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特別講演

**Selected Topics in Radon Balneology, Europe 1993/94:
Springs, Spas, Therapy, Radiation Protection**

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About ten radon spas from the German speaking area in Middle Europe are *organized* in a working group of radon spas (chairman : P. Doertelmann, Bad Kreuznach). The International Society of Medical Hydrology and Climatology (ISMH), President Prof. Dr. H. Pratzel, has established recently within its German Section a working group for Radon Balneology; chairman is the author. A newcomer is *Sibyllenbad* at Oberpfalz, south-east of Fichtelgebirge. Its well-type source has about 120 nCi/l radon, which provides a small, preliminary radon treatment establishment. The acceptance by patients is good and has an increasing tendency.

Schlema at Saxonia tries strongly to reactivate his radon spa from before second world war. At that time it had the strongest radon spring of the world, Hindenburg spring with 6,660 nCi/l radon and Bismarck spring with 1,280 nCi/l, both from underground mining areas. Uranium mining after end of world war II by the Soviet-German Wismut AG had transported about 120,000 tons of uranium metal as ores to Soviet Union for constructing its first atomic bombs.

From the view point of this lecture, this, however, was also a gigantic large-area decontamination from uranium and its decay series nuclides. As a consequence, Schlema nowadays has difficulties for official recognition of even one single radon spring; it has only 17.5 nCi/l radon, whereas at least 18 nCi/l would be necessary.

At Fichtelgebirge, north-east of Bavaria, from 1981 to 1992 the author has discovered or confirmed more than 120 radon springs between 19 to 60 nCi/l as naturally occurring surface water springs. At the uranium prospection mine of Großschloppen, he found an underground spring with more than 400 nCi/l. By these reasons, the author had the idea to plan a "Radon Spa of Central Fichtelberg", which has been concentrated at Fichtelberg (610-805 m). Its Ahornquelle I is under official recognition and has a radon concentration of 42 to 45 nCi/l radon with 0.6 to 1.5 l/sec water flow and about five other radon water springs. Members of the international Scientific Committee for Fichtelberg are S. R. Andrejew, G. Bach, M. Bogoljubow, P. Deetjen, H. Holzgartner

and B. Sansoni (chairman).

2. Radon Therapy

Radon balneology in Middle Europe since the old Roman times mainly was based on *hot* radon springs. Examples are Ischia and Bormio in Italy, Bad Gastein at Austria. Examples for *cold* radon waters are Meran, Kreuznach, Münster am Stein, Sibyllenbad, Steben, Zell and Jachimow. Radon therapy is based there mainly on *wet radon water* treatments with strong *inhalation* components. Examples for *inhalation* of dry air are especially the galleries of Bad Kreuznach and Bad Gastein.

From 1990 to 1993 the author studied radon spas and therapy at former *Soviet Union*, kindly supported by S. V. Andrejew, M. Bogoljybow and E. Pen. In former UdSSR the large number of about one *million* radon cures per year were performed. By lack of enough natural radon springs, about 70 % of these cures are synthetic radon from radium-226-sources. Preferred type of application of radon are *wet radon water* and/or *dry radon/air* baths. Lung radiation exposure is avoided in favour of *skin therapy*. Radon spas visited were Deneschi and Chmelnik in Ukraine, Bristonas and Druskininkai in Lithuania and Archangelskoje near Moscow.

3. Radiation Protection

Within the last ten to fifteen years radon balneology had become increasing problems with radiation protection, especially in *West Germany*. The origin there were strong political movements and ideological fightings against nuclear power and, therefore, radioactivity. With respect to radon therapy this tendency, however, is decreasing within the last two or three years.

The public as well as administration could be convinced, that radiation exposure of man due to one radon cure per year is *almost negligible* when considering the period of a whole year.

4. High Radon Level Areas

In west Germany, Fichtelgebirge and especially the town of Weißenstadt is one of the areas with the highest radon burden in water and houses.

The author's department at KFA Jülich had investigated from 1981 to 1992 the expectation of life by *mortality data*, especially for inhabitants of some houses in the center of the town on granitic ground with as much as about 6,000 to 100,000 Bq/m³ radon in the air of deep basements.

Furthermore, the water plant of the city of Hot/Saale at Weißenstadt produces with its 15 bore hole wells (ca. 50 to 100 m depth) *per day* about 0.11 *Curie* (I) radon, compared with 0.18 for the valley of Gastein with Bad Gastein and Bad Hofgastein. *No* significant health hazards have been observed until now for the inhabitants of the houses mentioned from 1700 to 1950 A. D., which corresponds to a period of *250 years*. The water plant mentioned above in its tap water reservoir sometimes has radon concentrations in air between ca. 200,000 to 700,000 Bq/m³. Health inspection of the workers of this water plant is under investigation by the Bavarian Government. The author, however, by his experience within this area, is predicting, that almost no radiation damage will be observed by these studies.