

inhibiting contraction). Thus, ATP is conserved and calcium overload is reduced (or prevented), enabling the cells to recover fully if the vasospasm is relieved quickly (<30 minutes).

The slow calcium channels also require ATP for activity,^{6,8} with half inhibition occurring when the ATP concentration falls to about 0.3 mmol/l.⁷ Since this value is considerably higher than that required for phosphorylation, ATP may be required to bind to a site on the inner surface of the calcium channel for it to exhibit activity. During ischaemia the ATP concentration falls (perhaps more quickly in the cytoplasm bordering on the cell membrane), and so this may serve as another means of inhibiting the calcium channels.

Nerves also regulate contraction

pH and ATP concentrations are intrinsic factors that regulate the activity of the slow calcium channels and thereby protect the myocardial cells from calcium overload (and necrosis) and conserve ATP during regional ischaemia. Extrinsic factors also regulate the force of contraction—for example, sympathetic and parasympathetic nerves, which act through raising the concentration of cyclic nucleotides, activating protein kinases, and phosphorylation.

Activation or stimulation of an outward flow of potassium is always hyperpolarising. It depresses excitability and shortens the duration of the action potential plateau. The briefer action potential turns off the calcium channels prematurely and therefore decreases the influx of calcium and force of contraction. The same principle applies to the special set of potassium channels that are sensitive to ATP.⁹ These potassium channels are normally in a long term state of inhibition (“masked”) when the ATP concentration is normal (5–20 mmol/l)—that is, when coronary flow is normal. However, during ischaemia (or hypoxia), the ATP concentration falls, thereby unmasking (or activating) this class of potassium channels and producing a large outward flow of potassium. This causes progressive shortening of the action potential, thereby reducing calcium influx and contraction and conserving ATP.

Increased intracellular calcium during ischaemia also inhibits the calcium channels and decreases the electrochemical driving force for calcium influx. The loss of potassium from cells that occurs during ischaemia results in some depolarisation, which decreases the driving force for calcium influx.

Together these mechanisms prevent or reduce calcium overload and resultant cell necrosis, and allow the cells to recover when the vasospasm is relieved. Without them, the cells would work themselves to death.

I have attempted a functional definition of myocardial ischaemia—when the myocardial cells start screaming for help and attempt to protect themselves against catastrophic adversity. At the level of ion channels it occurs when the slow calcium channels in the cell membrane begin to shut down and the potassium channels, regulated by ATP, begin to become disinhibited. This is the earliest functional change that I know of and leads to a concomitant rapid depression of contraction. This definition seems to meld the biochemical and physiological definitions given in *Cardiovascular Research*.

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Primary health care led NHS: learning from developing countries

Many lessons

Over the past 30 years a wide range of developing countries have successfully developed a model of primary health care promoted by the World Health Organisation. This is based on the idea of “essential health care based on practical, scientifically sound and socially acceptable methods and technology, made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain.”^{1,2} It differs fundamentally from the primary care system in the United Kingdom, which relies more on technical and curative care than the community oriented approach. Many Western countries, including the United Kingdom, are now, however, shifting their policies to strengthen primary health care,³ and there could be lessons to be learnt from the achievements of developing countries.

In the 1950s and '60s many developing countries faced a daunting task. Economic recession meant that many could not even start to emulate the West's medical model of health

based on hospital medicine and high technology. A different model of care emerged, which recognised that the health of populations was determined by factors other than medical care and that these factors could be controlled by communities themselves, through collaboration with other sectors, such as agriculture, water sanitation, and education, in a “spirit of self reliance and self determination.”

The roots of this started with health initiatives based in the community in Africa and Asia, some dating back to the 1920s—for example, training programmes for community health workers in Sudan. By the 1970s the WHO had recognised and formulated this model and declared at Alma Ata that “health for all” was achievable through primary health care by 2000. Many people have only recently become familiar with the words and principles that followed this declaration, such as “community oriented primary care,” “intersectoral collaboration,” “integrated services,” and “local health systems.” The then director of the WHO,

Halfden Mahler, suggested that health for all would be attainable for a few dollars a person.⁴ While this target was perhaps optimistic, few can doubt the effectiveness of primary health care programmes based in the community.

The West's reaction to this model was to support it in developing countries by giving aid but to reject it for the West's own countries. The medical model was powerful, and its proponents had a vested interest in arguing that populations would become healthier with more doctors and hospitals.

The West's second reaction was political. Socialist countries such as China, Cuba, and Tanzania had fully adopted primary health care and the concepts of community participation, devolved decision making, and equity. In Tanzania, for example, the government dramatically reversed the normal allocation of health expenditure in 1971, allocating 75-80% of spending to primary health care. In 1973-5 the hospital allocation was further reduced to 12-15% with a simultaneous increase in training facilities for non-specialist health professionals.⁵ Further political and social reforms encouraged the democratisation of decision making; each community appointed chairmen representing a small group of households and developed women's organisations, which had an important political and administrative role within the local health system.

Fears of socialism

Such reforms resulted in dramatic improvements in health status in many countries. After the introduction of barefoot doctors, for example, China witnessed one of the greatest reductions in mortality among the under 5s since 1960, the rate falling from more than 175 per 1000 live births to under 49.⁶ The West, however, fearing socialist expansion, denied that these socialist ideological concepts were appropriate for Western countries. Nevertheless, the medical model was under pressure, with spiralling costs and the realisation that most determinants of health lay outside the domain of medical care services.^{7,8}

The third and final reaction by the West has been quite different. With the end of the Cold war, the receding threat of socialist expansionism, and the emergence of the "caring '90s," British and other Western governments are now discovering the wider determinants of health and the strength of community involvement and collaboration with other sectors outside the health services.^{9,10} The increased recognition of the causes of poverty and of widening inequalities in health has helped this process.^{11,12} Some of the WHO's initiatives that have been so successful in developing countries, such as "Health for All," use of health targets, and community empowerment, are now being pursued in Britain. The latest is a primary health care less NHS.

Health professionals from Britain who have worked in a developing country may be familiar with programmes that are led by primary health care. They may have seen the democratisation necessary for community participation and

the powerful effect of intersectoral collaboration at local level. They may have helped to train community health workers and traditional birth attendants; taken part in community based rehabilitation, health promotion, nutrition, and immunisation programmes; and worked on health sector reforms.

As one health professional put it recently, "Working overseas for Oxfam and the Red Cross in refugee health broadened and clarified my understanding of primary health care, in particular the need to assess health needs to plan provision; involving communities in the planning process; the benefits of multidisciplinary training and the essential role of audit."¹³ The potential contribution of health and development workers with first hand experience of health services in the developing world has now been recognised by the Department of Health, which has encouraged employers to view an overseas posting as an opportunity for professional development.¹⁴

The new policies in the United Kingdom that are led by primary health care have therefore resulted from international health policy based on the experiences of many developing countries over the past 30 years. A wealth of knowledge about primary health care exists in developing countries, which is now relevant to the NHS. It is time for us to recognise this and learn from it.

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Correction

Local research ethics committee

Three editorial errors occurred in this leading article by Professor K G M M Alberti (9 September, pp 639-40). The first sentence of the sixth paragraph should have read: "The time to obtain a response varied greatly, from six to 161 days (mean 60 days [not median 56 days]) in While's [not White *et al's* study]."¹¹ Reference 11 should therefore have read: "11 While AE [not White A]. Ethics committees: impediments to research or guardians of ethical standards? *BMJ* 1994;311:661."