ROUND TABLE

ADVANCES IN OCCUPATIONAL CANCER
INTRODUCTION

The cancer for which a direct link with a carcinogenic agent from the workplace can be established is an occupational cancer. If the length of exposure and the latency are long enough to induce the disease, the agent can be considered one of the causes of the disease. The individual exposure to carcinogenic agents at workplace has low prevalence in the general population (0.05 - 0.15). The level of exposure can vary largely according to the job, workplace, and industrial process. The epidemiologic studies concentrate on establishing a dose-response relation between carcinogenic agents and the disease but the results remain a matter of controversy.

The International Agency for Research on Cancer from Lyon, France, specialized body of the World Health Organization, carries out a complex program (IARC Monographs) aimed to evaluate the carcinogenic risk for various agents/circumstances. According to a standard methodology the IARC’s committee investigated and evaluated 833 agents in the major categories: group 1 (sufficient evidence for carcinogenicity in humans) with 75 agents, group 2A (probable – 59 agents) and 2B (possible – 227 agents) with limited evidence, group 3 (with inadequate/insufficient evidence – 471) and probable non-carcinogenic for humans (1 agent). Most of the agents/exposure circumstances in group 1 (24/12) are occupational.

It is well recognized that 4% of the total number of incident cancer cases are occupational.

Out of 1759306 newly cancer cases diagnosed in Europe each year, 70000 are due to the occupational risk factors.

In Romania a total number of 42907 cancer cases are diagnosed yearly and most probably, 1716 are caused by the occupational exposure to the carcinogenic factors. If we consider both the sex and the cancer site the estimation of occupational cancers in Romania for the main topography would be as follows:

- 5-10 occupational cancers of the pleura;
- 600-900 occupational lung cancers;
- 100-150 occupational bladder cancers;
- 20-30 occupational sinuses cancers;
- 20-30 occupational larynx cancers;
- 80-120 occupational leukemia.

Actually, in Romania only four cancers cases (lung cancer) were recognized as occupational between 2000-2003. The causes of this serious underestimation are the lack of knowledge among the medical doctors (oncologists, pneumopathologists, general practitioners, and occupational physicians). They do not recognize the suspected cases and consequently do not notify them. Both the medical doctors and the patients are not interested in declaring the occupational cancers because the lack of any benefit. There is also a serious lack of information regarding the occupational cancer risk among the employers and employees. The public health authorities and labor inspection do not have the adequate tools to monitor the risks.

The epidemiological ground of these statements are the results of a large INCO-Copernicus study carried out by The Institute of Public Health in 1998-2003 on occupational cancer. 72 lung cancers, 40%, (out of the 181) were occupational cancers.

AIM AND OBJECTIVES

From the epidemiology to the daily practice of occupational medicine, the link is established by the legal enforcement. The regulations should be in accordance with the European recommendations and with the national strategies and their coherence must be ensured by a continuously adaptation. The practical difficulties can be solved through the dialogue. The aim of the section is to establish an optimal communication between experts coming from different fields of occupational health.

The main questions of the occupational medicine to be answered by the epidemiology are:
- the list of cancers suspected as occupational cancers (notified or not);
- the list of occupational carcinogenic agents and occupational carcinogenic circumstances;
- criteria for occupational cancer diagnosis;
- occupational cancer notification according to The Health Minister’s guidelines;
- guidelines for epidemiological research of carcinogenic agents at workplace;
- epidemiology and occupational cancer control;
- data sources in occupational cancer etiopathogeny and epidemiology.

MATERIALS

Discussions on practical aspects of an epidemiologic study on occupational cancer, exemplified with the results of INCO-Copernicus study in Bucharest;
Debates on occupational cancer prevention and control strategies according to Romanian Ministry of Health;
Occupational medicine clinical practice in Europe;
Practical tips on main data sources in occupational cancer epidemiology.

EXPECTED RESULTS

At the end of the discussion on occupational cancer epidemiology we will be able to identify problems and questions specific to each group and, hopefully, we will be able to give some answers or, at least, to establish future strategies for solving queries.
PRESENT DATA ON RISK ASSESSMENT IN WORKERS EXPOSED TO PULMONARY CARCINOGENS

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OBJECTIVES
The efficacy of lung cancer screening methods, including sputum cytology is still controversial. An evaluation of the mass screening programs for lung cancer in workers exposed to pulmonary carcinogens and in smokers in the 1980’s and 1990’s showed no decrease in the mortality rate for lung cancer (Coul tas D.B., 1992, Petti T.L., 2001). However, in many cases, patients diagnosed at earlier stages through CXR and sputum cytology had a higher resectability and survival rate, compared to those receiving CXR only (Palcic B, Cytometry, 50(3), 2002). The present discussion will try to show our point of view concerning this controversy.

METHODOLOGY
To date, the methodology for lung cancer screening recommends CAR and sputum cytology for central pretumoral changes and squamous metaplasia, and CT for peripheral adenocarcinoma (William S., 1998). In our country, sputum cytology is used since 1980, in occupational exposure to asbestos, 3,4 B (a) P, hexavalent chromium, uranium etc., and in asbestos exposure for the presence of asbestos bodies, as markers of heavy past and present exposure and of lung fibers burden. The embedded sputum technique, used for 25 years (still considered to have high sensitivity and specificity) was replaced with the smeared sputum technique, much cost effective and less time consuming.

RESULTS AND DISCUSSIONS
The results of sputum cytology screenings made in our laboratory showed the predisposition of some workers to develop a lung disease, illustrated by the pretumoral changes in bronchial epithelial cells and by the cellular background of the sputum samples. The proportion of pretumoral changes, according to Papanicolaou classification, adapted for lung epithelium was as follows:
- gr.I (normal) - ≈ 60%
- gr.II (mild atypia, squamous metaplasia) - ≈ 30%
- gr.III (moderate atypia, suspected for malignancy) - ≈ 8%
- gr.IV (severe atypia, suggestive for malignancy) - ≈ 2%
- gr.V (tumoral cells) - ≈ 0%
We noted the high incidence of inflammatory sputum samples in all types of exposures. Neutrophils in excessive numbers within the lung can be both protective as well as destructive. Neutrophil-derived oxygen radicals are known as cytotoxic and genotoxic, and, in longer exposures, they can induce fibrosis and even cancer. Lymphocytes, in streams of cluster, suggest a chronic infection, which should be noted in the subject history. When inflammation was associated with cytology III or IV, we recommended a new sputum investigation and, when confirmed, a more careful follow-up of the subject in the periodical medical check, in order to detect any early stage of disease, before the radiological outcome.

The results of sputum cytology, correlated with the results of clinical, radiological and functional investigations improve the medical check up for workers at high risk for lung cancer. Although the suspected and severe atypia cases (gr.III and IV) are less frequent, the information regarding the lung defense mechanisms (loaded macrophages, high frequency of inflammatory cells) are very important for each individual.

Many studies recommended the sputum cytology to be more frequent used for those at high risk for lung cancer. In this respect, and according to the legislation in our country, we would suggest the reorganisation of the sputum cytology specialists network, initially created during 1979 – 1981, with the help of the competent authorities.

CONCLUSIONS

Although the use of sputum cytology screening and of standard CXR did not decrease the incidence of lung caner in subjects at high risk, the information concerning the individual predisposition to develop a lung disease, fibrosis and/or cancer in workers with more than 10-15 years of exposure to pulmonary carcinogens, over 40 years of age and smokers (the group at high risk) are very important in the primary prophylaxis programs.
INTRODUCTION
The Romanian Ministry of Health implemented a nation-wide program aimed at preventing asbestos-related risks. The goals were to minimise exposure to asbestos, identify people exposed at work and improve the diagnosis of asbestos diseases especially mesothelioma. New regulations on the protection of workers from the risks related to exposure to asbestos at work were applied since 2002.

METHODS
The program manager set the following actions to be realised by the local sanitary authorities:
- identifying people occupationally exposed to asbestos
- monitoring occupational exposure to asbestos
- the development of techniques and training of medical staff for an early diagnosis of asbestos related diseases
- the development of scientific research projects
- collaboration with labor inspection in common activities

RESULTS
Measurements of asbestos levels have been carried out especially in big enterprises. In 30% of cases they were over the TLV(0,3 f/cm³). Still, no measurements have been done to estimate the exposure of workers who don’t come into contact with asbestos all the time. During the last year we have observed an important increase in the number of employees who have been exposed. (Effect of a better notification)
During the last year 12 cases of asbestosis were declared and for the first time in Romania, in 2003, 3 cases of occupational cancer caused by asbestos were recognised as professional.
By processing data from an international research program (Inc-Copernicus) we discovered that 17 out of 180 subjects with lung cancer were heavily exposed to asbestos. Out of these 17 only 8 were exposed only to asbestos during their professional life.
Our research showed that there are difficulties in identifying asbestos-related cancer because of smoking habits and the simultaneous exposure to other carcinogenic substances.
CONCLUSIONS
A good detection of health effects at a national level is important for awareness of decision makers and also for the awareness of medical practitioners. Unfortunately only 50% of Public Sanitary Directorates reported actions done in this program. It is important that the occupational health physicians contribute to not only to prevention but also to detection and early diagnosis of asbestos-related disease for workers who are exposed to both high and low concentrations of asbestos.
METHODS USED FOR ASBESTOS IDENTIFICATION IN OCCUPATIONAL ENVIRONMENT

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INTRODUCTION
To identify asbestos in various materials (industrial dusts, other products containing asbestos) various methods are used: X-ray microanalysis by electron microprobe, mass spectrometry, X-ray diffraction, infrared spectroscopy, polarized light microscopy. In this work, two methods will be comparatively presented, namely: infrared spectroscopy and X-ray microanalysis by electron microprobe.

METHODS CHARACTERISTICS AND PERFORMANCES

Both conventional and Fourier transform infrared spectroscopy are the most reliable methods used for asbestos qualitative (identification) analysis. The most frequently used technique is the KBr pellet standard one. In the case of Fourier transform infrared spectroscopy (FT-IR), respirable dust is sampled on membrane filter, having size pores of 0.8 µm. The flow rate is 1-2 l/min. Filter samples are ashen in furnace, then 1 mg of this sample ash is homogenized in KBr and pressed to pellets. Sample infrared spectra are recorded and compared with standard asbestos spectra. At least, six vibrations in standard asbestos spectrum must to be identified in the sample spectrum: two stretching vibrations of O-H groups, three stretching vibrations of Si-O groups and one stretching vibration of cation-oxygen group. Spectrum band resolution is 2-0.1 cm⁻¹ and the abscise accuracy is lower than 0.01 cm⁻¹. Fig.1 shows the spectrum of respirable dust sampled in asbestos gasket manufacturing process in comparison with standard chrysotile spectrum.

X-ray microanalysis is made by a scanning electron microscope (SEM) equipped with an energy dispersive X-ray system (EDXS) to analyze asbestos elemental composition; particles under analysis are selected from images directly taken from SEM. The ratios of key elements are calculated too. Airborne dust is sampled on policarbonate filter. Detection limit is 10⁻¹⁵ g, precision is ±1%. Fig.2 shows EDXS spectrum of respirable dust sampled in asbestos gasket manufacturing process.

CONCLUSIONS
The two methods presented above are comparable related to their performances. Qualitative analysis performances are related to performances of instruments, experience of the analyst and the type of matrix, which includes asbestos.