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Environmental risk and risk perception management in public health

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ABSTRACT

When evaluating environmental risk and its perception, psychosocial and psychosomatic factors may be of fundamental importance for public health programming and the promotion of quality of life. This is the case in particular where knowledge of the true health consequences of environmental exposure to given risk factors are incomplete or its action is within the range of values where we do not anticipate the measurable biological effect. This applies not only in the case of the indoor environment related complaints but also to that of non-ionizing electromagnetic radiation and electroionic microclimate, among many others. A serious consequence found in the syndrome of mass hysteria is the fact that due to differently motivated information and disinformation, part of the population can suffer from psychosomatic symptoms and deterioration quality of life for those affected.

Keywords: Risk Perception; Environmental Risk Assessment; Psychosocial Aspects of Risk

1. INTRODUCTION

Scientific and Social Models of Health and Illness

When contemplating the aspects that comprise a healthy environment, it is necessary to define the relationship of health and illness in general. Currently, health is conceived as a condition of physical, psychic, and socio-economic wellbeing and health security. Health security is the access to essential health services and protection from environmental and behavioral risks that diminish health [1,2]. This definition frames health security as an aspect of human security, which is the "freedom from want", and access to life saving clinical and public health interventions [3].

Plainly, health and human security converge in definitions as the adequate access to healthcare resources grounded within community-based primary health care, mental health access and equity, basic hygiene access, access to environmental health and protection, safeguards populations against external and internal threats of conflict, protects against infectious disease and pandemics and in general provides the most basic in public health and collective security for populations.

Health security has evolved over time so that it encompasses many entities that compose the present nexus of health and security and promotes adequate risk assessment for communities. The United Nations (UN), World Health Organization (WHO), Asia-Pacific Economic Cooperation (APEC), and the European Union (EU) approach a health security definition within specific areas: emerging diseases; global infectious disease; deliberate release of chemical and biological materials; violence, conflict, and humanitarian emergencies; natural disasters and environmental change and radioactive accidents [4-6]. Global infectious diseases are those that are transmissible and communicable between people due to the presence and growth of a pathogen; examples being bacteria, fungi, parasites or a virus that causes an infection [7].

Contrastingly, illness involves an extensive set of different experiences or behaviors of the affected person. Different experience in the negative sense against the generally accepted standard is implying the deteriorated or endangered subjective condition or social function, feeling of undesirability, of being unwelcome and/or unexpected. The illness induces some activities which aim is an improvement of the condition [8].

Every society responds to such impaired function by charging a number of individuals or institutions with duties to evaluate and interpret the actual condition and provide the necessary measures that gauge public health indicators and defines consequent health security for populations. Public health key stakeholders (owing to public health being both an institution and scientific discipline) includes physicians, nurses and public workers,

among many others, are expected to prevent and react to social requirements and provide best practices and outcomes; this includes education to the masses of risk assessment that take into account cultural and societal specifics.

Where medicine attempts to build up a scientific model of illness, its diagnostics, treatment and prevention, yet this model frequently not identical nor congruent with the dynamic social model and expectation. There is a difference between illness and disease; the same as the difference of views concerning the therapeutic and preventive approach to medicine [9]. Prevention of disease is and remains to be a major barrier to public policy and public health funding across states while reaction to disease outbreak, major epidemics and overall prevalence and disease burden fetch quicker politics and more funding; despite prevention being a better investment in health for communities.

The priority of the scientific approach remains to be objective approach to problems, the collecting of data and balanced analysis and interpretation. On the contrary, the social model is mostly based on subjective and strongly emotional and dynamic attitudes. Both, the expert and lay community are not immune against the harmful influence of poorly represented data and its conclusions, poorly based science and allegories. Science, however, moves closer to what is actually occurring, but not exceptionally, the science-based, as well as lay models, tend to misinterpret the situation, and provide altered or skewed approaches [10]. Using objective methods rooted in the scientific process, it becomes clear to be able to reflect upon failures, where the subjective approach often resists logical argumentation and organized methodology. These qualities are a recipe to promote social infection that does not promote the search of truth.

Nevertheless, even the scientific process operates with some traditional elements. Max Planck has lamented, “the new scientific truth would not win by convincing the opponents, but rather by letting the opponents die, and the new generation then adopts a new, and own truth”. This approach may sound quite dramatic at first glance, however it echoes the precautionary principle in risk assessment and risk management of known and unknown health risks. The precautionary principle or approach dictates if a product, action or policy has a suspected risk of causing harm to the public or to the environment in the absence of definitive scientific consensus that the product, action or policy is harmful, the burden of proof that it is not harmful falls on those taking the action [11,12]. The application of the precautionary principle into public policy and public health is hotly debated, however the European Union has chosen to apply it as a statutory requirement [13]. The principle implies that there is a social responsibility to protect the public from exposure to hazard and conse- quent harm, when scientific investigation has found a plausible risk. Of course, the precautionary measures taken can be reversed or otherwise if and when further scientific research concludes that no harm will result.

If rationally removing harmful effects and providing for a healthy living environment we have to consider both the scientific and social aspects, then the views and needs of people living in particular environment are accounted for and taken into consideration.

2. ASSESSMENT OF ECOLOGICAL AND HEALTH RISK FACTORS AND SETTINGS

The health risk assessment of potential ecological and health risk rising from the planned industrial transport and the treatment of waste at facilities and other industrial and construction activities is paramount [14]. Of course, the public health processes and procedures of such waste management and industrial activities as such cited projects are primarily controlled, regulated and approved by district or regional public health and state authorities, within the scope of prevention of risk, health supervision and best practices.

Whereas the initial phase of risk assessment, its identification or potential human exposure are of pure scientific character, the actual risk assessment increasingly assumes the arbitrary aspects (e.g. safety coefficients), risk communication, its control and management by way of psychological aspects; collective decision making then becomes a hotly debated political issue [15]. As illustrating examples we can use problems related to conflicting views concerning the health risk and associated effects of electromagnetic field and electronic microclimate [16].

The present approach to quantitative risk assessment artificially separating physiologically based pharmacokinetic (PBPK) model and biologically based dose response (BBDR) model needs to be substantially improved. The modeling procedure must go beyond the current organ-tissue based PBPK model as well as the hard-to-modify two-stage BBDR model. It is clear that a model must be flexible and capable of incorporating information about pharmacokinetics and cell signaling response, among other transparent metrics that help to elucidate the situation [17,18].

A limitation of the present approach to risk assessment is low dose extrapolation of cancer incidence data from both animal (experimental) and human (epidemiology) studies that are most frequently based on models that assume linearity at low doses and low exposures [19]. There are situations in which this assumption could be considered unreasonable. However, because of the lack of data and no alternative methodology for risk extrapolation at present, the model of low-dose linearity con-

tinues being used despite existence of qualitative evidence evidencing the contrary. This is specifically relevant in the case of many non-genotoxic carcinogens modulating mitogenic stimulation or suppression of apoptosis—processes regulated by signaling through its impact on gene expression [20]. Dioxins (TCDD) can serve as example of non-genotoxic carcinogen, endocrine disrupter acting through the Ah receptor. It is a general consensus that to resolve this problem, we need to develop a methodology incorporating biological data on mechanisms operating at the cellular or molecular level.

3. PSYCHIC INFECTION AND MASS HYSTERIA

Clinicians and public health experts alike know that when dealing with patients and clients, both material and psychological problems arise. Addressing a group of individuals who, may feel endangered is more complicated still, especially when these groups previously organized in harmony and through a certain hierarchy, begin to transform into a disintegrated one where behavior suggest the behavior of masses or of the mob. By definition, mass hysteria is the spontaneous and en masse development of very similar physical or emotional symptoms among a group of individuals; it can be a socially contagious frenzy of irrational behavior in a group of people from a reaction to an event, new finding in the media or purposeful ignition. The mass psychology may appear whenever a sufficient number of persons are gathering around one point of common interest. This differs from panic in that there is no real threat found in mass hysteria where with panic, the legitimate threat exists in proportion.

The psychology of the group never makes a mere sum of the member's psychology but it has its own individual characteristics. The group as a whole shows better quality than the most inferior members, but the worse judgment and lower emotional development compared to the highest individuals of the group, and it is prone to being influenced by emotion rather than so by reality and evidence. Another characteristic is behavior of the group as a mob (aggressive, panicking, etc.) whose activities are more often worse than those of an individual [10,21-23].

The basic characteristic of mass dynamics is the "psychic infection" due to increased suggestibility responsible for the sensation of symptoms and subsequent chain reactions. A person in the mob then is capable of acts they would otherwise never have committed as an individual on their own. The cases of mass psychoses are well known from many literary descriptions of "mass hysteria" in real or theoretical exposure to toxic substances, or in health problems and symptoms connected with the indoor environment (sick building syndrome) found in air conditioned buidlings [24-28].

In such cases, it can be considered "objective", (*i.e.* the patient really suffers from them). They are reminded of such symptoms of acute distress but they are less intense and last for a longer period of time, (e.g. for many days, weeks, or months). The affected are aware of the overall stress and tension, fright, shyness, of sensations of oppressiveness and worries, when addressing other people, and vague stressing uncertainty for the future. All these symptoms are accompanied by chronic fatigue, headache, insomnia and other sub-acute vegetative disorders. As the syndrome is not fully debilitating, the patient feels chronically unwell in both his daily duties and his reaction towards other people. Often their capacity of cognition and making sense of daily activities becomes reduced as the result of chronic fatigue and impaired concentration.

The symptomatology fully corresponds to the term "somatization" introduced in the ICD-10 international classification. The point is that emotion—here a very strong one—finds its vegetative correlate occurring in the somatic sphere. An important role in further development plays the "interpretative model" of the patient being xenochtonous in our case (the cause of all trouble comes from outside) and the patient is aware of it (sick building, living nearby a radar station, TV tower, waste incineration plant etc). This mass reaction can manifest by two syndrome levels: one prevails the state of anxiety and the other prevails motoric symptoms (e.g. the medieval processions of flagellants praying for aversion of a pest).

The symptoms may appear separately or combined, or occur in turn in the patient. Mass hysteria afflicts men less frequently than women, especially those living in poorer socioeconomic conditions. Mass hysteria is closely connected with the problems of "sick indoor environment" illness. Important here is the firm conviction of outside pollutants and noxious substances responsible for any kind of symptom, further tendency to hypochondria and stress and also hostile attitudes of the patient to anybody to blame for these conditions; in practice materialized by voluminous and indecisive litigation. In a sense, also collective insistence on Uni- dentified Flying Objects (UFOs) and other paranormal encounters belong to this category.

Yet, not all mass-occurring pathological symptoms are mass-hysteria-related. For example, the mass poisoning of school children in the school canteen in London can be mentioned, manifested by gastrointestinal troubles shortly after lunch. The complex microbiological, hygienic, and toxicological examination included a questionnaire for children, which showed a significant link between the symptoms and consumption of raw cucumber (relative risk 6.1). Microbiologically the cucumbers were safe but pesticide contaminated, as proved by toxicology

tests. In the discussion, the authors warn against any overhasty diagnosis of mass hysteria.

Another example can be found with vaccination and concerns of a disproportionate amount of adverse side effects, including cognitive and development impairment. A paper published in *The Lancet* by Dr. Wakefield about a causal link between autism and the MMR vaccine initiated parents to refuse to vaccinate children [29]. This new version of vaccine denialism has caused some eradicated disease such as polio, measles, mumps and rubella (MMR) to be once again found in the developed world due to significantly reduced herd immunity due to parents opting out of such otherwise required vaccines.

Vaccine-preventable diseases have been a major cause of illness, death, and disability throughout human history. The advent of the modern vaccine era has changed this significantly. In more recent times, there has been much debate in the lay press regarding vaccine safety—namely what possible side-effects vaccines cause and whether these outweigh the risks of leaving a population without a vaccination program. Despite most of the hysteria, some key literature relating vaccines and childhood development have been completely rebuked and withdrawn from the literature. Present use vaccines provide disease coverage to populations, prevent illness and save lives.

Even when the concentration of toxicants fails to reach the risk values, other factors may be involved, e.g. ambient temperature, air humidity, etc., which have up to now not been included in models but which are able to objectively influence the clinical course, morbidity and mortality rate [30]. There even may be a combination of actual infection and mass hysteria. In some people evident hypersensitivity to some substances exists: their pathophysiological reaction then is capable of psychogenic effects on the environment. Nevertheless, we presume the psychosocial aspects may be of basic importance in understanding the potential health risks.

Furthermore, we can expect such problems when our knowledge of actual health effects of human exposure is incomplete or the intensity of exposure oscillates in levels raising doubts as to possible biological effects [31]. Very serious problems, mostly in psychologically unstable patients, are neuro-psychic and psychosomatic symptoms resisting to treatment. Despite the difficulty in objectification, they represent suffering that should not be underrated considering the quality of patient's life.

4. CHALLENGES FOR PREVENTION

The prevention of such conditions can either be systematic: early educational or popularization campaigns, specific health education orientated to the development of industrial, transportation, or other types of constructions, and integration of the local civic activities in the program. The purpose of this should not be a cheap belittling of the risk but reasonable explaining of its acceptable rate, and also the likely advantage to benefit from the realization of the structures. Any later efforts to inform the public about the true state of affairs is normally accepted with distrust and disbelief, in belief this information had been well-paid by the government, industry and market forces, the military or some other institution trying to camouflage the actual condition.

5. CONCLUSION

It is therefore recommended to carry out a relevant, competent epidemiological pilot study on potential incidence of some health problems (tumors, congenital malformations, etc.) still before starting the structures, to compare—using a set of reliable data, when the building had already been approved for use—the incident phenomenon with the previous conditions. Such a study, of course, is no alibi. In cases of positive findings the study could serve as basis for rational measures to minimize the health risk due to the operation of the particular facility. The concept of health risk minimization must be included as a theme in all stages of the design and realization, covering all potential risks for the environment and human health. In medicine, the Hippocrates' statement still holds: Life is short, and Art is long; the occasion is fleeting, experience fallacious, and judgment difficult. The physician must not only be prepared to do what is right himself, but must also make the patient, the attendants, and externals to co-operate. If we honor this in therapy, we should do so in prevention of environment related health risks twice as much [9].

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