The

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usual shipping routes between Cape Town and South America pass some distance to the north of Tristan da Cunha.

Tristan da Cunha itself is roughly circular and about 11 km in diameter. Only a relatively small area of the island, a plateau above sea level some 7 km long and up to 800 m wide on the north-west aspect of the island, is used actively. It is the site of the settlement of Edinburgh, the pastures where most of the sheep and cattle are kept and where the cultivation of potatoes at a site called 'The Patches' takes place. The remainder of the island consists largely of cliffs rising from the sea to a height of up to 600 m above sea level, to the level of a plateau called 'The Base', from which rises the central extinct volcanic cone of Queen Mary's Peak at 2 040 m above sea level.

The climate is temperate and oceanic with rapid weather changes. Rainfall averages 150 cm or more per year,[2] and the humidity is high. The vegetation has been altered to some extent by overgrazing and the exploitation of wood for fuel, and the introduction of alien grasses and New Zealand flax for windbreaks and for thatching in previous years.

## The population

The community of Tristan da Cunha is practically unique in that one is able to trace its development from its very foundation.[3] Its history dates back to 1816, when a Corporal William Glass from Kelso, Scotland, chose to remain behind after a British garrison, stationed on the island in 1816 to prevent its being used as a base for any attempted rescue of Napoleon from Saint Helena, was withdrawn in 1817. Additions to the community included shipwreck survivors sailors and women from St. Helena.

At the time of writing there were 297 people on the island, including a British administrator, his wife and one medical officer (MO). The ages of the islanders varied from 7 months to 92 years. The Tristan islanders have attracted attention previously for their longevity,[4] and 52 islanders (17.2%) were over 65 years old at the time of writing. Most of the elderly are still extremely active for their age. Schooling on the island takes place up to the age of 15 years.

It is widely thought that the current population of almost 300 is descended from only 15 individuals.[5] They have been described as highly inbred,[6] there being only seven family names on the island (excluding the fairly recent marriage of a British man to an island woman). This degree of inbreeding, and the isolation of the Tristan islanders, has made them the object of much medical interest, both at the time of the 1961 evacuation and thereafter, with publications of genetic studies,[3,5-10] studies on mental disorders,[11-14] genetically based diseases,[15-17] and nutritional status;[18,19] their isolation has been of particular interest for studies on the common cold.[4,20-23] This largely unwanted attention and many uncomplimentary books about Tristan and the islanders have made them wary to some extent of the motives of investigators and journalists.

## Economy

The economy of Tristan da Cunha has gone through a number of phases; the community was initially fairly prosperous, supplying numerous American whaling ships with produce and bartering for essential supplies during the

**Fig 1. Tristan da Cunha from the south-west, with the 6 760-foot central peak obscured by cloud, and a small segment of the settlement plain visible on the left edge of the island.**

**Fig. 2. The settlement of Edinburgh on Tristan da Cunha. The 1961 volcanic eruption occurred just to the left of the village.**

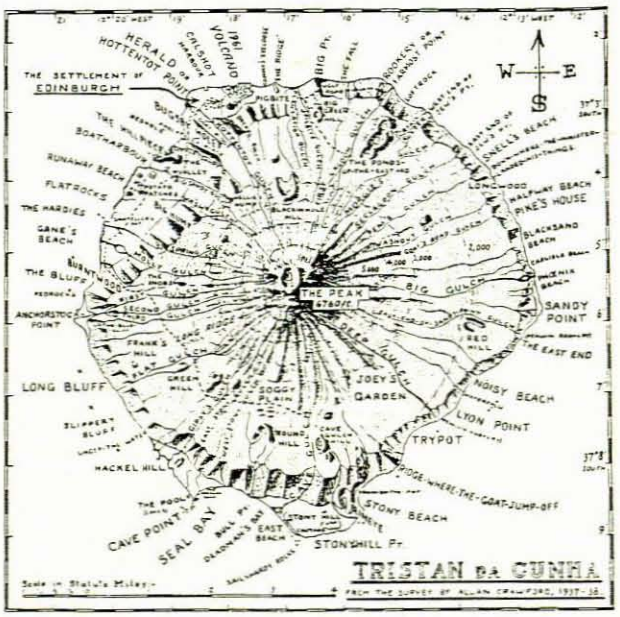


**Fig. 3. Tristan da Cunha as surveyed in 1937-8 (Crawford A. *Tristan da Cunha and the Roaring Forties*. Cape Town: David Philip, 1982). Place names such as 'Ridge-where-the-goat-jump-off' are used in everyday conversation.**

rly and mid-19th century. At the turn of the century, with e advent of steam ships, Tristan entered an era of creasing isolation and dependence on charity from issionaries. In 1940 a British garrison was established and ash introduced for the first time. In 1949 a crayfish canning ctory was established, providing employment and contact ith the outside world via the crayfish company's two ships.

In 1961, with the eruption of a volcanic vent adjacent to e settlement, the entire community was evacuated to the K, where some chose to remain. Most chose to return to e island once it was safe to do so.

Today the community is relatively affluent, with the major ource of island revenue being the royalties from the crayfish oncession. All homes have running water, electricity and ater-borne sanitation. Flax roofing has been replaced by orrugated iron or asbestos sheeting, and many homes have elevision sets and microwave ovens. Many people have otorcycles and a few have motor vehicles. A supermarket upplies imported foodstuffs and other items. A telex and adio link exists between Tristan and the maritime Cape own radio. More recently a satellite and fax link has been stablished. There are no air links with the outside world.

Despite the improvements in the economy and living tandards of the islanders, the island remains very isolated, with periods of up to 3 months between the arrival or departure of any ships. This often makes the evacuation of islanders with medical problems difficult, if not impossible.

## Medical facilities

The settlement has a 4-bed hospital with a small udimentary operating theatre, mobile X-ray machine (films are developed by hand), a dispensary and a labour ward. At the time of writing there were two nurses, neither of whom had any formal nursing training, and a third woman who acted as midwife. Two nurses have recently returned from St Helena, where they were trained to the level of enrolled nurse.

The current island expenditure on medical care fluctuates but was budgeted to be about £102 000.00 for the 1994/1995 financial year. Over 60% of this amount is spent on the passage, accommodation and medical care of patients sent to Cape Town for specialist treatment.

In comparison, Samuels reported on the medical facilities in 1961[1] as follows: 'A converted wooden munitions store was used as a surgery, dispensary, and hospital . . .. There were four beds in the hospital but no bathroom and the operating theatre was a room used as a thoroughfare and store-room . . .. A sum of £400 per annum was provided by the Colonial Office to cover drugs, day-to-day requirements such as paraffin and soap, as well as instruments, gloves, X-ray film, cleaners' salaries and laundry.'

The high proportion of total island revenue currently spent on medical care has become more and more of concern as income from the crayfish industry has fallen dramatically over the past few years.

## Consultation analysis

A retrospective analysis of all medical consultations on Tristan da Cunha during the 6 months from May to October 1994, a total of 1 268 consultations, revealed an average of 8.4 consultations per person per year, which is well above the averages of between 2.5 and 6 consultations per person per year for the UK, quoted by Potter.[24] Of these consultations 9.9% were home visits and 8.5% were after-hours consultations.

Of all consultations 20.3% were for asthma or respiratory tract disorders, with an average of 36.4 consultations for asthma or respiratory complaints per month for 5 of the months under review, increasing to 75 consultations for asthma and respiratory disorders in 1 month when upper respiratory tract infections (URTIs) affected the community following the arrival of a ship. This pattern of URTIs and exacerbation of asthma on Tristan following the arrival of ships was previously noted by Shibli *et al.*[20]

Patients referred to Cape Town during 1994 included a man with persistent unexplained ataxia, who was found to have a posterior meningioma on MRI scanning; a woman with grade 3 cervical intra-epithelial neoplasia (CIN III) who underwent a total abdominal hysterectomy with removal of a cuff of vagina; a man with recurrent unexplained loss of consciousness; a girl with osteochondritis dissecans who underwent drilling of the lateral femoral condyle and proximal patella realignment, and a man with severe perennial allergic rhinitis who underwent nasal polypectomies.

Major surgery performed single-handedly included an appendicectomy under spinal anaesthesia and debridement of bedsores under ketamine anaesthesia.

## Asthma

The high prevalence of asthma among the people of Tristan da Cunha was described by Samuels in his 1961 report as 'undoubtedly the commonest chronic complaint' on Tristan.[1] This was indirectly corroborated by Citron and Pepys,[16] of the Institute of Diseases of the Chest, London, who in 1964 reported on 34 Tristan islanders who had been referred to them with a history of asthma or exacerbations while in England.

In 1974 Mantle and Pepys[15] reported on a survey which showed that 32% of the islanders had suffered from asthma at some time in their lives, and that over half of the asthmatics were allergic to house dust extracts. Mantle and Pepys found heavy concentrations of house-dust mites in the Tristan dwellings, and also commented on the role of well-defined epidemics of URTIs brought by visiting ships and the markedly increased incidence of wheezing that followed such epidemics.

More recently (in 1993), a University of Toronto Genetics of Asthma Research Group visited Tristan and used methacholine dose-response challenges or response of forced expiratory volume in 1 second ($FEV_1$) to inhalation of 400 µg salbutamol. They found that in 49% of the 242 islanders tested, the provocative concentration (PC20) was lower than 8 mg/ml or that the $FEV_1$ increased by more than 15% after salbutamol. They comment that 'this is the highest prevalence of increased airway responsiveness recorded in any community' (N. Zamel — personal communication). This high prevalence, associated with the high degree of inbreeding, is currently being used in a search for a genetic basis for asthma. Despite this high prevalence of a history of asthma and the high prevalence of increased airway responsiveness found by Zamel, most of the islanders suffer from mild asthma; many are on inhaled

$\beta_2$-stimulants used on an 'as necessary' basis only. Of those who have moderately severe asthma, most are well controlled on inhaled steroids and occasional $\beta_2$-stimulants 'as necessary'. Only a few of the islanders are on regular oral theophyllines, as drug level monitoring facilities are obviously not available. All of those who had been on oral $\beta_2$-stimulant tablets (Ventolin 4 mg tablets) have been changed to more appropriate therapy, along current management guidelines.[25-27] Three of the older asthmatic women are now on regular low-dose maintenance prednisone and one of these has a degree of restrictive lung disease unresponsive to $\beta_2$-stimulants, probably consequent on previously chronically uncontrolled asthma over many years.

Exacerbations of asthma normally only arise following the importation of URTIs on visiting ships. In the periods of up to 3 months between ships, most of the patients are well controlled and exacerbations of asthma are infrequent. All the islanders have now been taught the symptoms of poor asthma control, e.g. nocturnal symptoms, early morning dipping, deteriorating effort tolerance and decreased $\beta_2$-stimulant responsiveness, by means of local FM radio broadcasts, the distribution of educational pamphlets and reinforcement at clinic visits. Many of the older asthmatics in particular have been given spacer devices, which either they or their families use to administer inhaled drugs. The introduction of general home peak flow monitoring was considered but decided against, as it was felt that many would have difficulty in using it, particularly older, often illiterate asthmatics and because of the findings of the GRASSIC studies which showed no advantages in a group of patients randomly allocated to receive a peak flow meter.[28] A policy of encouraging early medical attention, particularly for the older asthmatics, has been instituted instead. This is made all the more easy by the fact that all patients on Tristan are always relatively close to the hospital and medical attention.

## Screening

Having a small, stable, accessible community on Tristan makes it ideal for screening purposes.

A Pap smear campaign netted 64 women, of whom one 52-year-old was found to have CIN III. Two other women had evidence of human papilloma virus (HPV) infection and 5 others had infective or inflammatory changes.

A fasting blood glucose screening programme of 143 adults between the ages of 35 and 70 years of age using an Accutrend reflectance meter (Boehringer-Mannheim) revealed 1 man with previously undetected diabetes mellitus. This is in addition to the 2 patients previously known to have non-insulin-dependent diabetes mellitus (NIDDM) on dietary control, and the 1 patient on oral agents for NIDDM. This contrasts with the findings of a Norwegian scientific expedition to Tristan da Cunha in 1937 - 1938, which reported that 'no endocrine disorders were found'.[29] The findings of Black *et al*.[30] submitted to the Tristan da Cunha Working Party of the British Medical Research Council in 1963, also reported finding no glycosuria among the islanders following their evacuation to the UK.

In addition to blood glucose screening, screening for other risk factors for ischaemic heart disease (IHD) was undertaken, prompted by an acute myocardial infarction with left anterior fascicular block in a 66-year-old man with the IHD risk factors of smoking and mild hypertension. This diagnosis was confirmed on the basis of an electrocardiogram faxed to a Cape Town cardiologist. Cardiac enzyme confirmation was not possible. This may well be the first reasonably well-documented myocardial infarction on Tristan da Cunha, although there have previously been clinically suspected cases.

A targeted screening of fasting blood cholesterol was undertaken in 41 adults with other risk factors for IHD, such as hypertension, NIDDM and smoking, using 'Accumeter' home cholesterol testing kits (ChemTrak, California, marketed by GD Searle, South Africa) which revealed a fasting blood cholesterol range 3.99 - 7.19 mmol/l, with a mean of 5.70 mmol/l. Of those tested 46% had levels in the 'moderate risk' range of the South African Heart Foundation chart for cholesterol levels. The determination of lipid subfractions would require further analysis in Cape Town.

As far as obesity is concerned, the results reported by the Norwegian team which visited Tristan in 1937 - 1938[29] are vastly different from the current situation. Most notable is the change in the women aged 18 years and older. The Norwegian study found the 44 women to have an average height of 1.62 m with an average weight of 53.74 kg (range 41 - 75 kg), and a mean body mass index (BMI) of 20.43.

Today results for 117 island women (18 years of age or older) measured (93.6 % of all island women in this age group) show a mean height of 1.62 m, a mean weight of 71.39 kg (range of 41.8 - 112 kg), and a mean BMI of 27.11 (range 15.71 - 39.72), which compares very unfavourably with the 1937/8 mean. Forty of the women measured (34.2%) now have a BMI equal to or greater than 29, which is indicative of severe obesity.

Hypertension is now common, in contrast with the findings of the Norwegian scientific expedition,[29] which reported only 4 individuals with 'a blood pressure that should be regarded with suspicion' out of a total of 100 adults measured. The findings of Black *et al.* in the UK following the evacuation of the island, were of a prevalence of hypertension of 11.1%.[30] Today, of 189 adults tested (80.5% of the adult population), 41 are on antihypertensive medications, with the majority being on thiazides, atenolol, angiotensin-converting enzyme inhibitors, nifedipine or combinations of these.

Cigarette smoking is fortunately relatively uncommon, with 23 of 189 adults surveyed (12.2%) being regular smokers. This is the only risk factor for IHD which compares favourably with the results obtained by Black *et al*., who found 31.8% of the adults to be smokers in 1961.[30]

It appears that, in the past few decades, the prevalence of major risk factors for IHD, particularly obesity, has increased substantially. This may be reflected in future years in an increased incidence of IHD.

## Alcohol consumption

As with many isolated island communities, the alcohol consumption on Tristan da Cunha is high. Calculated from the figures of alcohol sales from outlets on Tristan, the per capita consumption of absolute alcohol was 17.6 litres of absolute alcohol per capita for the 1993/1994 financial year, assuming that all alcohol sold was consumed. This includes expatriates on the island. This figure is well in excess of

ice the current recommended safe limit of alcohol onsumption of 21 units per week for men and 14 units per eek for women.

## ental work

addition to medical matters, the MO on Tristan da Cunha also expected to provide dental care for the island in the me between the visits of the dental surgeon. The dentist urrently visits for a few weeks every year. Between ebruary and December 1994 some 15 dental extractions ere performed by the MO.

Tristan da Cunha has attracted much dental interest in at the dental health of the population changed ramatically between the visit of the Norwegian scientific xpedition in 1937 - 1938, when Sognaes[31] found an xtremely high standard of dental health, and that reported llowing the evacuation to the UK in 1961. In 1966 a full ental field survey by Fisher[32] reported that 'in general the eeth of these people were grossly carious' and that there ad been 'a marked change for the worse in the general eriodontal condition of these people.' Fisher comments on he change in the diet of the islanders, from the period prior o the 1940s when flour, tea, coffee, sugar, jams, tinned oods and other luxuries could only be obtained from the are passing ships. Since the 1940s a major change in diet esulted from the development of the crayfish industry, a ash economy and the availability of imported foodstuffs, ncluding refined sugar and jams, has been largely mplicated as causing this deterioration.[33]

Since that time the fluoride content of the local water has been tested and found to be low at 0.13 parts per million (ppm) (unpublished data). A fluoride supplementation programme has been under way since.

## Veterinary work and 'health lessons'

In addition to being responsible for all medical care, all administrative aspects of running the hospital, staffing and the like, the MO is also expected to assist the agricultural officer with veterinary problems. During 1994 these included sheepdogs with broken legs and a pregnant cow with a compound fracture of the mandible.

It has also become traditional for the MO on Tristan to teach 'health lessons' at the local school, a task which I found far more enjoyable than I first anticipated.

As the only expatriate employed on the island, apart from the Administrator, the MO is often asked to take a number of roles that require a neutral party. With only seven family names and the endless intermarriages among the islanders, impartiality is often a problem. As a result, I was asked to act as presiding officer at the elections for the Island Council, a body elected to decide matters of policy, and was asked to oversee numerous appointments boards for job applications. These are certainly not the sort of functions expected of most MOs!

## Conclusion

I have attempted to give some idea of current medical practice on Tristan da Cunha, to highlight the prevalence of asthma in particular, and to give some indication of the multifaceted role of the MO on the island.

The changes in health parameters, especially in risk factors for IHD, in particular the increasing prevalence of obesity among the women, and the increasing prevalence of hypertension and diabetes mellitus, compared with studies done prior to the establishment of the crayfish industry and the 1961 evacuation to the UK, are also highlighted.

Despite the advent of satellite, telephone and fax links, Tristan da Cunha, the most remote inhabited island in the world, remains a challenging location for medical practice.

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