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Non-cancer mortality in workers in the meat and delicatessen departments of supermarkets (1950–2006)



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ABSTRACT

We studied non-cancer mortality in 10,701 workers in the meat and delicatessen departments of supermarkets because they have increased exposure to a variety of microorganisms that infect and cause disease in food animals such as cattle, pigs, sheep, and poultry, to which subjects in the general population are also exposed, albeit to a lesser degree. These workers were also exposed to fumes from the wrapping machine. Standardized mortality ratios were estimated in the cohort as a whole and in race/sex subgroups, using the US population for comparison. Study subjects were followed up from January 1950 to December 2006. Significantly increased deaths from diabetes, ischemic heart disease, pulmonary embolism, chronic bronchitis, peritonitis, intracranial and intraspinal abscess, other bacterial diseases, and significantly decreased deaths from diffuse diseases of connective tissue, functional diseases of the heart, intracerebral hemorrhage, occlusion/stenosis of the precerebral and cerebral arteries, and various types of accidents were observed in certain race/sex subgroups or in the cohort as a whole. The observed increased risks of several infectious conditions suggest that the increased occupational exposure to microorganisms may be responsible for at least some of the observed excess deaths, while exposure to fumes may also contribute to the excess of chronic bronchitis. The findings are important not only for supermarket workers and other workers in the meat and poultry industries, but also because the general population is exposed to these microorganisms found in food animals and their products. Nested case-control studies within cohorts that include both workers in supermarkets and other sectors of the meat and poultry industries, are now needed to examine specific risks from occupational exposures while adequately controlling for confounding factors, so that the role of these infectious agents in the occurrence of these diseases in workers and in general population subjects can be adequately assessed.

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1. Introduction

We previously studied the subjects in this report for mortality on two occasions between 1949 and 1989 because they were workers in the meat and deli departments of supermarkets who had increased exposure to a variety of transmissible agents that infect and cause disease in animals commonly used for food such as cattle, pig, sheep and poultry, and that are also commonly found in meat and poultry products. The results indicated that male supermarket meat workers had an elevated relative risk of death from diabetes. There was also a suggestion of an increase in deaths

from ischemic heart disease, other diseases of the kidney and ureter, acute/chronic alcoholism and dipsomania, and subarachnoid hemorrhage. Women had elevated relative risks for chronic bronchitis and ischemic heart disease, and possibly alcoholism. The numbers were too small to interpret the apparent increase in deaths from intracranial and intraspinal abscesses and acute nephritis in men and peritonitis in women. (Johnson, 1987a; Johnson, 1987b; Johnson and Zhou, 2007a). Here we report on a third update of this cohort. While it is clear that subjects in the general population are commonly at risk of being infected with resulting disease from ingesting meat and poultry products and water contaminated with some of these agents such as salmonella, campylobacter, toxoplasma, and *E.Coli* that cause acute disease (Tenter et al., 2000; Vipham et al., 2012), it is not known if many of the other microbial agents present in these animals or their products are the ones responsible for some of the known and

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unknown *chronic* diseases in the general population. A study of supermarket workers with above background exposure to these agents, may assist in identifying which diseases these agents could be responsible for causing in these workers and possibly also in the general population. Here we report on the cohort for non-cancer mortality between 1950 and 2006, because (1) new findings not previously reported are now evident; (2) the cohort has now been followed up for more than 26 years on average, and sufficient time has now elapsed for chronic diseases resulting from these exposures to be manifested; (3) there are no other studies in this occupational group.

2. Methods

The cohort consisted of 10,701 subjects who worked in the meat and deli departments of supermarkets between 1950 and 1979. They were identified from the roster of a United Food & Commercial Workers (UFCW) union in Baltimore, Maryland. Information available from union records for each worker included, name, date of birth, social security number, dates of union dues payment, department (supermarket) and company where employed, employment status (employed, terminated, retired, sick, deceased), address and sometimes phone numbers. Name of the next-of-kin, address and phone number were also frequently available. Other than specifying that the person worked in a supermarket with the name of the supermarket given, no other job classification was given, since the union was a meat cutters union and for supermarkets, serviced only workers in the meat and deli departments. Although those who worked in the deli department (typically women) could not be separately identified from women who worked in the meat department, the deli women constituted only a small proportion of all women (probably less than 15–20%) and they were meat wrappers who handled and wrapped cooked meat and other food products requiring little preparation for serving such as cheese and salads, and therefore had little or much reduced exposure to microorganisms than their fellow women in the meat department. However, they were exposed to fumes from the wrapping machine. The deli department was usually adjacent but separate from the meat department. In the meat department, men and women share the same room; the men cut raw meat (meat cutters) while the women wrap the freshly cut raw meat (meat wrappers). In the study reported here, subjects were followed up from January 1, 1950 until December 31, 2006. Since in the initial follow-up of this cohort that covered the pre-National Death Index (NDI) years (before 1979), more than 92% of the cohort was successfully traced using a wide variety of follow-up methods (Johnson, 1987a; Johnson and Zhou, 2007a), in the current follow-up only the NDI and the Pension Benefit Information (PBI), Inc. were used to determine vital status. It is known that the NDI can identify up to 99% of deaths when matching information includes date of birth and social security number (Patterson and Bilgrad, 1986; Boyle and Decoufle 1990; Kraut et al., 1992) as was the case in this study for over 94% of subjects. The PBI, Inc. matches subjects against US death records for all years from the 1800s to the present, using information received from Social Security Administration, Health Care Financing Administration, and Maryland State Department of Vital Records, as well as the Civil Service Commission, Railroad Retirement Board, and the Department of Defense. Thus follow-up rate in this update is assumed to be greater than 92%.

A total of 4270 deaths (40%) were recorded among the 10,701 workers. Deaths were coded to the 9th ICD Revision. Standardized mortality ratios (SMR) were estimated using the OCMAP Plus software for analyzing cohort mortality studies from the University of Pittsburgh, using the United States general population

rates for comparison. The study population was stratified by calendar time, race, sex, age (5-year intervals), and company. Person-years accumulation started from the date the company was unionized for those subjects who were already employed prior to the company being unionized, or from the date they joined the union (date of employment) if the company had already been unionized by the time they were employed. Person-years accumulation was terminated on the date of death for deceased persons. Subjects not identified as deceased were assumed to be alive at the end of the study, and their person-years accumulation terminated on December 31, 2006. Expected deaths were estimated by multiplying the respective person-years accumulated by the corresponding US population rates, and summed up over all strata to get the total expected number of deaths. The SMR is the total observed number of deaths divided by the total expected. Sixty percent of the workers in the union were from Baltimore city itself and 95% were from Maryland, with the rest from neighboring states. We used the US national mortality rates to provide expected numbers of deaths for this cohort for the following reasons: (1) The Baltimore city population is only 10% of the Maryland population, while 60% of the workers in this cohort are from Baltimore. (2) All-causes mortality rates are usually much higher for Baltimore city than those for the state of Maryland, for example the rate for 2012 was 1001.7/100,000 as compared with 749.6/100,000, respectively. Hence it would not be appropriate to use the Maryland state rates to provide expected numbers of deaths. (3) The mortality rates for city and state are based on relatively small numbers of deaths, e.g., For Maryland in 2011 there were 43,650 deaths from all causes as compared with 2,515,458 deaths in the US, and hence the Maryland rates are likely to be unstable for less frequent causes of death. (4) The all-causes mortality rate for the US is similar to that for Maryland, 7.4/1000 versus 7.5/1000. Hence overall, for this cohort of workers, use of the US rates provided the best option, and would also permit comparison of our results with those of other investigators using the US rates. <http://health.baltimorecity.gov/sites/default/files/Health%20Disparities%20Report%20Card%20FINAL%2024-Apr-14.pdf>; http://www.cdc.gov/nchs/data/nvsr/nvsr63/nvsr63_03.pdf; <http://dhmh.maryland.gov/vsa/Documents/11annual.pdf>

Information on duration of employment was available up to 1979 and analysis by duration of exposure was carried out at the initial follow-up. However, employment information was not subsequently updated after 1979 because records of dues payment were lost after 1979 during transitioning from a hard copy record system to electronic computerized record system, and therefore analysis by duration of exposure was not conducted in the current follow-up.

A total of 16 subjects were not included in the study because of missing date of hire, and also six because of impossible date of birth or date of hire. While all 4270 deceased subjects had complete information on race, gender, and date of birth present in death certificates, the remaining 6431 subjects (60%) not identified as deceased had no information on race. Therefore to perform the SMR analyses, the 4270 deaths with known race were separated into four strata by gender and race (white males, white females, black males, and black females). The proportion of each race/sex subgroup among these deceased subjects was then randomly assigned to the 6431 non-deceased subjects. Thus if for example 30% of all the 4270 deaths were among white males, then 30% of the 6431 non-deceased subjects were randomly assigned as white males, and so on. A questionnaire survey in 1983 of companies involving more than half the union membership indicated that the racial distribution by job category of the current workers was almost identical with that of deceased union members at that time.

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