

Apple The Guardian of Health

BY MRS. S. RAMANAND

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There is a well-known saying "An apple a day keeps the doctor away". This is not merely a saying but a good prescription to safeguard health.

Till some years back, except in parts of Kashmir, the plantations of apples were rarely known in other hilly tracts (which are suitable for its growth) of India. With the spread of knowledge about its usefulness and vitamin value, its growth has rapidly spread in Simla and Kulu hills of the Punjab and Kumaon Division of the United Provinces. It is a crop of great commercial value also, and still there are ample tracts of hilly lands in North-West India where this fruit can be grown to better the health of the nation.

The tempting aroma, and luscious flavour of the apple make it a universal favourite. It promotes secretion of appetite juice and thus stimulates digestion.

The sugar content of the apple is not very high, but it has very useful mineral salts. It contains potassium and sodium, lime, magnesium and a trace of iron. Though the protein contents is small but it is very fine. It also contains free organic salts, malic and gallic. Its therapeutic and medicinal value in cases of diarrhoea specially of infants and children has recently been established. Both in Unani and Ayurvedic systems of medicines stewed apple in sugar coupled with gold and silver leaves is prescribed for heart trouble and general debility.

Student Nurses' Section

Radium

BY J. D. DORAI RAJ, R. N.

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I am sure most of you have heard of Radium but very few of you will have seen it. I have written in this article only the elementary things about Radium. My training school (Scudder's Hospital, Ranipet) is one of the fortunate hospitals to deal with radium. I have worked for nearly a year as a radium custodian which gave me the opportunity to know something about it.

Radium.—During the present century, the power of science is increasing. Hardly a week passes without some important discovery being announced. The discovery by Madame Curie, of radium, is perhaps one of the most important events in the history of man. Radium is a metal of the alkaline earth group similar to calcium, barium, strontium and magnesium. It is extracted from pitch blende. Its symbol is Ra. Its melting point is 700 degrees centigrade. What is generally referred to as radium is *Chloride* of Radium. It resembles small crystals of common salt which may be crushed into a fine powder.

Discoverers.—The discovery of radium can be traced to the French Scientist Henri Becquerel in 1897, who undertook the systematic study of fluorescent and phosphorescent substances after the discovery of Rontgen's Rays. Fortunately, he began these experiments on some Uranian compounds and having put these minerals in small trays, of aluminium and copper, placed the trays on photographic plates and obtained direct photographs by exposure to sunlight. One day, the sky became overcast and so he placed the trays in a drawer where they remained for several days. Inquisitively he developed the plates without exposing them to sunlight and found definite dark dots on them. He soon found out that the darkening of the photographic plates was due to some effect emanating from the substance itself, possessing the power to penetrate the bottom of the metal trays. Becquerel had watched Marie Curie in the laboratory, had recognised in her a trained and a gifted experimenter. He

presented the problem to her. Perseverance won, and the honour and glory of discovering radium fell to Madame Marie Curie who was born in Warsaw, in Poland, in 1867. In 1895 she married Pierre Curie who was a research professor. Their common interest in science not only brought them together but was responsible for this famous discovery. Honours were showered upon them and they were awarded the Nobel Prize in 1904 and Madame Curie received it once again in 1911—the only scientist ever so honoured. In 1910 she completed her crowning achievement in discovering radium and on July 4th, 1934 she died. After her death her daughter, Irene Curie, has started further research and in 1934 she made a startling discovery. She produced Radio activity in non-radio active elements.

Sources.—The Eldorado Gold Mines Limited, as the Company's name is, is the world's chief supplier of radium. Although radium is found in various rocks in many parts of the world, the quantity is usually so minute that it would be difficult, and much too costly, to isolate it from the material in which it is contained. Between the years 1913 and 1925 the world's chief production of radium was in the hands of the Radium Belge at Brussels. Their radium mines are in the Belgian Congo. Gilbert Labine discovered a region called Labine Point, on the eastern shores of the Great Bear Lake in the Canadian sub-Arctic. Upto 1930 the world's production was approximately 35 grammes annually and one had to pay the enormous price of about two lakhs of rupees per gramme for this precious element. It is owing to the Government's appreciation of the needs of that sick people the Madras owns the largest stock of radium in India to-day. The Madras Government owns nearly 1700 milligrammes of radium element, out of which 850 milligrammes is as Radium Bromide in aqueous solution for extraction of Radon, Madras being the only place in the east where Radon (the emanation from Radium) is extracted.

Methods of Extraction.—The important ore of radium is Pitch Blende. The processes involved in the efficient extraction and purification of Radium are both intricate and time consuming and therefore very costly. A ton of ore requires 5 tons of chemicals and 50 tons of water to yield 3 to 5 centigrammes of radium. The first stage is the process of reduction and to grind the ore to a suitable degree of fineness. The powdered ore is bleached with acid or alkali to bring the radium into a form in which the separation from the other metals may be readily accomplished. Within the next stage of the treatment Barium is added and precipitated to simplify the recovery of radium. The resulting surface is then converted into a chloride solution. Under the influence of heat the Radium chloride and the Barium chloride are separated. Radium chloride crystalizes more quickly than the Barium chloride, and so it is readily removed. This process is repeated many times with the resulting enrichment of Radium chloride with each new crop of crystals until practically all the Radium chloride is received at one end of the series and Barium chloride at the other end. This is then sealed in a glass tube and delivered to the physics department for the measurement of the radium element content after comparison with the inter-national, standard. The radium salt is then introduced into suitable containers of platinum which are called needles. The needle consists of three parts, 1. Eyelet. 2. Active length (that is the extent of the actual radium salt.) 3. Trocar point. The manipulation of radium salts in the filling up of tubes is a process requiring very high skill. In spite of various precautions radium workers are constantly exposed to several risks. Thus this dangerous and intractable element becomes available to the medical profession as one of the weapons to use in the fight against disease.

The first product of disintegration of radium is a gaseous emanation called RADON, whose half value period is nearly four days as compared to 1690 years for radium. Radium is a metal and Radon is a gas. The two are as different as any two elements and yet Radium is the parent of Radon.

Properties of Radium.—It has been calculated from physical measurements that if you have a gramme of radium to-day it is reduced to 1/8th of a gramme in about 5280 years. It has been found that a tube of Radium suspended over the heads of a family of mice rapidly kills them, and a single pound of radium placed in an ordinary room would probably blind and kill any living creature that came near it. Of the rays

given out by radium 90% are alpha rays, 9% are beta rays while only 1% is a gamma ray; yet these gamma rays are the most wonderful of the three. They travel at a speed of 185,000 miles a second and they have a tremendous power of penetration. A sheet of paper will cut off the alpha rays, a sheet of tin foil will stop the beta, but the gamma will penetrate half an inch of solid steel, and it is these gamma rays that have such a marvellous effect upon malignant growths. All the radium in the world that has been collected so far would not weigh as much as a golf ball. The heat given off by radium is very great. 1 gm. of this substance in complete disintegration has been calculated to evolve an amount of heat equal to 2,900,000,000 calories. One gram of radium has a potential energy of 300 tons of coal. The radium rays have a penetrating power as great as some of the naval guns. By the side of radium, diamonds and rubies are worthless pebbles. It is the most potent poison known. Its presence, sterilized seeds, healed surface cancers, killed microbes, coloured diamonds and penetrated solids. It is a hundred thousand times as valuable as gold. Thirty tons of Pitch Blende yield only one tenth of an ounce of radium.

Mode of Application and Uses.—The use of radium in medicine started from the famous Becquerel. In 1899 Professor Becquerel was invited to deliver an address on radio-activity. He placed a vial of the impure salts in his waistcoat pocket and proceeded to London. He delivered the lecture, exhibited the radium, and returned to Paris still carrying the radium in his waist coat pocket. A few days later he noticed a burn on the skin of the abdomen immediately beneath the place where the radium had rested. This gave the idea of its use in therapy, and a valuable weapon has the gamma ray from the radium proved. The first use to which radium was put was the successful cure of warts.

The effect of radium upon a living cell shows either one of the following three phases:—1. Increase of cell activity. 2. Arrest of cell activity. 3. Destruction of cell. It is upon the correct appreciation of this fact that successful radium therapy is largely dependent. If an overdose is given, an intractable and incurable ulcer will result, and if a weak dose is administered the growth will increase in size, this having received a stimulating dose. As I have told, the radium salts and the Radon emit three kinds of rays, namely alpha, beta and gamma. Alpha rays are not used for therapeutic purposes except in SPA treatment. In certain skin diseases, like rodent ulcers, keratoses and warts, the beta rays are used. Radium treatment consists for the most parts in the use of gamma rays only. The several methods of application of radium can be outlined under four heads.

1. *Cavity.*—The radium is introduced in suitable containers, these being chosen according to the anatomical site. This method is used in the case of diseases which affect cavities, such as the uterus, rectum, oral, oesophageal and vaginal lesions.

2. *Interstitial*—In this method the radium is used in the form of needles which are inserted into and around the growth and removed after the required time. Carcinoma of the breast, tongue, lip and skin, are often treated by this method. Radon seeds can also be used for interstitial radiation.

3. *Surface.*—In this method the radium is applied to the external surface of the body. Usually wax is moulded to the part of the body affected and the radium is mounted on the surface of the plastic material. This is applied over the lesion and fixed there by means of bandages for the pre-determined period. Surface radiation is used in conditions like recurrent carcinoma of the breast, carcinoma of the skin, and also in treating malignant glands in the neck and elsewhere.

4. *Bomb therapy*—One of the developments in recent years in the treatment of disease, is the use of large amounts of radium applied at a distance. This is known as Telecurie Therapy, Bomb therapy or Beam therapy. The so-called radium bombs contain one to five grammes of radium or even up to ten grammes. The radium is kept in the safe but by an electrically operated switch can be brought to a small chamber in a mass of dense metal such as lead, which is hung over the couch upon which the patient is placed for treatment; in this mass of metal is an aperture to allow the passage

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of gamma rays. Cancers of the tongue, of the mouth, the pharynx, the larynx and the breast are among those most frequently treated by this method, and in many cases X-Ray treatment is combined with Radium treatment.

Nurse's Duty.—The amount of discomfort involved varies with the situation of the cancer. The amount of discomfort may be great in the case of the mouth, profuse salivation occurs. The adequate nursing of such patients is extremely important, to guard against respiratory complications. The radium plaques should be applied and removed exactly at the times dictated by the medical officer. The general effect of radiation on the body gives rise to certain blood changes which cause severe illness, and the tips of the fingers are affected by dermatitis, from their constant contact with radium. So the nurse must be extra careful in dealing with the same. Members of all sections of the staff are warned that time and distance are the most important factors in protection against radium. The application and removal must be done in the shortest possible time, and the containers should be held as far as possible away from the body. Blood counts should be done frequently for the staff who are working in the radium department. The nurse's duty includes a careful watch to see that no radium is lost. Bed-pans should be watched carefully when the patient has radium applications in the cervix or vagina. Any local or general reaction, such as redness, swelling, head-ache, giddiness, vomiting or diarrhoea, should be immediately reported. The nurse should always use rubber gloves, and the radium must be handled with forceps. No mercurial medicines, lotions or iodine should be used with radium. Patients while being treated with radium must not be allowed to leave their beds except under supervision. All containers may be sterilized in lysol or carbolic lotion. All manipulations such as threading of needles, the making up of plaques and the cleaning of the needles must be carried out on the lead protected bench. The nurse in charge of the patient in the Radium Theatre should take note of the position and the dose of the radium inserted and record them in a special case card.

The term "Conquest of human suffering", though perhaps emotive rather than scientific, nevertheless implies the existence of this very real and important Cancer Problem and the Radium is the best known and the most powerful weapon to combat the human suffering.

I express my thanks to the Superintendent, Lt.-Col. Leslie, I.M.S., and the Matron, Rev. Sister S. S. Remi, for allowing me to publish this article and I am much indebted to Dr. S. Subramaniam, Radiologist, for the valuable suggestions and corrections.

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Answers to last month's questions.

1. The patient of course.
2. Miss Wilkinson, S.R.N.S.C.M. English.
3. Mure Hospital, Nagpur, C.P.
4. Vesico-Vaginal Fistula operation.
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