Chemicals causing mammary gland tumors in animals signal new directions for epidemiology, chemicals testing, and risk assessment for breast cancer prevention

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Abstract: Background: Identifying chemical carcinogens in animal studies is currently the primary means of anticipating cancer effects in humans. Animal studies to evaluate potential chemical carcinogenicity are particularly important for breast cancer, because environmental and occupational epidemiologic research is sparse.
Methods: We compiled a list of chemicals that increased mammary gland tumors in animal studies from the International Agency for Research on Cancer (IARC), US National Toxicology Program (NTP), and other sources. Summary assessments of the carcinogenic potential for each chemical and potentially exposed populations were also compiled.
Results: We identified 217 chemicals that have been associated with increases in mammary gland tumors. These include industrial chemicals, chlorinated solvents, products of combustion, pesticides, dyes, radiation, drinking water disinfection, pharmaceuticals and hormones, natural products, and research chemicals. Twenty-eight are produced in the US at > 1 million pounds/year; 36 are air pollutants, 25 involve occupational exposures to > 5000 women, and 66 have been present in consumer products or as contaminants of food. Thus, exposure is widespread. Almost all of the chemicals were mutagenic and most caused tumors in multiple organs and species; these characteristics are generally thought to indicate likely carcinogenicity in humans. Some characteristics of the tests lead to challenges in interpreting results for mammary gland tumors, so risk assessments used as the basis for regulation often do not mention mammary gland tumors or breast cancer. Conclusions: This is the most comprehensive list developed of animal mammary gland carcinogens and, along with associated data, will be freely available electronically. It appears that valuable information from cancer bioassays is not well utilized in risk assessment and regulatory processes, suggesting a need to strengthen chemicals testing and risk assessment as tools for breast cancer prevention.