NIOSH

Criteria For A Recommended Standard

Occupational Exposure to Ethylene Glycol Monobutyl Ether and Ethylene Glycol Monobutyl Ether Acetate

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health

CDC
CENTERS FOR DISEASE CONTROL

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FOREWORD

In the Occupational Safety and Health Act of 1970 (Public Law 91-596), Congress declared that its purpose was to assure, insofar as possible, safe and healthful working conditions for every working man and woman and to preserve our human resources. The Act authorizes the National Institute for Occupational Safety and Health (NIOSH) to develop and establish recommended occupational safety and health standards and to develop criteria that will assure that no employee will suffer diminished health, functional capacity, or life expectancy as a result of his or her work experience. By means of criteria documents, NIOSH communicates these recommended standards to regulatory agencies (including the Occupational Safety and Health Administration [OSHA] and the Mine Safety and Health Administration [MSHA]) and to others in the community of occupational safety and health.

Criteria documents provide the scientific basis for new occupational safety and health standards. These documents generally contain a critical review of the scientific and technical information available on the prevalence of hazards, the existence of safety and health risks, and the adequacy of control methods. In addition to transmitting these documents to the Department of Labor, NIOSH also distributes them to health professionals in academic institutions, industry, organized labor, public interest groups, and other government agencies.

This criteria document reviews available information about the adverse health effects associated with exposure to ethylene glycol monobutyl ether (EGBE) and ethylene glycol monobutyl ether acetate (EGBEA). The results of studies in animals have clearly demonstrated dose-related adverse effects on the central nervous system, the hematopoietic tissues, the blood, the kidneys, and the liver in several species by different routes of administration. Limited data from humans also indicate the risk of adverse effects on the central nervous and hematopoietic tissues, the blood, and the kidneys. Because limited data are available from studies in humans, NIOSH bases its recommended exposure limits (RELs) for EGBE and EGBEA on data from studies in animals. The data were adjusted to allow for uncertainties in the extrapolation from animals to humans.

NIOSH takes sole responsibility for the conclusions and recommendations presented in this document. All reviewers' comments are being sent with this document to OSHA and MSHA for consideration in standard setting.

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ABSTRACT

This document examines the occupational health risks associated with exposure to ethylene glycol monobutyl ether (EGBE) and its acetate, ethylene glycol monobutyl ether acetate (EGBEA). Criteria are also provided for eliminating or minimizing the risks encountered by workers during the manufacture and use of EGBE and EGBEA. These criteria include recommendations for preventing dermal contact, sampling and analytical methods, medical monitoring, biological monitoring, engineering controls and work practices, and protective clothing and equipment.

In humans and animals, the principal health effects of exposure to EGBE and EGBEA involve the blood and hematopoietic system, the central nervous system (CNS), the kidneys, and the liver. No evidence indicates that EGBE or EGBEA causes reproductive or developmental toxicity.

In animals, CNS, liver, and kidney effects occur at higher EGBE exposures than hematotoxic effects. Thus limiting exposures to prevent hematotoxic effects will also prevent CNS, kidney, and liver effects. Because limited data are available from studies in humans, NIOSH bases its recommended exposure limits for EGBE on data from studies in animals. The data were adjusted to allow for uncertainties in the extrapolation from animals to humans. Because any effects of EGBEA are likely to occur after this compound is metabolized to EGBE, the same REL is recommended for EGBEA.

The National Institute for Occupational Safety and Health (NIOSH) therefore recommends that exposure to EGBE and EGBEA in the workplace be limited to 5 parts per million parts of air (5 ppm). Dermal contact is prohibited because EGBE and EGBEA are readily absorbed through the skin.

CONTENTS

ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
BAA	butoxyacetic acid
Cal OSHA	California Occupational Safety and Health Administration
CAS	Chemical Abstracts Service
cc	cubic centimeter
CFR	Code of Federal Regulations
CHO	Chinese hamster ovary
CNS	central nervous system
EAA	ethoxyacetic acid
EC_{50}	concentration that allows 50% cell formation
EGBE	ethylene glycol monobutyl ether
EGBEA	ethylene glycol monobutyl ether acetate
EGEE	ethylene glycol monoethyl ether
EGEEA	ethylene glycol monoethyl ether acetate
FR	Federal Register
g.d.	gestation day
Hb	hemoglobin
Hct	hematocrit
i.v.	intravenous
kg	kilogram
L	liter
LC_{50}	lethal concentration for 50% of the exposed animals
LD_{50}	lethal dose for 50% of the exposed animals
L/min	liter per minute

LOAEL	lowest observable adverse effect level
m.a.c.	maximum allowable concentration
MCHb	mean cell hemoglobin
MCHC	mean cell hemoglobin concentration
MCV	mean cell volume
mg	milligram
mg/m^3	milligrams per cubic meter
mM	millimolar
mmol	millimole
MSDS	material safety data sheet
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NOAEL	no observable adverse effect level
NOES	National Occupational Exposure Survey
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
ppm	parts per million parts of air
REL	recommended exposure limit
RBC	erythrocyte or red blood cell
RTECS	Registry of Toxic Effects of Chemical Substances
s.c.	subcutaneous
STEL	short-term exposure limit
TLV®	threshold limit value
TSCAPP	Toxic Substances Control Act Plant and Production
TWA	time-weighted average
UCC	Union Carbide Corporation

UDS	unscheduled DNA synthesis
µmol	micromole
USITC	United States International Trade Commission
W	watt
WBC	white blood cell

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