OPINION

Biomonitoring and its issues

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ABSTRACT

Human biomonitoring data has been the subject of an explosion in knowledge and literature over the past two decades. Workgroups, workshops, and symposiums have been established to cover all aspects of biomonitoring. One such workgroup, established by the Health and Environmental Sciences Institute (HESI) of the International Life Sciences Institute, created a wheel with biomonitoring as its hub, and its spokes represent the purposes of biomonitoring. The biomonitoring wheel will undoubtedly get a new spoke as it rolls and speeds up. Nowadays, Human Biomonitoring (HBM) of dose and biochemical effect is extremely useful and offers a quick and inexpensive way to measure human exposure to chemicals. In addition to establishing exposure distribution among the general population, identifying vulnerable groups and populations with greater exposures, and identifying environmental concerns at specific contaminated sites, HBM can do all of these things for comparatively little money.

Key Words: *Biochemical effect, Human biomonitoring*

INTRODUCTION

Human biomonitoring data has been the subject of an explosion in knowledge and literature over the past two decades. Workgro--ups workshops, and symposiums have been established to cover all aspects of biomonitoring. One such workgroup, established by the Health And Environmental Sciences Institute (HESI) of the International Life Sciences Institute, created a wheel with biomonitoring as its hub, and its spokes represent the purposes of biomonitoring. The biomonitoring wheel will undoubtedly get a new spoke as it rolls and speeds up. Nowadays, Human Biomonitoring (HBM) of dose and biochemical effect is extremely useful and offers a quick and inexpensive way to measure human exposure to chemicals. In addition to establishing exposure distribution among the general population, identifying vulnerable groups and populations with greater exposures, and identifying environmental concerns at specific contaminated sites, HBM can do all of these things for comparatively little money. Additionally, the sensitivity of HBM techniques allows for the clarification of human metabolism and harmful mechanisms of contaminants. HBM is thus a tool that may be used by both scientists and decision-makers. The most often used matrices are by far blood and urine. Most chemicals that are the subject of debates about environmental medicine around the world can be analyzed using HBM. The term "biomonitoring," an abbreviation for "biological monitoring," is used in the field of environmental public health to describe the measurement of an environmental chemical, its metabolit--e, or reaction product, in human blood, urine, milk, saliva, adipose, or other tissue in individuals taken separately but typically taken together to constitute a population, in order to assess human exposure to that chemical. The initial application of chemical compound detection in human body fluids was in occupational medicine to safeguard the health of workers who were exposed. Early instances of Human Biomonitoring (HBM) of workplace exposures include the detection of lead or benzene metabolites in blood or urine. Powerful analytical methods that enabled the measurement of extremely low chemical concentrations in urine and blood entered the labs in the early 1960s. These methods made it possible to find considerably lower chemical concentrations in bodily fluids that were brought on by exposure to the environment. Atomic absorption spectroscopy, for instance, revealed that the general public in industrialized nations was exposed to lead to such a degree that immediate action was needed. The applications of biomonitoring are numerous. The International Life Sciences Institute/Health and Environmental Sciences Institute subcommittee on Biomonitoring has created a wheel with biomonitoring at the center. The spokes that extend from the hub show several biomonitoring applications. These spokes ultimately connect to the inner wheel, indicating that information from these "spokes" may be utilized to measure exposure or investigate potential adverse effects or risks to health. Applications of these data are better defined by the outer wheel.

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The creation of reference ranges and the gathering of information on spatial and temporal trends are two of the spokes leading to exposure assessment. Epidemiological research and emergency response research are two spokes that lead to health consequences and dangers. Without a doubt, as the field of biomonitoring continues to advance at an even quicker rate, additional spokes will be added to the wheel while others might be removed. According to, which shows the sharp rise in publications during this time period, this quicker rate started in the middle of the 1980s and is still going strong now. The various applications and problems of biomonitoring will be illustrated in this article. The presentation we made at the HESI annual meeting in San Juan, Puerto Rico, in January 2007 served as the basis for this manuscript. A HESI International Biomonitoring Workshop held in September 2004 in Research Triangle Park, North Carolina, served as a prelude to this yearly meeting. Stress proteins, also known as heat-shock proteins or HSP, have an advantage over analytical methods in that they can measure the actual effective fraction of pollution that has an impact on an organism by integrating multiple exposure routes over a specified time period and for any specified number of pollutants. According to their molecular weight, the group of proteins known as stress proteins can be classified into families. The most common stress-protein families are four, and they are known as hsp90, hsp70, hsp60, and Low Molecular Weight (LMW) stress-proteins. These families have members with molecular weights of 90 kDa, 70 kDa, 60 kDa, and 16-24 kDa. Multiple isoforms of each stress-protein family exist, and the synthesis of each is controlled differently. Some of the constitutively produced stress proteins are elevated in a manner that is proportionate to the level of stress when subjected to therapies that cause protein destruction (proteotoxicity). Other isoforms, the most prominent of which is hsp72, are thought to only be created when the cell is subjected to harsh conditions, while still, other isoforms have a stress-modulated expression. Stress proteins are hypothesized to counteract the proteotoxic effects of these harmful circumstances by avoiding the denaturation of proteins and keeping them in a folded or assembled state to aid in repair. Environmental public health can use biomonitoring in a variety of ways, as the HESI wheel and the other recent symposia and workshops on the subject demonstrate. The interpretation of it, particularly when non-permanent substances are involved, is arguably the biggest problem. We must also be conscious of the fact that the proper application and interpretation of biomonitoring is highly dependent on the objectives of the study, or more specifically, the design of the study. Type of population may be determined by study design.