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Mineral Waters – Key to Health and Advanced Cultures?

Abstract

"Water loading" is not only a modern term, but was already in former times ("Trinkkuren") a physiologically important preventative cure method for health maintenance.

Searching for hydrogeologic investigations in Greece to the Middle East and by visiting cultural sites of antike Greek artists and sportsmen in Athens, some comparisons obviously were evident with the local aquifer-well drinking-water chemistry (espec. Magnesium and Potassium content) of other main cultural sites like f.e. (alphab.): Babylon (Iraq), Byzanz (Turkey), Gizeh (Egypt), Jerusalem (Israel), Petra (Jordan) or Rome (Italy) with similar paleogeografic genesis of the groundwater bearing sediments. From all these the former people get their drinking water by local wells dug in marine evaporitic derived mineralized sediments with high content of $MgSO_4$-mineralization, i.e. solution by similar sedimentation cyclus and thus aquifer typus. Several sites named Magnesia are well-known SE Larissa and twice near Izmir (Smyrna, Manisia, Ephesos, Bodrum = Halikarnassos).

By drinking that high concentrated magnesium complex, medical reactions derive some proper oxigen-consumption for the human blood causing a better supply of brain, heart, nerves and muscles, hence improving the intelligence and health of human beings. Simultaneously the Sulfate consumption causes a better digestion and metabolism. Although these effects and additionally Fluoride, Iodide, Lithium, Magnesium, Potassium, Strontium causes the reaction: "mens sana in corpore sano ....." and might be the reason, that these former antike people were able to create their famous cultural development, quod erit demonstrandum by further interdisciplinaric geomedical-hydrogeologic investigations, which had been done by some local groundwater analysis (espec. F, K, Li, Mg, Sr), because improved bioequivalence by "water loading" is a fact.

These shallow groundwaters are slight bitter mineral waters, which were used exclusively in former times, caused probably health, high motivation for cultural aspects and geogene originating intelligence. Austrian mineral waters too, like the spa (salus per aquam) Bad Radkersburg named "Longlife" (nomen est omen?) or the "Purgina" are enriched with Mg. But too much causes severe renal failure by Hypermagnesemia, whereas a moderate (< 29 ppm Mg, for therapeutic application 67 - 134 ppm/day) consumption by drinking water improves statistically brain performance, concentration, stress tolerance and decreases blood pressure, myocardial infarct risks, neuromuscular hyperexcitability, asthmatics, cerebrovascular and total mortality.

Further on it is interesting that such salts were used as cathartic drugs by priests during Renaissance times in Italy, as one might assume causing the origin of holy sites, like Assisi, Loreto, Lourdes, Mariazell, but also Canterbury, Glastonbury, Stonehenge, Tschenstochau, Salt Lake City (Mormones) or the river Ganges. Additionally improving also artistically abilities and faculties as known from sea coastal regions f.e. in the Netherlands (Rembrandt, Rubens etc) and the Toscana (Leonardo da Vinci, Michelangelo etc) would be imaginable by drinking that waters with more than 200 ppm Mg. Maybe that the colossus of Rhodos has been built by euphoria caused by to much intake from mineral water springs over there.

By the fact of actual existence of the local aquifers, already now available for sampling, the scientific argumentation by hydrogeochemistry in-situ-analysis of local domestic wells should be improved and manifest that hypothesis, hoping that GeoMedicine help to prevent from drugs and conduct to global social and economic progress

"hydor men ariston"

"water is the best"

(quotation after PINDAR)

Having read at a well for water drinking cures on the island Kos (birthplace of HIPPOKRATES)
dedicated to HYGIEIA - the Greek goddess for health

1. Introduction

1.1. Historics

The great Greek philosopher THALES from Milet (625 - 545 B.C.) concluded that water is the ultimate substance, the principle or element of all things (PERKOWITZ, 1999). A century later, when the Greek philosopher EMPEDOCLES (490 - 430 B.C.) proposed that the complexities of creation required four elements instead of one, the liquid state took its place among them as the element water. Since him, who was as a philosopher of nature interested in the development of life, the the human physiology and the entire universe based on that fundamental substances. But reduction to only 4 elements: air, fire, soil and water has been overcome since BOYLE (17. century), who developed, besides the physical conditions of gases, the first atomic-theory as a basis of chemical elements (Periodic System). EMPEDOCLES yet indicated by his interests in essential parameters of life the high intelligence of that great Greek (Agrigent was a former Greek colony in Sicily, which is formed by volcanic and other Magnesium-enriched rocks, like dolomites and also potassium salts).

Nevertheless another Greek - called: "smiling" - philosopher DEMOKRIT (460 - 370 B.C.) created the first theory of the atomic structure. Even the term "Atom" derives from the Greek language and means "not divisible". Maybe the intuitive ability of that rational thinker, who was born in Abdera was improved by his travels to Egypt and other main centers of culture in the Near East

The founder of philosophical tradition in human-medicine was the famous Greek HIPPOKRATES (460 - 375 B.C.) on the island Kos. Perhaps triggered by a lot of minerals in the marine salt, fish-food and liquids around, his idea that medical doctores should study the environment of their patients sounds quite actual and should be a hint for more interdisciplinaric cooperation between medicine and geosciences.

ARISTOTELES (384 - 322 B.C.), born as a medical doctor´s son in Stagira (NE Greek) collected systematically facts concerning nature and human life and founded the first Geo-Bio-encyclopaedia.

1.2. State of science

Natural water is by far the most important, for the scientific consensus is that life could not exist without it (PERKOWITZ, 1999). Its central role in life arises because water is a prime natural medium for chemical reactions. Its mobile molecules act to diminish the electromagnetic forces that link atoms together, freeing the atoms to combine chemically with other free-floating atoms. According to present thinking, only a watery environment such as the sea could have supported the chain of chemical reactions that formed such elaborate compounds as Chlorophyll, DNA and hemoglobin, thus the presence of water and its mineralization is once more essential for all the ongoing chemical processes of life.

Unfortunately in the mediterranean and semiarid climate and marine geological environment generally the groundwater is scarce and mostly strong mineralized. Because of the content of certain essential minerals deriving from the adequate, somewhere evaporitic influenced salty mineralized sediments, high contents of essential elements like F, J, K, Li, Mg, Mn, Mo, Se, Sr, Va, Zn etc (GRUBER, 1998) can be expected. Especially the $MgCl_2$- and $MgSO_4$-mineralization (i.e. solution by groundwater of similar sedimentation cyclus and thus aquifer typus) may perhaps cause some proper oxigen-consumption for the human blood causing a better supply of brain, heart, nerves and muscles, hence improving the intelligence and health of human beings. Simultaneously the Sulfate consumption causes a better digestion and metabolism. Although these effects the reaction: "mens sana in corpore sano ....." and might be the reason, that these former antike people were able to create their famous cultural development.

It might be an interesting thesis to investigate the sites of the ancient sports-stadions concerning their local groundwater, which had to be used for drinking by the former sportsmen (Olympic games), because of improving proper muscles activity by Magnesium which now is applied as a quasi legal doping.

Tab. 1 presents some results of hydrochemical groundwater-analysis from Athens, Rhodos, lower Egypt, in the Jordan valley, E. Petra as a first step of further interdisciplinaric geomedical-hydrogeologic investigations, quod est demonstrandum (EDLINGER & KOLLMANN, 1997, 1998). These have been done by some local groundwater analysis (espec. F, K, Li, Mg, Sr), because improved bioequivalence by "water loading" is a fact (GRIMM & NOWITZKI-GRIMM, 1999).

2. Theory

Being creative, healthy and sane (ZIRM, 1995; MARKTL et al., 1996) - because of living in a salt-enriched evaporitic environment with much Magnesium (see Tab. 1: Egyptian-, Greek-, Jordan-people and others like i.e. the Mayas in Merida, which is supplied with 311 ppm Mg; whereas in common continental water supplies Magnesium is generally only <20 ppm) - people seem to were able for constructing advanced and most exceptional cultures.

Locality	Mg	Sr	K	Li	F	SO_4
Rhodos Soronis (Greece)	100	0,17	3		0,12	37
Rhodos Sakalou	57	0,21	1		0,42	38
Bodrum = Halikarnassos (T)	47		10			
Athens Metro S. Akropolis	30	0,01	240	0,07	0,41	365
Athens National Garden	29	0,49	3	0,02	0,40	76
Dilessi - Schimatari	62	0,9	1	0,07	0,53	33
Ilia drilling (a)	215	27,2	192	2,76	30	790
Ilia drinking water supply (b)	27	0,01	1	0,01	0,04	13
Edipsos Spring "A"	338		503	0,56		1111
Edipsos Thermae Sylla (F3)	242	11,2	260	0,93	50	990
Edipsos drilling Ipokrates	300	15	330	1,25	40	1100
Edipsos drilling Artemis	295	14,8	335	1,33	50	1130
Edipsos drinking tap "C"	45		103	0,14		83
Kamena Vourla "A"	263		164	0,46		714
Kamena Vourla Koniavitou "B"	191		173			511
Kamena Vourla Asproneri "C"	33		1			7
Dead sea (Jordan)	more Mg than Ca, more K than Na					
Jordan valley Karameh	304		25			259
Tell Asaidyeh	107	2,75	21	0,06	1,02	122
Pella	30	0,52	3	0,01	0,45	33
Berg Nebo Moses-Qu.	29	0,56	2	0,01	2,7	27
Hammamat Ma'in Therme	31	3,80	44	0,26	1,85	210
WV Amman Qasr Amra	51	4,95	10	0,03	15,8	365
Shomari Reservat	57	5,95	17	0,03	19,5	420
Al Jafer (E. Petra)	443		23			302
Jerash = Gerasa	68		49			538
Merida (Mexiko)	311,2					
Gr. Bitter Lake (Suez - Egypt)	1146					
Ismailia Artesian well	48	0,97	9	0,04	0,34	615
Luxor - Karnak "Holy well"	85	0,86	118	0,01	0,08	356
Luxor - Karnak "Holy Lake"	73					
Memphis Museum Ramses II	40					
Memphis well	52	0,79	13	0,01	0,12	165
Sakara Farm - Restaurant	64	0,97	7	0,01	0,14	310
Siwa (Roman spring)	83,2		40			282
Ain Dakrour	65,1		28			274
Ras el Hekma	62,7		29			358
Ayoun Musa	102,5		70			446
Purbach "Purgina" (Austria)	1974	2,6	30	1,6	0,18	11647
Spa Radkersburg "Longlife"	202,1		9			8

Tab. 1: Essential mineralizations of waters (ppm) Analysts: BVFA Arsenal, BA f. Landwirtschaft, BA f. chem. pharm. baln. Unters.,Geol. BA, IGME, SCHNEIDER, et al.

By having Sulfate enriched and therefore metabolism accelerating (TOMPKINS, 1973) up to 40 °C warm groundwater (SCHNEIDER, 1973) or surface water, which is scarce and not fine for drinking one has to store rainwater in cisterns. Unfortunately because of the high air temperatures causing warm, nasty drinking water with serious risk of bacteriological incubation and additionally loss by evaporation they had to protect it by construction of cooling cap rocks. But as known under

arid conditions capillarity runs against gravity up and more to 7 m (KOLLMANN, 1984).

The same problem like the Mayas had the Egyptian too. To protect water reservoirs by using cap rocks could be done simply by constructing for example a pyramid, which provides the further advantage getting four triangle roof segments for better collection of wind drifted rain to catch infiltration at a circumference basal drainage system. The famous Greek historian HERODOT (in NUSSBAUMER, 1977) described the Great Pyramid in the second volume of his histories: "By using a subterranean channel water has been conducted into the pyramid; its inside being full with water and looked like a island surrounded by water". Preparing the foundation before building up the pyramids one has to ensure the horizontality of the four corners. Simple to level is possible by digging a trench (fortunately the Eocaen Nummulite-limestone is intensively faulted) and afterwards filling it up with water. The silty sedimentation of muddy water provides moreover a sealing bottom of the later reservoir, which might consists of thrown in gravels due to a porous aquifer. At two of the corners NAPOLEON's archaeologists found 1/2 m deep, appr. 5 m^3 large subterranean catchment-like basins (TOMPKINS, 1973). Besides one should mention that the time for preparing the foundation needed ca 10 years, i.e. 1/3 till finalization of the whole pyramid-building. The possible further function as a subterranean cistern for drinking-water supply, additionally to others, like a astronomical observatory, compass, calendar, watch, trigonometrical fixed point, terrestical measuring system, for dehydratation of mummies but also for cooling (storage of food) might be recognized better at the northern pyramid of El Lisht. Erosion by deflatation of the covering sandy soil seems to have buried out a wide-spread centripetal drainage system (Aerial photo in the Egyptian Museum in Cairo, seen 1997).

Directly beneath the top of several pyramides one can notice under the base of the foundation a central vertical shaft. These dampy-moisty holes with depth < 50 m havn' t been investigated sufficiently till now (HITCHING, 1979, 1982). They obviously look like a well! For infiltration down to this centric well the basal pediment has a slight inclination towards the first square stones, as can be seen by spill-tests. The vertical crease on the triangular -surfaces, which could be seen by different shadowing on aerial photos, especially at the Mykerinos pyramid, are thereby explainable. They had the function to conduct the infiltration path to the centre.

Drawing water out of the well by a goat-stomach using as a container it would be simple pulling it up to the outside by the slippery and upwards sloping passage (EDLINGER & KOLLMANN, 1998, 1999). From the entrance about 15 m above the ground they used probably the hydraulic self-pressure to supply the surrounding houses of Pharaos' clan (may be ... they enjoyed a wonderful view to the Nile valley?).

3. GeoHydrology - GeoMedicine

But drinking further on solely rainwater without essential minerals and trace elements like f.e. (alphabetical) Fluoride, Iodide, Lithium, Magnesium, Potassium, Selen, Strontium, Zinc etc (BRUNNER, 1996, MARKTL et al., 1996, PORTA, 1998) the sovereigns probably lost their self-confidence, domineering thirst for power and authority. Hence their influence upon the regular groundwater drinking subordinate people of Memphis (Tab. 1) decreased as can be seen in successive minor pyramids. Cheops' father, having built the step-pyramid in Sakara with an outside situated well in gypsum- and epsom-salt-sediments was formerly the increasing dominator in that dynasty.

Please apologize these audacious theory deriving from a self-medication with a surplus of 1 g/d Magnesium by the author, improving his neuromuscular behaviour. Austrian mineral waters, like the spa (salus per aquam) Bad Radkersburg named "Longlife" (nomen est omen?) or the "Purgina" are enriched with Mg (Tab. 1). But too much might cause severe renal failure by Hypermagnesemia, whereas a moderate (< 29 ppm Mg, for therapeutic application 67 - 134 ppm/day) consumption by drinking water improves statistically brain performance, concentration, stress tolerance and decreases blood pressure, probability of the occurrence of renal calculi, myocardial infarct risks, neuromuscular hyperexcitability, asthmatics, cerebrovascular and total mortality (MARIER, 1990).

Further on it is interesting that such salts were used as cathartic drugs during Renaissance times in Italy (BIRCH, 1990), as one might assume causing artistically abilities and faculties as known from sea coastal regions f.e. in the Netherlands (Rembrandt, Rubens etc) and the Toscana (Leonardo da Vinci, Michelangelo etc) would be imaginable by drinking that waters with more than 200 ppm Mg

(SCHULZ, 1978, WICKERT, 1997). Because of taking in Mg-salts by Italian priests it might be an interesting thesis to investigate the holy sites, like Assisi, Loreto, Lourdes, Mariazell (Dolomites and Magnesite of the Austrian Northern Limestone Alps), but also Canterbury, Glastonbury, Stonehenge, Tschenstochau, Salt Lake City (Mormones) or the river Ganges etc concerning possibly higher Magnesium contents of their local water. Maybe physiological together with psychological best feeling is the reason - and now coming back to Greece - that the colossus of Rhodos has been built by euphoria caused by to much intake from mineral water springs (Tab. 1, GIONI-STAVROPOULOU, 1983).

Due to the fact that Magnesium reacts as a anti-stress mineral (PORTA et al., 1997) by endocrinological quasi buffering of hormones like catecholamines (Norepinephrine, Cortisol, Endorphine) one might assume reversive effects vice versa. It seems that a surplus of Magnesium would possibly cause mobilization of these hormones too and that might cause the self-confidence-effect together with euphoria. This is .... an idea of a philosopher and hydrogeologist, studying now additionally human medicine.

4. Healthy waters in Greece

By that physiological-psyhological reactions deriving possibly from Magnesium and other essential minerals in a surplus overdose, there one might ask the question, whether further quasi superhuman performances or achievements in construction or art have caused some of the antique wonders of the world? Sites like Bodrum (water-sample from actual tap in Tab. 1), where the mausoleum of Halikarnassos was been built or the temple of Artemis in Ephesos, both in the surroundings of the locus typicus of Magnesium (there exists even 2 villages named Magnesia) seem to be causal connected.

Conspicuous at all are the facts of salt- and/or sulfate-fallout often to observe at foundatations of sacred buildings (i.e. Bycantine churches with drainage-trenches north of the Akropolis (GPS-Koord. 37° 59' N, 23° 44' E) and the coincidence of a lot of orthodoxe and christian chapels) further i.e. at the temple of Karnak und Edfu in Egypt together with Mg-containing groundwaters (Tab. 1: Luxor - Karnak "holy well and -lake"). Whether the origin of the 3 main world-religiones in the surroundings of the Dead Sea would be triggered by that Potassium- and Magnesiumsalt and the reason therefore perhaps would be adequat to more than sufficient physiological supply with minerals from local drinking water and the nutrition-chain seems to be verifyable by actual-hydrological methods. Hydrochemical datas from groundwater sampling results in the literature (AL-ALAWNEH, 1998, WATER AUTHORITY, 1987) and in-situ analysis (KOLLMANN, 1999) show values up to 304 ppm Mg in the Jordan-valley, culminating in maximum concentrations of 443 ppm Magnesium E. of Petra (Tab. 1).

Coming back to Greece, the evidence of Magnesium has been proofed by the studies of IGME presented in the map "Thermal-Mineral Springs in Greece" (GIONI-STAVROPOULOU, 1983) at sites like Nikrita, Rhodos, North of Athens, Area of Larissa (Magnesia), Loutraki, Korinthos where Ödopus lived and a lot of brothels (make love not war!) were established. Perhaps the former advanced cultures of Karanova (4.500 B.C.), enthusiastically described from M. GIMBUTAS (L.A., California, 1977 in: HITCHING, 1979, 1982) or Sitagroi near Kavala, where people were peace-loving, simultaneously rich, but also having all equal rights may be caused by good mineral supply from their local drinking water, ...quod erit demonstrandum by further interdisciplinaric geomedical-hydrogeologic investigations with hydrochemical analysis.

Actual (1998 and 1999) water sampling in Athens, resulting in moderate 30 ppm Magnesium, but 240 ppm high Potassium- (medication against cardio arhythmy and weak muscle tonus) concentrations, were done at the 28 m deep Metro construction trench (Makrigiani - Athanessiu - Diakou: GPS-Koord. 37° 58' N, 23° 44' E) just S. of the Akropolis (Tab. 1). Additionally it is proved at a well of the National garden, showing much more Mg, than in the tap (nowadays drinking water supply of Athens supplying with only 5,5 ppm Mg and 0,8 ppm K). Due to MARIER (1990), that difference of 5 times might be probably the reason of the modern hectic life in the city, because of generally deficiency symptomatic (no buffering of noradrenaline/norepinephrine surplus).

Among the 720 well known thermal springs in Greece, developed from ancient times, during the

Roman and Byzantine period of Greek history, up to now, the most famous are in spatown of Edipsos on the island of Eboea (GARAGUNIS, et al., 1997). Two groups of high mineralized (4 - 8 g TDS/l) of most productive (5 l/s + unknown amount mixing with sea water at the coast) thermal springs (50 - 60 ^{o} C and 70 - 84 ^{o} C) are sedimentating sinter by loosing CO_2. The source rocks are volcanic Andesite (Magnesiumsilicate from Tertiary age?), permeable limestone and Magnesite, surrounded and covered by impermeable Bauxite, other neogene minerals and schists.

Healthy and sane are these waters not only by their temperature and valuable traces of Radon gas but most important because of the high Mg contents up to 338 ppm and also K < 503 ppm (Tab. 1). A little bit lower concentrated are the waters of Kamena Vourla (Asproneri spring), but therefore preferable good for drinking (Tab. 1 "C" is mentioned as similar to Evian: 33 ppm Mg).

A further effect of good physiological status - probably caused by the nutrition-chain - has mentioned from BITSCHNAU, M. (1997) by evaluating some epidemiological investigations on the island Cyprus, the birthplace of Aphrodite, the goddess of beauty. It is a fact ocurring there less cancer than in other countries of Europe. Cyprus people are mostly vegetarians eating bread, fruits, vegetables and are using much of normally pressed oil of olives further prefering halogenide enriched marine fishes and regular moderately red wine (WORM, N., 1996). Considering that nutrition-chain a Geologist tries to back coupling the geogene resources and by looking on the geological map of Cyprus (BEAR, L. M., 1963) one can recognize the island consists of mainly alkaline - ultraalkaline Magnesiumsilicate rocks like Olivine- and Pyroxenegabbro, Ophiolites, Peridotites, Epidotdiabase and Serpentinites, further Vulcanites (Andesite, Dazite, Basalt), Carbonates i.g. with a lot of Magnesite-minings, miocene gypsum and last not least detritus clasticas of them all in Plio-Pleistocene (KOLLMANN, W., 1998).

By fertilizing Cupressocyparis trees for their therapy with Epsomsalt $MgSO_4$ (for producing chlorophyllum plants need Mg which builds the central atom and that is necessary for the Photosynthesis) the GeoMedical interested author won the first knowledges in Mg-research (EDLINGER, E. & KOLLMANN, W., 1997, 1998).

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