

Special Article

Anaesthesia training and development in Nepal 1985-1990

J.R. Maltby MB FFARCS FRCPC,* R. Amatya MBBS DA,†
N.B. Rana MBBS FFARCS DA,† B.M. Shrestha MBBS DA,†
T.M. Tuladhar MBBS FFARCS,† T.J. McCaughey MB FRCPC‡

In 1985 a diploma program in anaesthesia was established in Kathmandu, Nepal, as a joint venture between the Institute of Medicine in Kathmandu and the University of Calgary. Development of the program and of the specialty in the capital city of Kathmandu was continuously documented during the next five years by local and visiting faculty. In 1990 teams of two Nepali and one Canadian anaesthetist also conducted a survey of each of the seven 50–100 bed zonal hospitals which did not previously have a trained anaesthetist and which are now staffed by graduates of the diploma program. In 1985 Nepal, with a population of 16 million, had seven trained Nepali anaesthetists all of whom worked in two hospitals in Kathmandu. By the end of 1989, 19 physicians had graduated. Seven of these continue to work in Kathmandu hospitals, nine work in zonal hospitals throughout the country and two are taking higher anaesthesia training in the United Kingdom. Additional Nepali anaesthetists have returned from training abroad, and the Society of Anaesthesiologists of Nepal, which joined the World Federation of Societies of Anaesthesiologists in 1988, now has 34 members. An annual anaesthesiology symposium is held, and weekly clinical meetings are organized in the major hospitals in Kathmandu. Anaesthetists who work in the zonal hospitals have limited supplies of drugs and equipment and

opportunities for continuing medical education are virtually nonexistent. Despite these problems, the establishment of an ongoing anaesthesia training program based in Nepal has had a dramatic impact on the number of trained anaesthetists in the country, and has improved the morale of the anaesthetists and the image of the specialty of anaesthesia in that country.

En 1985 un programme pour l'obtention d'un diplôme en anesthésie a été établi à Kathmandu (Nepal) en collaboration avec l'Institut de Médecine de Kathmandu et l'Université de Calgary. La suivie du programme et de la spécialité dans la capitale de Kathmandu a été continuellement documenté pendant les cinq années par des professeurs visiteurs et locaux. En 1990, un groupe de deux anesthésistes Népalais et un anesthésiste canadien ont fait une étude de chacun des sept hôpitaux régionaux de 50–100 lits qui n'avaient pas au préalable des anesthésistes entraînés et qui ont actuellement un anesthésiste gradué du programme établi. En 1985, le Nepal avec une population de 16 millions avait sept anesthésistes Népalais qui travaillaient tous dans deux hôpitaux à Kathmandu. A la fin de l'année 1989, 19 médecins furent diplômés, sept de ceux-là ont continué à travailler dans les hôpitaux de Kathmandu, neuf travaillent dans les hôpitaux régionaux à travers le pays et deux sont en train d'acquérir un entraînement plus poussé en anesthésie en Angleterre. D'autres anesthésistes Népalais sont retournés faire un stage à l'extérieur et la Société des Anesthésistes du Nepal qui s'est joint à la Fédération Mondiale des Sociétés des Anesthésiologistes en 1988, compte actuellement 34 membres. Un symposium en anesthésie annuel est tenu et des réunions cliniques hebdomadaires sont organisées dans les grands hôpitaux de Kathmandu. Les anesthésistes qui œuvrent dans les hôpitaux régionaux ont des ressources limitées de médicaments et d'équipements et les opportunités pour une éducation médicale continue sont virtuellement non existante. Malgré ces problèmes, l'établissement d'un programme d'entraînement en anesthésie basé au Nepal a eu des effets dramatiques sur le nombre d'anesthésistes entraînés dans le pays et a amélioré le moral des anesthésistes et l'image de la spécialité anesthésique dans ce pays.

Key words

ANESTHESIA: equipment;
EDUCATION: continuing, residents;
EQUIPMENT: anaesthesia machines;
ORGANIZATIONS: Society of Anaesthesiologists of Nepal,
World Federation of Societies of Anaesthesiologists.

From the Departments of Anaesthesia, *Foothills Hospital at the University of Calgary, †Tribhuvan University Teaching Hospital and Bir Hospital, Kathmandu, Nepal, ‡Shawville Hospital, Quebec.

Address correspondence to: Dr. J.R. Maltby, Department of Anaesthesia, Foothills Hospital at The University of Calgary, 1403 29 Street NW., Calgary AB, Canada T2N 2T9.

Accepted for publication 10th September, 1990.

In 1985 an anaesthesia training program was established in Kathmandu, Nepal, with the assistance of Canadian anaesthetists. A preliminary report¹ was published in 1987. At that time, five candidates had graduated with the Diploma in Anaesthesiology from Tribhuvan University DA(TU), and four more had enrolled in the second course. We expressed cautious optimism that the training would eventually produce a sufficient number of anaesthetists to staff zonal hospitals, as well as those in Kathmandu. In this paper we report on the first five years of the training program, the establishment of an annual Anaesthesiology Symposium, the formation of the Society of Anaesthesiologists of Nepal, and a preliminary quality assurance review of services and equipment in each of the zonal hospitals to which DA(TU) graduates are posted.

Diploma in anaesthesiology program

Before the first course commenced Canadian and Nepali faculty agreed that, although the program must be appropriate to the needs and economic conditions of Nepal, the standard of clinical and academic training should be comparable with the one year anaesthesia training in Canada for family practitioners, and Part I (formerly DA) of the FCAnaes (formerly FFARCS) in the United Kingdom.² In-training evaluation and examinations take place at three months, six months, and at the end of each one-year course. Canadian preceptors have spent terms of three to twelve months in Kathmandu, and help in setting academic goals and in preparation of a core curriculum. They are not substitutes for the shortfall in anaesthesia manpower, although they frequently visit the operating theatres of all hospitals in Kathmandu.

Clinical rotations, supervision and teaching of candidates is the responsibility of the local faculty. During the first year of the program, only two hospitals could provide clinical teaching. Staffing improved as seven other anaesthetists returned from training abroad and DA(TU) candidates graduated. Candidates now rotate through Bir Hospital, Tribhuvan University Teaching Hospital, the maternity hospital, and the children's hospital.

During the first two courses the Canadian preceptor conducted most of the twice-weekly seminars and lectures; this responsibility was taken increasingly by the local clinical and basic science faculty during the third year. Preparation of the curriculum and conduct of the core program is now the responsibility of the local faculty. For the fourth and subsequent years, the Canadian anaesthetist's presence was reduced from the full year to the last six months of each course.

DA(TU) candidates

Academic standing and professional motivation of candi-

dates who enter the program are much more variable than in North America. Nepali physicians graduate from medical schools in India, Pakistan, Bangladesh, Russia, China, and now from their own medical school. Thus, although English is the language of medical teaching in Nepal, for some candidates it was a third language, and some had worked for 10–15 yr in parts of the country where English is rarely spoken.

Nearly all physicians are employed by His Majesty's Government (HMG), and they may be nominated by HMG to take anaesthesia training, even though anaesthesia is not their first choice for a specialty. The same is true for those employed by the Institute of Medicine at Tribhuvan University Teaching Hospital. A few physicians work "on contract" for these employers, as long-term locums, and they may choose to apply for a postgraduate program as free candidates. Since 1987 four positions have been allocated for the DA(TU) program. Physicians who are government employees may be nominated according to seniority by HMG Ministry of Health, and free candidates may compete in the entrance examination. Despite the many difficulties which face the candidates the standard achieved at the final examination has impressed external examiners from both India and Canada. Out of 19 candidates, all except one passed the final examination at the first attempt. The one-year course is now recognized by the College of Anaesthetists in England as one year of training towards its Fellowship examination.

Incentive allowance for anaesthetists

The extreme shortage of anaesthetists which occurred before the DA(TU) program was due to several factors. In Nepal there is "source force"³ by which relatives or friends with influence can help a young physician to obtain training in the specialty of his or her choice. Hospital salaries for all doctors are uniformly low, but surgeons and other physicians easily earn five to ten times their salary by providing general practice consultations in private clinics. Lack of this type of private practice for anaesthetists, because of the people's belief that anaesthetists can only put people to sleep, and the low esteem in which the specialty was held, made anaesthesia an unattractive specialty. In 1982, in an attempt to make anaesthesia more attractive, the board of Bir Hospital in Kathmandu started paying anaesthetists an incentive bonus of 200 per cent above the basic salary. During the first DA(TU) course HMG recommended that specialist anaesthetists should be paid the same incentive bonus in HMG hospitals throughout the country, although the health care budget could not cover this expense. It is therefore the responsibility of each hospital board to pay the bonus from money raised in its community for this and

other items which are not covered by HMG's health care budget.

Continuing medical education

There is little access to continuing medical education in Nepal. Textbooks are scarce, and medical journals are almost non-existent outside Kathmandu. The Nepal Medical Association holds a two-day conference every two years, but there are no formal refresher courses, nor funds for physicians to attend international meetings. The first one-day Anaesthesiology Symposium was held in 1986, organized jointly by the Canadian preceptor and the local anaesthesia faculty. This has become an annual event with invited speakers and free papers, and it is now organized by the Society of Anaesthesiologists of Nepal. In 1990 three half-days of refresher course lectures, given by foreign visiting anaesthetists, followed the symposium. Despite the small number of anaesthetists in Kathmandu the symposiums attract 100–150 registrants who include other specialists, health ministry officials, and nurses. During 1989, weekly clinical anaesthesia meetings were started in each of the major hospitals, plus monthly city-wide joint meetings, which attract 40–50 anaesthetists, surgeons, and nurses.

Society of Anaesthesiologists of Nepal

A constitution for the Society of Anaesthesiologists of Nepal was drafted in 1987–88, and the society was accepted as a member of the World Federation of Societies of Anaesthesiologists (WFSA) at the World Congress in Washington, D.C. in 1988. The Society now has 34 members and a proposed shield (Figure). The first benefit of WFSA membership was that an Australian anaesthetist was funded to speak at the 1990 Anaesthesiology Symposium and refresher course.

Survey of zonal hospitals

All anaesthesia training is given in hospitals in Kathmandu. Equipment and drugs are limited, but plenum system compressed gas anaesthetic machines are used, for which nitrous oxide as well as oxygen are usually available. In some Kathmandu hospitals ECG monitors and oxygen analysers are available, as are limited library facilities and, recently, regular clinical discussions. Circumstances in zonal hospitals are very different, where the Epstein-Macintosh-Oxford (EMO) ether drawover vaporiser⁴ is universal, monitors are not available, and there are no library facilities. Between 1985 and 1990 nine DA(TU) anaesthetists were posted to seven of the ten zonal hospitals. The other three zonal hospitals had surgeon(s) and obstetrician(s) but no anaesthetist.

In 1990, the authors visited all of the zonal hospitals to which DA(TU) graduates had been posted. Meetings

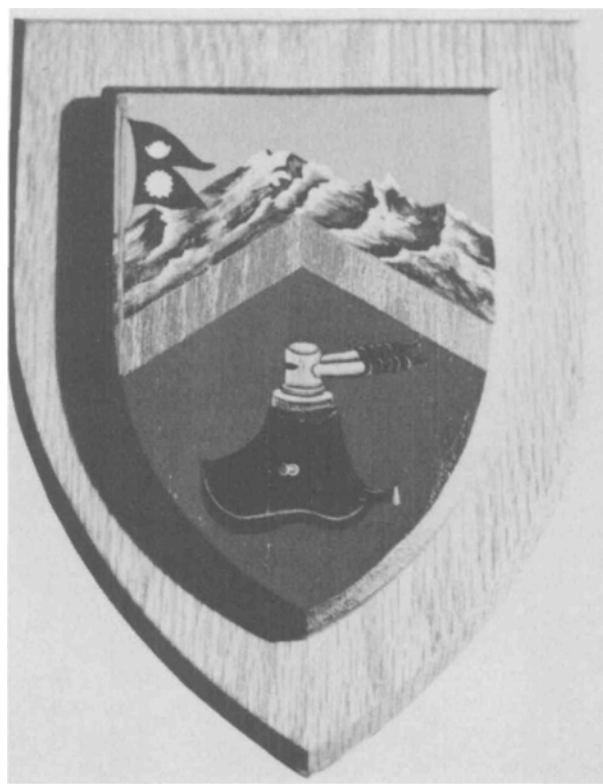


FIGURE Proposed shield of Society of Anaesthesiologists of Nepal, showing the flag of Nepal, Himalaya, and an anaesthesia mask.

were held in each hospital with the anaesthetist, surgeon, obstetrician-gynaecologist, medical superintendent, and operating room staff. Surgeons and anaesthetists were also interviewed separately. The purpose was to determine whether the anaesthesia training was appropriate, to review equipment, drugs, and educational facilities, and to offer advice or help in obtaining or servicing necessary items.

The surgical caseload at most hospitals, including obstetrics, gynaecology, general surgery and trauma, was 500–700 per year. General anaesthesia was used for 30–40 per cent of cases, regional (mostly spinal), 20–30 per cent, intravenous sedation by the surgeon for dilatation and curettage for incomplete abortion, 10–20 per cent, and local anaesthesia, given by the surgeon, 20 per cent. Table I summarizes availability of anaesthesia equipment. All of the Boyle's compressed gas anaesthetic machines were at least 20 yr old and none was in working condition. Nitrous oxide was not available at any of the hospitals, nor was it requested. In one hospital the halothane vaporiser on a Boyle's machine was in use with oxygen from a cylinder. The EMO vaporisers were in good working order at all except two hospitals. One unit could not be repaired, the other required minor servicing

TABLE I Equipment in seven zonal hospitals

Equipment item	OR availability
Oxygen cylinder	7
Oxygen concentrator	2
Nitrous oxide	0
EMO machine (ether)	7
OMV (halothane)	2
Ventilator	1
Laryngoscope	7
Endotracheal tubes*	7
Oxygen analyser	0
ECG monitor	0
Defibrillator	0
Pulse oximeter	0
Capnograph	0
Peripheral nerve stimulator	0
Automatic non-invasive BP	0
Manual BP	7

*Not all sizes of ET tube were available at all hospitals.

by one of the authors. Ether was easily obtainable, as was halothane, but the latter was not used in most hospitals because of lack of halothane vaporisers. Two hospitals had halothane Oxford miniature vaporisers (OMV), as used in the Triservice apparatus,⁵ for use in series with the EMO. One hospital also had a Farman entrainer⁶ which, with a low flow of compressed oxygen, converts the drawover system to a plenum system. Monitoring was limited to manual blood pressure recording and clinical observation. No operating theatre possessed an oxygen analyzer, ECG monitor, peripheral nerve stimulator, pulse oximeter, or end-tidal CO₂ monitor, and none of the hospitals had an intensive care unit.

At least one drug of each main group was available in all hospitals (Table II), although variety was limited: thiopentone; succinylcholine and gallamine; meperidine and pentazocine; diazepam; atropine and neostigmine. Ketamine was also available in most hospitals. The only local anaesthetic was lidocaine, in concentrations suitable for infiltration analgesia, regional anaesthesia, and in spinal five per cent ampoules.

The satisfaction which was expressed for the anaesthetists by other members of the hospital staffs was gratifying, and the boards of all seven hospitals were paying the 200 per cent incentive bonus. Seven of the nine anaesthetists were highly commended by their surgical colleagues for their knowledge, confidence, clinical competence, and for their availability for both elective and emergency cases. Mortality and morbidity statistics were not available. The other two anaesthetists apparently lacked interest in their work, their performance was less than satisfactory and, in one case, service was no better than before.

TABLE II Drugs available in seven zonal hospitals or from local pharmacists

Drug	Availability
<i>Induction agents</i>	
Thiopentone	7
Ketamine	4
Diazepam	7
<i>Opioids</i>	
Meperidine	7
Morphine	0
Fentanyl	0
Pentazocine	7
<i>Muscle relaxants</i>	
Succinylcholine	7
Gallamine	7
Pancuronium	0
Vaccuronium	0
<i>Reversal agents</i>	
Atropine	7
Neostigmine	7
<i>Local anaesthetics</i>	
Lidocaine	7
Bupivacaine	0

Discussion

Anaesthesia training programs in third world countries must be appropriate to medical and economic conditions, and they should become viable without external aid. Some countries train nurses, technicians, or other health care workers to be anaesthetists;⁷ Nepal decided on physician anaesthetists. We were fortunate that, when the program commenced, there were seven trained anaesthetists in Kathmandu; some entire countries have none.⁷ However, ten or more years had passed since these anaesthetists received their training, none had any experience of organizing a postgraduate program, and textbooks and medical journals were scarce.

The primary purpose of the DA(TU) program was therefore to provide competent clinical anaesthetists to hospitals throughout Nepal. In 1984 the World Health Organization (WHO) estimated that 27 anaesthetists were required for the population of 16 million.⁸ Most of the 50–100-bed zonal hospitals have only one operating theatre, and much of the population lives several days' walk from these hospitals which are therefore inaccessible. Within five years, the WHO goal was exceeded (Table III), with the original anaesthetists from before 1985, nineteen graduates from the DA(TU) program, and seven anaesthetists who returned to Kathmandu from training abroad. Of the nineteen graduates eight are employed in hospitals in Kathmandu, nine in zonal

TABLE III Trained Nepali anaesthetists employed by His Majesty's Government (HMG), Institute of Medicine (IOM), and military authorities

	<i>Kathmandu</i>			<i>Rest of Nepal HMG zonal</i>
	<i>HMG</i>	<i>IOM</i>	<i>Military</i>	
1982	2	–	2	0
1984	5	–	2	0
1986	5	4	2	2
1987	8	7	2	4
1988	10	7	3	6
1989	14	8	3	9
1990	14	8	3	9

hospitals, and two are taking higher training in the United Kingdom. A proposal for a more detailed survey of anaesthesia manpower, training, and anaesthesia services has been approved by the Nepal Research Council Committee and has been forwarded to WHO for further action.

The success of this program in its first five years may be attributed to a variety of factors. The idea came from senior members of the medical profession in Nepal, and it was strongly supported by the Ministry of Health. From the beginning, therefore, this was a Nepali program, rather than a foreign program which involved Nepalis. It is an ongoing program with a nationally recognized diploma. Clinical training was always conducted mainly by the local faculty, with minimal supplementation from the Canadian preceptor. Responsibility for lectures and seminars, initially taken by the Canadian preceptor, was gradually transferred to the local faculty, which also organized clinical meetings and the annual Anaesthesiology Symposium.

Senior Canadian anaesthetists as preceptors brought organizing experience in residency training and Royal College examinations, and in administrative experience as former heads of university teaching departments. This was important because of their need to work with senior Nepali anaesthetists, the Dean of the Institute of Medicine, and with officials in the Ministry of Health. The three-year commitment from the University of Calgary was fulfilled with the support of anaesthetists from other centres (see Acknowledgements), which made it a contribution from Canadian anaesthesia as a whole rather than from the University of Calgary. Funding initially came from private donations, and later from the Canadian International Development Agency (CIDA), and is similar to that for the proposed ASA Overseas Teaching Programme.⁷

Secondary achievements, which were not originally foreseen, include the establishment of an annual symposium,

the formation of the Society of Anaesthesiologists of Nepal, and the development of continuing medical education and clinical research. All these signs of a maturing specialty are taken for granted in first world countries. The symposiums initially focused on the need for training anaesthetists and were attended by government officials, as well as by anaesthetists, surgeons, and nurses. Later ones have had increased scientific content and reports of clinical research projects. The local faculty has grown in number, quality, and experience, and continuation without further Canadian support is feasible. However, there are many areas in which the continuing presence is valuable. These include organizational experience, familiarity with recent advances, preparation of manuscripts, coaching for and conduct of examinations, review of training, and quality assurance. The Nepali faculty will be primarily responsible for the conduct of future courses, and a senior Canadian preceptor with funding provided by CIDA, will continue to join them for the second six months of each of the next three courses.

Supplies of drugs, equipment and monitors is a problem in all third world countries which may have an annual health care budget of \$1 per person per year,⁷ compared with more than \$1,000 in Canada. The variety of intravenous drugs is limited, although at least one of each main group is available and, with the exception of ketamine, the cost of these drugs is low. Oxygen is also cheap, whether it is supplied in cylinders (\$0.40 per hour at 1 L·min⁻¹) or from an oxygen concentrator.^{9,10} A portable plenum anaesthesia system using compressed oxygen 1–3 L·min⁻¹, with a Farman entrainer, was developed in London, Ontario and was recently field-tested in Kathmandu.^{11,12} Nitrous oxide, which must be imported, is more expensive (\$6 per hour at 1 L·min⁻¹) than all other drugs combined, and it is only available at two hospitals in Kathmandu. Use of drawover equipment, EMO with or without OMV halothane vaporiser, rather than a plenum system, is reliable, economical, and supplementary oxygen at 1 L·min⁻¹ flow raises FiO₂ to 30 per cent. Drawover systems are not mentioned in most standard textbooks, although this deficiency has been overcome by the recent publication of two books which emphasize this type of equipment.^{13,14} Specific outcomes following general anaesthesia may be influenced by the use of individual anaesthetic agents¹⁵ although, even in patients who undergo coronary artery surgery, the use of different agents does not affect overall outcome.^{16,17} Therefore, the limited choice of drugs in zonal hospitals is probably a minor factor in surgical and anaesthesia outcome.

First world anaesthesia training programs commonly take four years to complete. They involve the use of high technology equipment which is rarely seen, and even

more difficult to service, in third world countries. From 1962 until 1984 such training produced only seven trained anaesthetists in Nepal. From 1985 to 1990 the Nepal-based DA(TU) program has trained 19 anaesthetists in five years, and all except two of HMG's 50-bed or larger hospitals now have anaesthesia services. It was the first specialist postgraduate program in Nepal, and it has been followed by similar programs for obstetrics and gynaecology, paediatrics, and otolaryngology. Higher anaesthesia training abroad is now considered essential only for anaesthetists who require special areas of expertise for the major hospitals in Kathmandu.

Acknowledgements

The authors acknowledge the encouragement of His Majesty's Government of Nepal and successive deans of the Institute of Medicine in Kathmandu, and the enthusiasm of anaesthetists and basic science colleagues who have sustained the DA(TU) program. Canadian preceptors 1985-90 were J.R. Maltby (Calgary), T.J. McCaughey (Shawville), J.W. Sandison (Montreal), M.E. Cooke (Toronto), G.E. Moonie (Edmonton), W.E. Spoerel (London), and W.A. Tweed (London).

References

- 1 Maltby JR, Rana NB, Amatya R, Shrestha BM. Anaesthesia training in Nepal. *Can J Anaesth* 1987; 34: 51-5.
- 2 Regulations Relating to the Examinations for the Diploma of Fellow in the Faculty of Anaesthetists (FFARCS Eng.). Faculty of Anaesthetists Royal College of Surgeons of England 1984.
- 3 Weiner SJ. "Source Force" and the Nepal medical profession. *Soc Sc Med* 1989; 29: 669-75.
- 4 Epstein HG, McIntosh RR. An anaesthetic inhaler with automatic thermocompensation. *Anaesthesia* 1956; 11: 83-8.
- 5 Houghton IT. The Triservice anaesthetic apparatus. *Anaesthesia* 1981; 36: 1904-8.
- 6 Farman JV. Economical anaesthesia overseas: air-entrainment device in conjunction with draw-over vaporisers in children. *Br Med J* 1965; 2: 1428.
- 7 Greene NM. An ASA overseas teaching program. *Anesthesiology* 1990; 72: 1-2.
- 8 Shrestha PN. Health manpower in Nepal. Basle, Switzerland: Ciba Geigy Ltd. 1984: 34.
- 9 Donald S. Use of Haloxair apparatus with an oxygen concentrator. *Can J Anaesth* 1987; 34: 537-8.
- 10 Swar BB. Oxygen concentrators. *Can J Anaesth* 1987; 34: 538.
- 11 Tweed WA, Amatya R, Spoerel WE. Re-evaluation of the Farman entrainer in a low pressure system for field anaesthesia. *Can J Anaesth* 1990; 37: 924-7.
- 12 Tweed WA, Amatya R, Spoerel JWE. A low pressure portable anaesthesia system for field use: clinical trials. *Can J Anaesth* 1990; 37: 928-31.
- 13 King M (Ed.). Primary Anaesthesia. Oxford: Oxford University Press 1986.
- 14 Dobson MB. Anaesthesia at the district hospital. World Health Organization 1988.
- 15 Forrest JB, Cahalan MK, Rehder K et al. Multicenter study of general anesthesia. II. Results. *Anesthesiology* 1990; 27: 262-8.
- 16 Slogoff S, Keats AS. Randomized trial of primary anesthetic agents on outcome of coronary artery bypass operations. *Anesthesiology* 1989; 70: 179-88.
- 17 Tuman KJ, McCarthy RJ, Spiess BD et al. Does the choice of anesthetic agent affect outcome after coronary artery surgery? *Anesthesiology* 1989; 70: 189-98.