- 19 Pickup JC, Bilous RW, Viberti GC, *et al*. Plasma insulin and C-peptide after subcutaneous and intravenous administration of human insulin (recombinant DNA) and purified porcine insulin in healthy men. *Diabetes Care* 1982;5 (suppl 2):29-34.
- 20 Kemmer FW, Sonnenberg G, Cüppers HJ, Berger M. Absorption kinetics of semisynthetic human insulin and biosynthetic (recombinant DNA) human insulin. *Diabetes Care* 1982;5 (suppl 2):23-8.
- 21 Botterman P, Gyarm H, Wahl K, Ermler R, Lebender A. Insulin concentrations and time-action profiles of different intermediate-acting insulin preparations in non-diabetic volunteers under glucose controlled glucose infusion technique. *Diabetes Care* 1982;5 (suppl 2):43-52.
- 22 Owens DR, Jones IR, Birtwell AJ, *et al*. Study of porcine and human isophane (NPH) insulins in normal subjects. *Diabetologia* 1984;26:261-5.
- 23 Holman RR, Steenson J, Darling P, Reeves WG, Turner RC. Human ultralente insulin. *Br Med J* 1984;288:665-8.
- 24 Chawdhury SA, Dodson EJ, *et al*. The crystal structures of three non-pancreatic human insulins. *Diabetologia* 1983;25:460-4.
- 25 Clark AJL, Adeniyi-Jones RO, Knight G, *et al*. Biosynthetic human insulin in the treatment of diabetes. A double-blind cross-over trial in established diabetic patients. *Lancet* 1982;ii:354-7.
- 26 Mann NP, Johnston DI, Reeves WG, Murphy MA. Human insulin and porcine insulin in the treatment of diabetic children: comparison of metabolic control and insulin antibody production. *Br Med J* 1983;287:1580-2.
- 27 Home PD, Mann NP, Hutchison AS, *et al*. A fifteen-month double-blind crossover study of the efficacy and antigenicity of human and pork insulins. *Diabetic Medicine* 1984;1:93-8.
- 28 Galloway JA, Peck FB, Fineberg SE, *et al*. The US "new patient" and "transfer" studies. *Diabetes Care* 1982;5 (suppl 2):135-9.
- 29 Francis AJ, Home PD, Hanning I, Alberti KGMM, Tunbridge WMG. Intermediate-acting insulin at bedtime: effect on blood glucose concentrations before and after breakfast. *Br Med J* 1983;286:1173-6.
- 30 Francis AJ, Alberti KGMM. A comparison of human Ultratard and porcine Monotard as part of a twice daily insulin regimen. *Diabetic Medicine* 1984;2:318-9.
- 31 Pickup JC, Keen H, Viberti GC, *et al*. Continuous subcutaneous insulin infusion in the treatment of diabetes mellitus. *Diabetes Care* 1980;3:290-300.
- 32 Fineberg SE, Galloway JA, Fineberg NS, Rathburn MJ, Hufferd S. Immunogenicity of recombinant DNA human insulin. *Diabetologia* 1983;25:465-9.
- 33 Heding LG, Marshall MO, Persson B, *et al*. Immunogenicity of monocomponent human and porcine insulin in newly diagnosed type 1 (insulin dependent) diabetic children. *Diabetologia* 1984;27:96-8.
- 34 Peacock I, Tattersall RB, Taylor A, Douglas CA, Reeves WG. Effects of new insulins on insulin and C-peptide antibodies, insulin dose, and diabetic control. *Lancet* 1983;ii:149-52.
- 35 Reeves WG, Allen BR, Tattersall RB. Insulin-induced lipatrophy: evidence for an immune pathogenesis. *Br Med J* 1980;280:1500-3.
- 36 Kurtz AB, Nabarro JDN. Circulating insulin-binding antibodies. *Diabetologia* 1980;19:329-34.
- 37 Maneschi F, Fineberg SE, Kohner EM. Successful treatment of immune-mediated insulin resistance by human insulin (recombinant DNA). *Diabetes Care* 1982;5 (suppl 2):175-9.
- 38 Nolte M, Hellman N, Damon G, Grodsky G, Karam J. Superiority of human monocomponent insulin to pork monocomponent insulin in a diabetic patient with severe immune insulin resistance. *Clinical Research* 1983;31:95A.
- 39 Reeves ML, Galloway JA, deShazo RD. Complications of insulin therapy and their treatment. In: Skyler JS, ed. *Insulin update 1982*. Amsterdam: Excerpta Medica, 1982:295-306.
- 40 Chamovitz A, Ackerman M, Levine R, Greene D, Galloway JA, Fireman P. Desensitization with human insulin for therapy of insulin allergy. *J Allergy Clin Immunol* 1983;71:112A.
- 41 Gray RS, Cowan P, di Mario U, Elton RA, Clarke BF, Duncan LJP. Influence of insulin antibodies on pharmacokinetics and bioavailability of recombinant human and highly purified beef insulins in insulin dependent diabetics. *Br Med J* 1985;290:1687-91.
- 42 Francis AJ, Hanning I, Alberti KGMM. The influence of insulin antibody levels on the plasma profiles and action of subcutaneously injected human and bovine short-acting insulins. *Diabetologia* 1985;28:330-4.
- 43 Bolli G, Feo PD, Compagnucci P, *et al*. Abnormal glucose counter-regulation in insulin-dependent diabetes mellitus. Interactions of anti-insulin antibodies and impaired glucagon and epinephrine secretion. *Diabetes* 1983;32:134-41.
- 44 Madsbad S, Hilsted J, Krarup T, Sestoft L, Christensen NJ, Tronier B. The importance of plasma-free insulin and counter-regulatory hormones for the recovery of blood glucose following hypoglycaemia. *Acta Endocrinol (Copenh)* 1985;108:224-30.
- 45 Madsbad S, Alberti KGMM, Binder C, *et al*. Role of residual insulin secretion in protecting against ketoacidosis in insulin-dependent diabetes. *Br Med J* 1979;ii:1257-9.
- 46 Vaughan NJA, Matthews JA, Kurtz AB, Nabarro JDN. The bioavailability of circulatory antibody-bound insulin following insulin withdrawal in type 1 (insulin-dependent) diabetes. *Diabetologia* 1983;24:355-8.
- 47 Yue DK, Baxter RC, Turtle JR. C-Peptide secretion and insulin antibodies as determinants of stability in diabetes mellitus. *Metabolism* 1978;27:35-44.
- 48 Mylvaganam R, Stowers JM, Steel JM, Wallace J, MacHendry JC, Wright AD. Insulin immunogenicity in pregnancy: maternal and fetal studies. *Diabetologia* 1983;24:19-25.
- 49 Ludvigsson J. Insulin antibodies in diabetic children treated with monocomponent porcine insulin from the onset: relationship to B-cell function and partial remission. *Diabetologia* 1984;26:138-41.
- 50 Guy RJC, Richards F, Edmonds ME, Watkins PJ. Diabetic autonomic neuropathy and iritis: an association suggesting an immunological cause. *Br Med J* 1984;289:343-5.

Endotracheal intubation: friend or foe

Endotracheal intubation is an essential part of modern anaesthetic practice, providing, as it does, both safety and convenience. Yet the doctor who attempts intubation and passes the tube into the oesophagus will—if he does not recognise the mistake—most likely kill the patient.

Obstetric anaesthesia is the only branch of the specialty in which we have accurate mortality data, and the most common cause of such deaths is "failed intubation." Possibly obstetric patients present greater problems for intubation than non-pregnant patients, but nevertheless some such preventable deaths must be occurring in non-obstetric practice.

Another worrying category of deaths is those associated with the resuscitation of unanaesthetised patients with cardiovascular collapse. When an anaesthetist attends a cardiac arrest he usually performs endotracheal intubation (though not as the initial attempt to fill the lungs with air or oxygen); properly placed, the tube is of the greatest value in maintaining artificial respiration and safeguarding the airway. The result has been that intubation has come to be seen as an essential part of cardiopulmonary resuscitation even when no anaesthetist is present. While some doctors who have not received anaesthetic training can pass tubes correctly, nevertheless the skill is one that requires fairly continuous practice. Even more important is the ability to diagnose incorrect placement quickly. There are very few absolute signs that the tube is in the trachea; in most cases reliance is placed on good visualisation of the larynx during intubation, the "feel" of the lungs during bag compression, the presence of reasonable breath sounds, and appropriate thoracic movement. The restarting of spontaneous respiration with the appearance of bag movement is reassuring. If the apparatus is available the detection of carbon dioxide in the expired air is

diagnostic. The presence of bronchospasm or pneumothorax can confuse the picture—but while these possibilities should be borne in mind their presence should be accepted only with good evidence. Difficulty in ventilating is more likely to be because the tube has been placed in the oesophagus than because of bronchospasm. The detection of breath sounds is notoriously misleading, as these may be mistaken for the sound of the air passing along the oesophagus.

The most convincing evidence of the position of the tube is the patient's response to attempted ventilation. If a blue patient goes pink the tube is unlikely to be anywhere but in the trachea. If the pink patient goes blue it probably is not. Both these possibilities require some cardiovascular adequacy. The patient with a palpable pulse whose alveoli contain a reasonable amount of oxygen will not remain blue in normal circumstances. The paradoxical danger of pre-oxygenation in this context is important, as it may be several minutes before cyanosis appears, by which time the anaesthetist may not suspect a misplaced tube. This is not a reason to avoid preoxygenation, but the fact that the patient has remained pink for some minutes does not exclude oesophageal intubation.

Patients do not die from a "failure to intubate." They die either from failure to stop trying to intubate or from undiagnosed oesophageal intubation. Ventilating with a mask and oral airway appears to be a dying art—even among anaesthetists—but it is easier to teach than endotracheal intubation. Those not trained in anaesthesia are best advised to use mouth to mouth breathing only.

One major advantage of an endotracheal tube is the protection it affords against aspiration of gastric contents into the lungs. If aspiration seems a possibility and endotracheal intubation has failed, or has not been attempted, an oeso-

phageal obturator may be inserted to prevent the gastric contents reaching the pharynx while giving a clear airway.¹ Such devices have been used successfully on considerable numbers of patients,² but they are not free from hazards.³ If they are to be available in the event of difficulty, anaesthetists must know how to use them and the problems they may pose.

The advice for inexperienced anaesthetists is—or should be—clear cut. Firstly, they should be sure the tube is really necessary in the first place. Secondly, they have to be ready to decide sooner rather than later that they cannot intubate a patient and have a readily applicable drill for such an eventuality. Thirdly, they should maintain a high level of suspicion for oesophageal placement. And, fourthly, they should be competent at artificial ventilation using a mask, airway, and bag.

Non-anaesthetists attempting cardiopulmonary resuscitation should attempt to intubate only if they know they are

competent and accept proper placement only if all the signs are right. They should never intubate as the first intervention—mouth to mouth respiration comes first. Finally, all those concerned with deaths should insist that the tube is left in situ. The pathologist will then be able to confirm its position—and so stop endless and fruitless arguments.

D B SCOTT

Administrative Consultant Anaesthetist,
Royal Infirmary of Edinburgh,
Edinburgh EH3 9YW

- 1 Tunstall ME, Geddes C. "Failed intubation" in obstetric anaesthesia. An indication for the use of the "oesophageal gastric tube airway." *Br J Anaesth* 1984;56:659-61.
- 2 Donen H, Tweed A, Dashfsky S, Guttormson B. The esophageal obturator airway: an appraisal. *Can Anaesth Soc J* 1983;30:194-200.
- 3 Corke CF, Jackson IJ. "Esophageal gastric tube airway"—a potential hazard. *Br J Anaesth* 1985;57:930-1.

AIDS in primates

Several species of old world African and Asian non-human primates are naturally infected with simian T lymphotropic viruses (STLV) types I and III, which are closely related to the human counterpart T lymphotropic viruses HTLV-I and LAV/HTLV-III.

The exogenous type C retrovirus isolated from captive macaque monkeys with an immune deficiency syndrome (simian AIDS) in the United States has been designated STLV-III mac. There are striking similarities between this virus and LAV/HTLV-III, the causative agent of the human acquired immune deficiency syndrome (AIDS). These include growth characteristics, morphology, T4 cell tropism, similar size of viral structural proteins, and serological cross reactivity of viral proteins. More recently a virus which is also related to LAV/HTLV-III was isolated from healthy African green monkeys (*Cercopithecus aethiops*) and designated STLV-III agm. Antibodies to this virus are found frequently (5-70% or more, average 40%) in serum from African green monkeys originating from central and other regions of Africa (K N Tsiquaye, A J Zuckerman, unpublished observations). The main proteins of this simian virus are also similar in molecular weight to the main gag and env encoded proteins of LAV/HTLV-III and are recognised by reference LAV/HTLV-III human serum as well as by monoclonal antibodies to the main core protein, p24, of the human virus.¹ Though we do not know how long such viruses have been present in African green monkeys in Africa, limited serological evidence suggests that antibody to STLV-III has been present for at least 10 years.²

These findings are particularly important in relation to the production of vaccines and reagents in monkey kidney cell cultures and the use of these cultures in diagnostic virology. For example, most of the oral attenuated live poliomyelitis vaccine used throughout the world is produced in primary kidney cultures from African green monkeys and in some countries from rhesus monkeys. The World Health Organisation therefore convened two informal meetings of experts to discuss the findings of simian T lymphotropic viruses and consider the implications. The conclusions were reassuring.³

Firstly, during the 1970s representative bulk and final preparations of live poliomyelitis vaccines prepared in African green monkey kidney cultures were tested for the presence of retroviruses by reverse transcriptase assays; and primary monkey kidney cell cultures, including those from African green monkeys, were examined after chemical induction by electron microscopy for virus-like particles and for particle associated reverse transcriptase activity. No evidence was found for the presence of retroviruses.

Secondly, current tests of World Health Organisation vaccine seed stocks of poliovirus types 1, 2, and 3 as well as more than 20 batches of vaccine in Europe and North America yielded no evidence of retroviruses. In addition 250 recipients of vaccine in Europe and North America were tested for LAV/HTLV-III antibodies and found to be negative. Thirty of these recipients were tested and were negative for antibodies to STLV-III.

Thirdly, long term and continuing follow up of recipients of live poliomyelitis vaccine suggests the absence of adverse effects potentially associated with retrovirus.

We have not, however, heard the last of simian T lymphotropic viruses. Antibodies to a virus which is almost indistinguishable from STLV-III agm have recently been found in apparently healthy people living in west Africa.⁴ Studies of the molecular structure and biology of these simian viruses will yield a wealth of information relevant to the study of the human counterpart viruses.

ARIE J ZUCKERMAN

Professor of Microbiology,
London School of Hygiene and Tropical Medicine,
London WC1E 7HT

- 1 Kanki PJ, Alroy J, Essex M. Isolation of T-lymphotropic retrovirus related to HTLV III/LAV from wild-caught African green monkeys. *Science* 1985;230:951-4.
- 2 Kannagi M, Yetz JM, Letvin NL. In vitro growth characteristics of simian T-lymphotropic virus type III. *Proc Natl Acad Sci USA* 1985;82:7053-7.
- 3 World Health Organisation. T-lymphotropic retroviruses of non-human primates. WHO informal meeting. *Weekly Epidemiological Record* 1985;30:269-70.
- 4 Barin F, M'Boup S, Denis F, et al. Serological evidence for virus related to simian T-lymphotropic retrovirus III in residents of West Africa. *Lancet* 1985;iii:1387-9.