

Nuclear Weapons: The Road to Zero. Joseph Rotblat (ed.). Westview Press, 5500 Central Avenue, Boulder, Colorado 80301-2877, USA. 1998. 331 pp. Price: US \$65.

This book is a compilation of articles presented at the Pugwash Workshop held in London in October 1996 and edited by Joseph Rotblat, Nobel laureate (1995). 'The volume assesses recent efforts by scholars, military leaders, and political figures to advocate the elimination of nuclear weapons. It brings to focus the major dilemmas of disarmament, including verification, nuclear theft and diplomatic and security threats and argues for why the obstacles must be overcome.' It raises the fundamental question, 'will it be possible for the international community not simply to reduce the number of nuclear weapons to low levels but reduce it to zero'. This may not be possible soon, as nationalism has yet to make way for internationalism in evolving policies that affect people across national borders. Wars are still considered as an extension of foreign policy for resolving issues except that nuclear wars are several orders of magnitude more destructive to life and property. This book is a valuable contribution to the debate.

If the reactions even among the educated community in India to the May 1998 nuclear explosions are any indication, there are not likely to be many disinterestedly interested persons who would be willing to examine the issues raised in this book on their own merits and change their perceptions. The 'bounded rationality' of human beings readily comes to mind. For those who believe in the futility of nuclear arms build-up, for whatever the reasons, the articles highlight the complexity of the issues involved while traversing the road to zero.

Part 1 of the book deals with issues related to achieving nuclear weapon free world (NFWF) and outlines the basis of the argument; phased elimination of nuclear weapons; verifying nuclear disarmament and the potential role of the society in verification; reducing the threat of nuclear theft and violation of the nuclear weapons convention by countries that signed it. Part 2 discusses issues of how to go about it, i.e. the

road to zero and discusses issues related to nuclear weapons reduction; ballistic missile defence; issues related to nuclear weapons development without testing; Western nuclear doctrine and related changes and influences; Russian disarmament dilemmas and closing the gaps in the nuclear disarmament.

An inevitable conclusion one could draw after reading through the book is that it is perhaps easier to produce nuclear weapons than obtain a nuclear weapon free world, in spite of the general awareness that it would be suicidal to indulge in a nuclear war. During the discussions associated with START I negotiations, Reagan and Gorbachev apparently agreed that 'A nuclear war cannot be won and must never be fought'. Pleach concludes that in spite of all the talk and efforts towards disarmament, 'the Western nuclear weapons states are putting up a strong resistance to implement their legal obligations towards disarmament. They have retained doctrines for the use of nuclear weapons in a variety of circumstances'. Against this background, Nikitin from Russia argued, that 'START II inspired reduction should be supplemented – or indeed lead by – measures to diminish the threat of the use of nuclear weapons'. This is the major stumbling block currently for all the nuclear powers. Cochran *et al.* conclude that 'While the public and media perception is that the US and Russian nuclear weapons stockpiles under START II will be reduced to no more than 3500 warheads each by the year 2003, the truth is that both the nations are planning stockpiles that are three times this amount, of the order of 10,000 to 11,000 warheads. The various future plans of the five nuclear weapons states still indicate that they intend to retain nuclear weapons into the indefinite future'. Apparently, the March 1997 joint policy statement by Clinton and Yeltsin did not have any reference to an eventual objective of eliminating them altogether.

Apparently, nuclear power stations produce one gram per day of plutonium for every mega watt of power generated. About 4 kg is required to make a bomb. Thus a 100-mega watt nuclear power station would produce enough plutonium to make a bomb once in every 40 days or about 9 bombs per year. It cannot be anybody's argument that to sepa-

rate the plutonium from the spent fuel is child's play. But the temptation to join the nuclear club will be very high indeed for countries that produce nuclear power and have dreams of glory in the name of developing deterrence, if not for aggressive purposes by rogue states, thus complicating the issue further.

Fetter states that Russia at present has enough fissile material to produce 1,20,000 bombs, US 80,000, France 4000, UK 3000, China 3000, Israel 100, India 80 and Pakistan 20. In a sense, these figures indicate who the potential adversaries could be for the various states who are already nuclear powers or who aspire to join the club. The threshold nuclear powers in particular need to give serious thought to the advisability of surrendering to their compulsions to join the nuclear club by stockpiling nuclear weapons. They should consider the relevance of their nuclear deterrence efforts and the associated costs.

In the chapter, 'Breakout from a nuclear convention' (assuming that one is signed by all nations), Milne and Rotblat conclude that while breakout, i.e. violation of the convention is a potential danger, it can be exaggerated. They argue that there are formidable political constraints, arising from 'rational thinking' on world affairs, working to deter any state from this action. They argue that 'A state that defied the world by producing nuclear weapons in a NFWF has little to gain and everything to lose from this action. One wonders if all national leaders, particularly those from rogue states, are driven by 'rational thinking', in formulating their national policies.

We seem to be as yet far away from the NFWF. The situation in fact continues to be of serious concern, when it is realized that a teenage American boy-scout was effectively close to obtaining a chain reaction in a garage. If they care to think about it dispassionately, such developments can quickly bring down the euphoric high of a nation's people for exploding a bomb or two, to a feeling of concern about the consequences of more and more nations, particularly rogue states, getting into the act.

This book is a must for all those with an open mind and willing to examine the issue of the painful walk along the road to zero. It is also a book for people who believe in nuclear disarmament but

have no illusions about the complexity. Every time another nation strives to join the nuclear club, it will be making it that much more difficult to reach the worthwhile objective of NFWF.

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Annual Review of Medicine: Selected Topics in Clinical Sciences: Cecil H. Coggins, William E. Hancock and Lee J. Levitt (eds). Annual Review Inc. 4139, El Camino Way, P.O. Box 10139, Palo Alto, CA 94303-0139, USA. 1998. vol. 49. Price US \$60.

The last century has witnessed rapid advances in various specialities of medicine. The pace of these phenomenal advances has gone beyond the scope and ability of the average physician to keep track of the information and to utilize the same in day to day practice. It is in this context, *Annual Review of Medicine* gains its relevance by giving a comprehensive review of the landmark developments in various branches of clinical sciences. The 1998 edition with its 31 reviews is a valuable addition to this series. It covers a wide range of topics from basic sciences, clinical medicine to public health, so that the clinician is updated and informed about the state-of-art knowledge as he marches on to the next millennium.

Three of the articles are related to coronary artery disease (CAD), the major killer disease of mankind in the 20th century. Phenylketonuria was the first inborn error of metabolism with a dietary cure to be identified. Towards the fag end of the millennium, yet another metabolic disorder of amino acids involving homocysteine (Hcy) is identified to account for at least 10% of the modern CAD epidemic, by epidemiological and biochemical studies. Refsum and colleagues summarize the data to project Hcy levels as a strong but modifiable predictor of cardiovascular mortality and morbidity. Elevated Hcy levels confer a graded risk with no

threshold and is independent of conventional risk factors. Evidences from 80 epidemiological studies are consistent, strong and temporally accounts for added CAD risk in general population. Endothelial dysfunction and thrombogenesis initiated by Hcy leads to atherogenesis. The four major enzymes involved in Hcy metabolism utilize B complex vitamins like folate, cyanocobalamin, riboflavin, pyridoxine and cofactor like betaine. In addition, a variety of factors like total protein intake, consumption of coffee, alcohol, smoking, age, hormonal status, renal function, drugs and genetic variants in enzymes affect the blood levels. Estimation of blood Hcy levels requires facilities for high performance liquid chromatography. Blood levels more than 15 $\mu\text{mol/l}$ in fasting state is considered abnormal for epidemiologic purposes. The risk conferred by Hcy for coronary, cerebral and peripheral vascular disease is modifiable with lifestyle modification and multivitamin supplementation. Currently fortification of flour and cereal products with folic acid is initiated in developed countries as a major public health measure aimed to achieve further reduction in mortality due to cardiovascular disease.

Solomon and Girsh address an important aspect in clinical cardiology, i.e. the open artery hypothesis. The concept refers to reperfusion of an occluded coronary artery beyond a time when myocardial salvage is no longer possible. This exerts a favourable course on left ventricular function and survival by improving wound healing, decreasing the incidence of ventricular arrhythmias and rejuvenating hibernating myocardium and also by acting as a potential source for future collaterals. This concept is substantiated by experimental and clinical studies like ISIS2, LATE, EMERAS and TAMI. The clinical implications of this hypothesis suggested by circumstantial evidence needs scrutiny of randomized trials.

In their article on monoclonality of atherosclerosis, Schwartz and Murray reexamine the clonal origin of the plaque as proposed by Beniditt and Beneditt as early as 1973. Clones represent focal replication of cells without mixing up with adjacent cells. Initially the proliferating smooth muscle cells of the plaque were identified to represent a

single clone of mesenchymal origin. Identification of the onset of this clonal expansion reveals the earliest event in the formation of these critical lesions. The original 'neoplastic theory' did not get wide acceptance and gave way to 'response to injury' hypothesis. But further studies by karyotyping, DNA-PCR technique and X-linked polymorphism have not only confirmed the clonal origin, but also identified large patches of single allotype existing in the arterial wall. These cells do not have rapid cell turnover and therefore should originate early in the natural history or result from natural selection over the years. These cells of the plaque may develop because of migration and trapping in embryonal life, or originate *in situ* from pluripotent cells derived from the vessel wall or circulation, or else apoptotic cell death of other cell lines which cannot adapt to the environment can select a cell line (and such clonal selection does occur in organizing thrombus). Spontaneous or infection-mediated mutation can also select the evolution of a single clone in an atherogenic environment. Thus the revival of monoclonal hypothesis after 25 years unifies the thrombogenic theory, lipid theory, and the response to injury hypothesis and the recent concepts for infectious origin of this deadly plaque. In this context it is important to recognize that atherosclerosis is not a natural disease of other species and animal models of atherosclerosis do not have monoclonality. Thus, understanding of the biology of these cells peculiar to the plaque will go a long way in conquering the disease, elucidating the mechanism of its origin, evolution, determinants of complication and patterns of re-stenosis.

Two other articles of relevance to cardiologists are related to arrhythmias, one on molecular genetics of long QT syndrome (LQTS) and the other on the pathophysiology and therapy of atrial flutter. LQTS are congenital autosomal disorders of electrical repolarization caused by mutation of six genes. This is a frequent, but overlooked cause of syncope and sudden cardiac death (SCD) in children and young adults during exercise, emotional upset, and rarely during sleep. The morphologic study of SCD victims at autopsy is normal. The diagnosis can be made only by genetic studies and family screening. The