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COMPUTERIZED MANAGEMENT OF HEALTH DATA IN A PETROCHEMICAL PLANT APPLICATION IN SURVEILLANCE OF LEAD EXPOSURE RISK

E. BARTALINI and S. GIUDICE
Occupational Health and Hygiene Department, Montedison, Milan, Italy

ABSTRACT

A language for computerized management of health data was created whereby the computer stores a series of personal data that identify the employee both as a person and as a worker referred to his job, in addition to data on the results of tests and examinations carried out. With real-time up-dating of stored data, the computer can furnish the employee with information of interest to him, but in particular it makes possible statistical analyses to be made of homogeneous groups of workers. The data pool provides information that can be used in observing the biological parameters of 230 persons exposed to lead salts in the plant's section producing PVC compounds.

The parameters were found to have changed over a certain period as a result of improvements recommended by the company's medical department.

Computerized management of health data has been in operation for three years at a petrochemical plant at Porto Marghera. It was introduced in order to meet the ever increasing need for filing and utilizing the very large mass of data that a modern preventive medicine facility now produces daily. To-day in fact, periodic medical examinations, whether or not demanded by law, are now routinely supported by numerous instrumental and laboratory tests which in large plants would be practically impossible to record and subsequently utilize using the traditional methods.

A language was created whereby we could transmit to the computer the results of examinations and checks made at the company's medical facility together with a set of personal data identifying the worker both as an individual and as a subject in relation to his occupational environment. For each worker the computer stores all data (suitably coded) regarding age, sex, type of exposure, years of risk, previous job, past occupational diseases, and all the results of the services obtained which at the respective plant include medical examination, audiometry, ECG, radiographs, lung function tests and laboratory tests. The purpose of this data pool, which is constantly up-dated by means of real-time feeding to the computer store direct from the Medical Department, is to provide

a personal health record to be kept by the worker himself and also allowing a wide range of statistical analyses to be carried out on samples selected according to desired characteristics, using a very flexible system.

In this paper we should like to show how it proved very easy to extract rapidly from the data pool the information which we considered useful for observing the biological signs of a lead exposure risk by evaluating the evolution of these signs.

The department under study produces PVC compounds and employs about 230 persons. For each individual, lead in blood, lead in urine, urinary ALA, erythrocyte ALAD and complete blood count are determined every six months. The computer was asked to give the results of each of these tests for fixed periods, and the diagrams obtained showed the frequency distribution for each result and the standard deviation for each test. We then requested diagrams showing on the X-axis the various periods in which the tests were performed and on the Y-axis the mean of the values obtained, in order to be able to follow over a certain period the evolution of the parameter studied. We thus ascertained, for instance, that lead in urine was diminishing and that erythrocyte ALAD was clearly increasing. The signs of exposure and of any biological impairment move in the desired direction according to the aims of prevention: this, of course, as a result of the technological improvements made to the plant upon recommendation by the Medical Department.

At the same time we were able to verify certain concepts that have long been known but are always useful to check, such as the exact inverse correlation between lead in blood and erythrocyte ALAD or the direct correlation between lead in blood and lead in urine.

Lastly we studied the relationship between test results and the job. The various jobs are on the X axis and the mean of the lead in blood values on the Y-axis. Low values of lead in blood were found in clerks and control panel operators; in persons working with raw materials (organic lead salts), in workers mixing raw materials with the resin, and in baggers the risk appeared greater. Conversely, the diagrams show high ALAD values for jobs with less exposure, with the lowest value found in persons handling with raw materials. The results once again confirm how valuable the enzymatic test is in the early detection of impairment due to lead.

The data discussed, which represent only one of the thousands of possible examples, were obtained within an extremely short time, whereas calculation of the same parameters and, prior to this, collection of all the data for processing would have taken many, many weeks of work.