Abstract title
MULTIDISCIPLINARY APPROACH FOR THE DETERMINATION OF UNUSUAL PATHOLOGIES CAUSES: THE CASE OF THE PIGMENTED BASAL CELL CARCINOMA IN A GIRL SIXTEEN-YEAR-OLD.

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Keywords
Pigmented Basal Cell Carcinoma
Multidisciplinary
Prospecting
Economic Geology
Mineral deposits

Abstract
Economic geology allows to individualize various type of anomalies (mineral deposits) on the earth crust. The instruments and technologies used by economic geology can be of help also in order to identify and to measure natural parameters potentially suspected to play a role in the development of pathologies defined as unusual, or pathologies for which does not exit apparently, based on the literature, a genetic or clinical explanation. In this study we will produce the preliminary results of a survey which allowed to suppose the responsibility of particular environmental conditions, naturally occurring in the survey area, probably acting in the development of a Pigmented Basal Cell Carcinoma in a girl sixteen-year-old according to a meaningful behaviour.
As a matter of fact, the interesting sanitary example involves a young subject, with no previous clinical history, and not showing the distinctive features typical for the uprising of such a pathology. On the contrary, the area where the subject is born and where she lives and placed, is located close to an important industrial site, which notably affects the surrounding natural environment.
Taking into account the particular aim of the research, operative choices have been done devoted to the realisation of a first characterisation of the area, using methodologies and instruments typical of the economic geology. Particularly, through the strategical prospecting, data have been collected, dealing with the lithological, structural and geochemical nature of the area, and a sampling has been carried out with a prospecting scintillometer S.P.P. 2 N F near the residence of the subject, and in the surrounding surface. Such a sampling has allowed a prompt inspection of eventual radiometric anomalies in the various lithological typologies, and in the hydrothermal superficial runs. Afterwards the data have been computerized and superimposed on the georeference data of the Georesources Database of DIGITA, particularly on the dataset of the geochemical data (AGSD: Geochemical Stream Sediment Archive of the DIGITA). The collected and processed information have allowed to supply a working base to formulate the first hypothesis about the putative causes of this sanitary case, and to plan the following study steps. The data collected up to now and processed show that the alluvial deposits present a radioactivity sensibly higher than that of the parent rocks, and that such a radioactivity is presumably due to Th. The abnormal values tend to remain constant in all the alluvial deposits, whether coming from the erosion of volcanic or metamorphic rocks, whereas the products mainly derived from intrusive rocks (or where their occurrence is prevailing) show notably higher values in this first analysis.
The processing of the geochemical data of AGSD does not show particularly high contents of the analysed elements (As, Co, Cr, Cs, Pb, Sr, Th, U, V, Zn), excluded Th and V. The latter shows higher values than those established by the national legislative instruments currently available (DM 471/99 e DL 152/06) whereas Th shows contents cited as "anomalous" from the quoted literature for the kind of ground in which it occurs. More analyses are however required in order to establish the effective high content and the distribution of such an element in the alluviums. This shall be possible through a new field work, to be carried out either by suitable instruments for the determination of intensity and type of the natural radioactivity of the area, and through soil, stream, and rocks sampling.

Presentation mode
ORAL

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Geoitalia 2009

Abstract title
THE IN-VITRO PERCUTANEOUS MIGRATION OF CHEMICAL ELEMENTS FROM A THERMAL MUD FOR HEALING USE

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Keywords
Pelotherapy

Essential elements

Percutaneous absorption

Abstract
In-vitro experiments have been developed to ascertain whether pelotherapy applications involve the transfer of chemical elements from the healing mud to the human body, across the skin. All the materials used for therapy (raw clay, mineral water and healing mud obtained after maturation) have been characterised from different points of view (mineralogy, chemistry, exchange properties, radioactivity, grain size and microbiology) in order to get an accurate knowledge of the natural media used for therapy and to follow the development of maturation in the spa centre.
A polymineralic silty clay with rather a common mineralogical and chemical composition is used; the mud is matured in a very saline mineral water, of marine origin, for 5 months. Under these conditions the maturation process increases the dispersion of clay particles and allows cation exchange between clays and water, whereas neither microbiological nor mineralogical changes are detectable. In absence of the biologic indicators of mud maturity, the equilibration of clay with mineral water represents an objective quantitative criterion.
In-vitro tests have been carried out by using the Franz-type diffusion cells, which show that the transfer of chemical elements across the skin is very well-developed, and also involving many essential or possibly essential elements. The amounts of chemical elements transferred were compared with toxicological guidelines and with world-wide daily requirement models.
No concerns appear from the data, whereas a significant supply of some elements results from a typical application of thermal mud (20 minutes, full body). The elements which have been considered in order to represent a significant supply are Li, Sr, B, I, Rb, Br, Ba, Na, Cl, Se and Ca, some of these are essential nutrients.
Available data show that among the possible therapeutic factors involved in mud therapy, the supply o inorganic essential elements should be considered in details.
About 20 essential or possibly essential trace elements have been identified in human nutrition, and even if the biological role of each element alone is difficult to ascertain, their absence from the diet has been shown to cause clinical negative effects. Mud therapy uses materials (clays and waters) that are plenty of trace elements, according to their natural origin, and for this reason can be considered a valuable source of trace elements. The percutaneous supply avoids side effects that have been observed with other types of administration.

Presentation mode
ORAL

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Geoitalia 2009

Abstract title
MINERAL AND MORPHOLOGICAL COMPOSITIONS OF PATHOGENIC BIOMINERALS: KIDNEY STONE PROBLEM IN BASILICATA (SOUTHERN ITALY)

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Keywords
kidney stone
mineralogy
texture
classification
prevalence

Abstract
The importance of mineralogy and morphology in medicine is well illustrated in the applications of mineralogical and geological approaches to study pathological mineral deposits in the human body. Nephrolithiasis benefits greatly because kidney stones are mineral concretions which contain one o more different crystalline components. Compositional analysis of kidney stones is an important requirement for a complete management of the disease, which means not only proper evaluation and treatment, but also prophylaxis to prevent recurrence, which is impossible without the knowledge of the composition of the kidney stones.
There are many useful techniques that can be used to obtain the type and quantity determinations of major and minor kidney stones mineral and chemical components, including infrared spectroscopy, chemical analysis, X-ray powder diffraction, electron microscopy, and atomic absorption spectroscopy.
Nephrolithiasis prevalence ranges from 2 up to 20% depending on the area studied (region or country) [Hesse et al., 1997; Pak, 1998]. In Italy, the prevalence of kidney stones varies substantially, region by region, increasing from North to South [Serio & Fraioli, 1999]. One of Italian southern region (Basilicata) is an exception because its kidney stones prevalence is low. The lifetime prevalence of nephrolithiasis in Basilicata was 6.49‰ (SD ± 3) between 2003 and 2005 [Giannossi et al. 2009].
As far as stone composition is concerned, unfortunately, very few studies on kidney stones in Italy have been published up to now [Ramello et al., 2000; Vitale et al., 1999]. This encouraged a regional study in order to analyze the type of kidney stones affecting the Lucanian people and to classify them in accordance with new suggested classifications taking in account the relationship between the components and the packing arrangements of the stone crystals. The aim of this study is to extend the knowledge on kidney stones composition in Basilicata taking into account that the different kidney stones prevalence has a geographical distribution.
This study was conducted on a qualitative level establishing (i) relative occurrence, (ii) phase composition and (iii) fine inner structure of 80 Lucanian kidney stones.
The results show that 62% of the studied kidney stones are composed of calcium oxalates (30% formed by calcium oxalate monohydrate, whewellite, and 32% formed by dihydratate calcium oxalate, weddellite). Trace quantity of other organic and inorganic components are still present. In the remaining 38% calcium oxalates are absent or negligible, being composed mainly by uric acid (17.50%), magnesium phospates (struvite, 3.75%) or cystine (1.25%). The 15% of stones are multi-composed (eg. weddellite plus hydroxyapatite or whewellite plus uric acid).
The internal structure and the relationship among the major and minor components provide information to classify the 80 kidney stones in 8 distinctive types and in 13 subtypes in accordance with Grases et al. [1998]. It is difficult to compare results came from this study and previous ones in Italy since that new suggested classifications [Grases et al., 1998; Daudon et al., 2002] of kidney stones was not used yet.
So the average prevalence of calculi in Basilicata was compared with prevalence found in some France and Spanish areas [Grases et al., 1998; Daudon et al., 2002] showing a difference. For instance, the prevalence of uric acid calculi is higher (15.6% with respect to 8.2%, Grases et al., 1998) whereas the prevalence of phosphate calculi, especially hydroxyapatite, is lower (6.8% with respect to 11.8%, Grases et al., 1998). These two types of calculi have different etiological factors related to the chemical components of water, so their geographical distribution in Basilicata may have a connection with environmental factors.

Presentation mode
ORAL

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Geoitalia 2009

Abstract title
PRELIMINARY DATA ON ROCK-WATER INTERACTION AND WATER QUALITY IN THE AREA OF THE POLLINO MASSIF (BASILICATA -SOUTHERN ITALY)

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Keywords
Groundwaters
Heavy Metals
Natural Pollution

Abstract
The capability of chemical elements to be released into a supragenic environment by chemical, physical and biological processes is a very dangerous factor for human health.
Physical and chemical degradation of soils and rocks can cause the release of chemical elements into the waters circulating and, consequently, to groundwaters, that can accumulate toxic elements and allow their transmission to human beings, both straight and by alimentary sequence.
For instance, ultramafic rocks have high concentrations of heavy metals, and the superficial alteration of the minerals constituting these rocks (such as olivine, pyroxenes, magnetite, serpentine) causes the release of metals into natural waters.
Considered that, we studied the groundwaters in the northern sector of the Pollino massif (Basilicata, southern Italy), where cataclastic serpentinites and ultramafic rocks outcrop, in order to evaluate possible natural pollution due to the water-rock interaction, focusing our attention on the mobility of heavy metals.
Several springs studied show high values of magnesium, nickel and chromium, most probably as a consequence of solubilization at the expense of ultramafic rocks and, as for magnesium, due to dolomite dissolution as well. All this is in agreement with the lithology of their aquifers, consisting of carbonates, metabasites, gneiss and densely fractured serpentinites.
In most of these springs the Cr6+ abundances are well above to the maximum permissible level (5 µg/l) fixed by the Italian body of legislation regarding groundwater for human use (D.Lgs. 152/1999; D.Lgs. 152/2006).
Further investigations are necessary to assess seasonal variations of the water chemistry and possible correlations with pluviometric regime.

Presentation mode
ORAL

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Geoitalia 2009

Abstract title
DECONTAMINATION AND SURFACE TREATMENTS OF BIOMATERIALS
BY GAS-PLASMA TECHNIQUE

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Keywords
plasma
biomaterials
surface

Abstract
Biomaterials frequently undergo specific surface treatments for improving their properties such as physico-chemical strength, biocompatibility, etc.
Traditional methods for surface treatment are typically mechanical, chemical or electrochemical.
In the last decade the low-pressure cold plasma technology has emerged as an alternative solution where on a dry, environmental friendly and cost-efficient way the surface can be modified below the nanoscale.
Without manual operations or the use of harmful substances and production of hazardous and pollutant by-products, with this technique it is possible to clean, activate, etch or modify the surface of plastic, metal and ceramic surfaces to get super cleaned surfaces, to improve their bonding capabilities or to get totally new surface properties.
Plasma discharges provide also a possible solution for the decontamination of this kind of new materials, overcoming several problems caused by traditional sterilization methods as autoclave (heat can damage the material), ethylene oxide (extremely poisonous), etc.
One of the most interesting modification obtainable by plasma, simultaneously combined with other positive effects such as cleaning and decontamination, is the increasing in hydrophilicity of the material, in particular titanium implants with increased roughness and complex surface nanostructures obtained by traditional treatments. The natural hydrocarbon contaminant surface layer adherent to the surface is indicated as the responsible for the material hydrophobicity. This sort of barrier which normally would obstacle the complete interaction between biological fluids and implanted materials can be efficiently removed by plasma discharges.
In the case of titanium implants, it has been demonstrated that wettability plays an important role in protein (fibronectin) adsorption to the surface of the implant, that means better starting conditions for an effective bone cell adhesion and successive osseointegration.
Titanium implants subjected to plasma treatments showed a strong enhancement of surface wettability, evaluable by measuring liquid contact angles using the Drop Shape Analysis method.

Presentation mode
ORAL

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Geoitalia 2009

Abstract title
THE CHEMICAL CHARACTERIZATION OF THE HUMAN KIDNEY STONES BY SEM-EDX AND LA-ICP-MS METHODS

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Keywords
kidney stones

SEM-EDX

LA-ICP-MS

Abstract
This paper describes an analytical approach to investigate the composition and morphology of height human kidney stones.
The study has been conducted using different analytical techniques:
• The X-ray diffraction analysis was used for identification of the crystalline components;
• The scanning electron microscopy was employed for crystal morphological analysis and especially for the observation of the internal structure;
• The EDX analyses were performed to determined the major elements composition;
• The La-ICP-MS analyses were carried out to determine the trace element composition;
Four samples were embedded on resin and cut to obtain a thin section to be studied by optical microscopy and by LA-ICP-MS; another part of the samples were used to analyze them with scanning electron microscopy (SEM) coupled with an energy dispersive X-ray spectrometer (EDX, Link 10000). Powder was analyzed by FTIR spectroscopy and X-ray diffraction.
All the kidney studied show millimetric dimensions and characteristic red-brown color, also, each stone is composed of numerous small spherulites and each spherulite shows a strongly pronounced concentric lamination with a great number of crystallite growth around a nucleus of variable nature. In particular, the stones studied were composed of pure calcium oxalate monohydrate and dehydrate respectively whewellite, ($CaC_2O_4.H_2O$), and weddellite ($CaC_2O_4.2H_2O$) as the dominant phase, which are the most common kinds of mineral phases composing human kidney stones.
The aim of this work was to carry out interdisciplinary studies in order to describe composition, morphology and the possibility to individuate, by trace elements composition, the correlation between the disease and the environmental pollution.
The significance and role of trace elements in renal stones has been studied by LA-ICP-MS.
Previous studies have shown that the concentration of trace elements, such as Zn, Sr, Fe, and Cu, in renal stones depends on their chemical composition, but the existence of toxic elements such as lead in organisms may be caused either by environmental pollution.

Presentation mode
POSTER

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Geoitalia 2009

Abstract title
CHEMICAL, MORPHOLOGICAL AND MINERALOGICAL CHARACTERIZATION OF AORTIC VALVE CALCIFICATIONS

Authors
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Keywords
cardiovascular system
AVC
calcification
SEM-EDS

Abstract
Aortic valve calcification (AVC) is the leading cause for valve replacement in Europe and North America and the third leading cause of cardiovascular disease.
AVC has long been regarded as a passive, degenerative process leading to severe precipitation of calcium phosphate into injured tissue in the absence of a systemic mineral imbalance and strongly associated with diabetes, atherosclerosis and aging.
Recently, a number of studies have evidenced that mineral deposition in the cardiovascular system is an actively regulated phenomenon similar to ossification process, involving the induction of noncollagenous matrix proteins of bone.
Over the past few decades, the prevalence of rheumatic and degenerative etiologies of calcific valve disease have drastically changed with the latter increasing probably due to the longevity of life.
Histopathological and morphological studies of calcified valves have been concerned mainly with the determination of the suitable sites for initial mineral deposition and much remains to be elucidated about the pathophysiological events of AVC and the exact elemental composition of the mineral deposits observed in the dystrophic calcification of aortic valves.
The present study sought to characterize the nature of mineral deposits and the ultrastructural features of calcified human aortic valves in order to provide valuable insight into the pathogenic mechanisms of calcium deposition in valvular tissue.
Valve calcifications have been investigated by optical and scanning electron microscopy (SEM), XRPD, DSC-TG, FT-IR. The composition was inspected on valve calcifications cross-sections by EDS/SEM and LA-ICP-MS analyses. X-ray diffraction show that the valve calcification consist of fluorapatite (JCPDS 035-0496) only. When observed with the SEM, fluoroapatite shows both regular and lacking in morphology. As regards chemical composition, some correlation is observed between elements concentrations (ppm) and removal from the organic-inorganic border. Further characterization of the valve calcifications have detected the presence in variable amount of other phases as siliceous spherules and needle titanium both crystallized in micrometric size.
Our ultrastructural investigations indicated that cellular and extracellular remodeling was present in the calcified areas and included vacuolization of elastin, disorganization of collagen fibers, and degeneration of valve interstitial cells without inflammatory infiltrate.

Presentation mode
POSTER

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