

## CHAPTER 39

### Ischemic Heart Disease: Medical Radiation as a Cause

- Part 1. Statement of Hypothesis-2
- Part 2. Various Names for Ischemic Heart Disease; ICD Numbers
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#### ● Part 1. Statement of Hypothesis-2

Hypothesis-2 is this: Medical radiation, received even at very low and moderate doses, is an important cause of Ischemic Heart Disease (IHD); the probable mechanism is radiation-induction of mutations in the coronary arteries, resulting in dysfunctional clones (mini-tumors) of smooth muscle cells.

Although this book was undertaken only to evaluate our Hypothesis-1 concerning the etiology of Cancer, Hypothesis-2 practically "fell out of the data" --- much to our surprise, as we said in Chapter 25. Evaluation of Hypothesis-2 is at least as important as evaluation of Hypothesis-1, in our opinion, in terms of the implications for explaining and reducing rates of a major disease.

We can prevent some confusion about Hypothesis-2 --- as noted in the Introduction --- by stating that (a) it was discovered decades ago that medical radiation at very high doses can damage the heart and its vessels, and that (b) the kinds of damage reported from very-high-dose radiation seldom resemble the lesions of Ischemic Heart Disease (details in Appendix J).

Ischemic Heart Disease is a complicated, multi-stage phenomenon. Passions run very high among medical investigators about its major "players" (the proven and suspected causes), and about the likely sequence of their actions. Chapter 44 discusses several of those major players. It appears that Hypothesis-2 is not in conflict with observations made by other investigators (Chapter 46).

#### ● Part 2. Various Names for Ischemic Heart Disease; ICD Numbers

Ischemia means a local deficiency of blood. Ischemic Heart Disease means that the heart muscle is not receiving enough blood to do its job properly.

There is widespread agreement that ischemia of the heart has its origin in what is going on in the CORONARY arteries --- namely, interference with the blood-flow in those arteries. Thus, IHD is often called coronary heart disease (CHD) and coronary artery disease (CAD). Other names incorporate suggestions of WHAT has gone wrong with the coronary arteries. Coronary arteriosclerosis: "Hardening" of the arteries. Coronary atherosclerosis: A build-up in the arterial wall of material (atherosclerotic "plaque") which finally intrudes into the lumen and obstructs the blood-flow, partially or completely.

In the Seventh International Classification of Diseases, adopted in 1955, what we now call Ischemic Heart Disease was called Arteriosclerotic Heart Disease (our Chapter 4, Part 5, Entry 17). The Ninth International Classification of Diseases, adopted in 1975 and still current, uses the name Ischemic Heart Disease and gives it numbers 410-414. There is no longer an ICD listing for Arteriosclerotic Heart Disease.

#### ● Part 3. Some Additional Terms

Coronary thrombus. In acute attacks of coronary ischemia, the immediate cause is usually, but not always, a thrombus (a wall-attached "blood clot") in a coronary artery, and the thrombus is blocking flow of the blood. A thrombus within the lumen is sometimes called an intraluminal thrombus, to distinguish it from a clot occurring within the atherosclerotic lesion itself. The

relationship between clot-formation and atherosclerotic plaques of various types is under continuing study, and we will have more to say about this in Chapter 44, Part 7.

**Embolus.** An embolus is a blood-clot or other plug carried by the blood stream to a new location and forced into a smaller vessel, where it obstructs the circulation. An air bubble in the blood-stream also can be an embolus.

**Angina pectoris.** The pain sometimes perceived by patients, when the blood-supply to the heart muscle is transiently inadequate, is named angina pectoris. Angina pectoris and severe coronary atherosclerosis are often found together. Some episodes of angina pectoris are suspected to be due, in part, to a reversible spasm of a coronary artery.

**Arrhythmia.** Variations from the normal rhythm of the heart's BEAT are arrhythmias. There are several causes of arrhythmia. Ventricular fibrillation ("V-fib") is a condition of the heart's ventricles in which the individual muscle fibres take up their own independent action, producing an uncoordinated contraction and very little (if any) pumping of the blood.

**Myocardial infarction (MI)** is commonly called "heart attack." When part of the heart muscle (myocardium) dies due to blockage of one of the coronary arteries, this is myocardial infarction. An infarct is an area of necrosis in a tissue due to local obstruction of blood circulation to that area. Not all myocardial infarctions are fatal.

**Cardiac arrest.** An abrupt loss of heart function, whatever the cause, is cardiac arrest. Myocardial infarction may or may not cause cardiac arrest, and cardiac arrest may have other causes, so MI and cardiac arrest are not synonyms.

**Acute IHD "Events" or Syndromes.** A new myocardial infarction, unstable angina, and ischemic sudden death, each qualify as "an acute IHD event."

#### Other Types of Heart Disease

Hypothesis-2 concerns specifically Ischemic Heart Disease --- not hypertensive heart disease, and not rheumatic heart disease. These two other entities were considered separately, in Chapters 30 and 34. In Part 4, below, some additional and important distinctions are made.

#### ● Part 4. Current Place of IHD in U.S. Mortality

In 1993, in the United States, the absolute number of deaths from all causes combined was 2,268,553 deaths (ACS-CA, Jan. 1997, p.18).

Also in 1993, the absolute number of deaths from all kinds of Cancer combined was 529,904 cancer deaths --- or 23.4 percent of the U.S. total (ACS-CA, Jan. 1997, p.18).

Also in 1993, the absolute number of deaths from Ischemic Heart Disease was 489,970 IHD deaths --- or 21.6 percent of the U.S. total (AHA 1995, p.9).

IHD accounted for about 51.4 percent of the 954,138 deaths in 1993 which were classed by the American Heart Association as deaths due to "cardiovascular diseases" (AHA 1995, p.2). According to the AHA (1995, p.9), there are nearly 1.5 million new or recurrent "heart attacks" per year in the USA (with approximately one-third of them being fatal).

#### 4a. CardioVascular Diseases (CVD) versus "Diseases of the Heart"

There is plenty of room for confusion in comparing MortRates from one source versus another. The American Heart Association is very helpful by being explicit (AHA 1995, p.1):

"In compiling statistics, the AHA looks at specific cardiovascular disease categories, based on ICDA codes [International Classification of Diseases, Adapted] ... Primarily, we look at 'total cardiovascular' (total circulatory, codes 390-459). Depending on availability, data for congenital anomalies of the circulatory system (745-747) are also included. Within total CVD, the AHA follows

what are considered to be the major cardiovascular diseases: Ischemic (Coronary) Heart Disease (410-414); Hypertensive Disease (401-404); Rheumatic Fever/Rheumatic Heart Disease (390-398) and Cerebrovascular Disease (Stroke) (430-438) ... And (AHA 1995, p.1):

"... 'Diseases of the Heart' is a term commonly used by NCHS [National Center for Health Statistics] in its mortality publications and in its compilation of the 'Leading Causes of Death' ... Statistically, this category represents about 78 percent of total cardiovascular mortality." The category ("diseases of the heart") is described as follows by AHA 1995 (p.1):

ICDA	INCLUDED in "Diseases of the Heart"
390-398	Rheumatic Fever/Rheumatic Heart Disease
402	Hypertensive Heart Disease
404	Hypertensive Heart and Renal Disease
410-414	Ischemic Heart Disease
415-417	Disease of Pulmonary Circulation
420-429	Other Forms of Heart Disease
ICDA	EXCLUDED from "Diseases of the Heart"
401, 403	Hypertension with or without Renal Disease
430-438	Cerebrovascular Disease (Stroke)
440	Atherosclerosis
Note:	Atherosclerosis is the underlying cause of IHD and of many strokes. 440 refers to atherosclerosis occurring in arterial vessels OTHER than the coronary and cerebral arteries. Note that ICD 440 neither overlaps with 410-414 for IHD nor with 430-438 for stroke.
441-448	Other Diseases of Arteries, Arterioles and
451-459	Capillaries and Veins and Lymphatics

#### 4b. Estimated Annual Deaths from Some Other Segments of CVD

AHA 1995 (pp.14-15) provides the following estimates for annual, recent (1990-1993) deaths from some segments of Cardiovascular Disease which are NOT Ischemic Heart Disease, Hypertensive Disease, or Cerebrovascular Disease (Stroke). We have arranged them in their ICD/9 sequence. In some cases, we note the prevalence (the total number of cases which exist in a population at a specific time), as an indication of how many people may be monitored with repeated xray procedures.

390-398	Rheumatic Fever/Rheumatic Heart Disease. Approx. 1.36 million Americans today have rheumatic heart disease.	5,590
421.0	Bacterial Endocarditis	2,011
424	Valvular Heart Disease, including:	15,070
424.0	Mitral Valve Disorders Mitral valve prolapse occurs in 4% of young men and 6-10% of young women. "It is reported most often in young women ages 14 to 30, where prevalence may exceed 10 percent."	2,044
424.1	Aortic Valve Disorders	7,966
424.2,3	Tricuspid and Pulmonary Valves	14
425	Cardiomyopathy	24,573
426, 427	Arrhythmias, Including:	40,843
427.0,1,2	Tachycardia Estimated prevalence: 2.2 million.	544

427.3	Atrial Fibrillation	4,056
	Estimated prevalence: 2 million.	
427.4	Ventricular Fibrillation: "While ventricular fibrillation is listed as the cause of relatively few deaths, the overwhelming number of sudden deaths (which are estimated at about 250,000 per year) are thought to be from ventricular fibrillation."	1,461
428.0	Congestive Heart Failure About 4.7 million Americans are living with CHF.	36,387
440-448	Arteries, Diseases of, Including Peripheral Vascular Disease and:	43,520
440	Atherosclerosis (see "440 Note" in Part 4a)	17,090
441	Aortic Aneurysm	16,220
442-448	Other Diseases of the Arteries	9,117
745-747	Congenital Heart Defects About 32,000 babies are born each year with heart defects. "About 960,000 Americans with heart defects are alive today."	5,508

#### 4c. The 15 Leading Causes of Death during 1993, USA

The following list of deaths in 1993 is presented by the American Cancer Society in its journal CA (ACS-CA, Jan. 1997, p.18), where the source is cited as "Vital Statistics of the United States, 1996." An asterisk indicates that readers should consult the definitions above.

		2,268,553	Percent
	All Causes		
1 *	Heart Diseases (incl. IHD; see Part 4a)	743,460	32.8
2	Cancer	529,904	23.4
3 *	Cerebrovascular Diseases (see Part 4a)	150,108	6.6
4	Chronic Obstructive Pulmonary Diseases	101,077	4.5
5	Accidents	90,523	4.0
6	Pneumonia & Influenza	82,820	3.7
7	Diabetes Mellitus	53,894	2.4
8	HIV Infection	37,267	1.6
9	Suicide	31,102	1.4
10	Homicide	26,009	1.1
11 *	Diseases of Arteries (excl. IHD; see Part 4b)	26,005	1.1
12	Cirrhosis of Liver	25,209	1.1
13	Nephritis	23,317	1.0
14	Septicemia	20,634	0.9
15 *	Atherosclerosis (excl. IHD; see Part 4a)	17,272	0.8
	Others & ill-defined causes	309,952	13.7

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