

Assessing Occupational Exposures & Managing Medical Surveillance

U.S. Department of Interior
Industrial Hygiene Working Group
November 18, 2009



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DOI Exposure Assessment
& Medical Surveillance

Concepts and figures used in this presentation were adapted from the classic work of John Mulhausen and Joseph Damiano: A Strategy for Assessing and Managing Occupational Exposures. 2nd Edition, 1998, AIHA Press, Fairfax



Managing Medical Surveillance

Your Assumption:

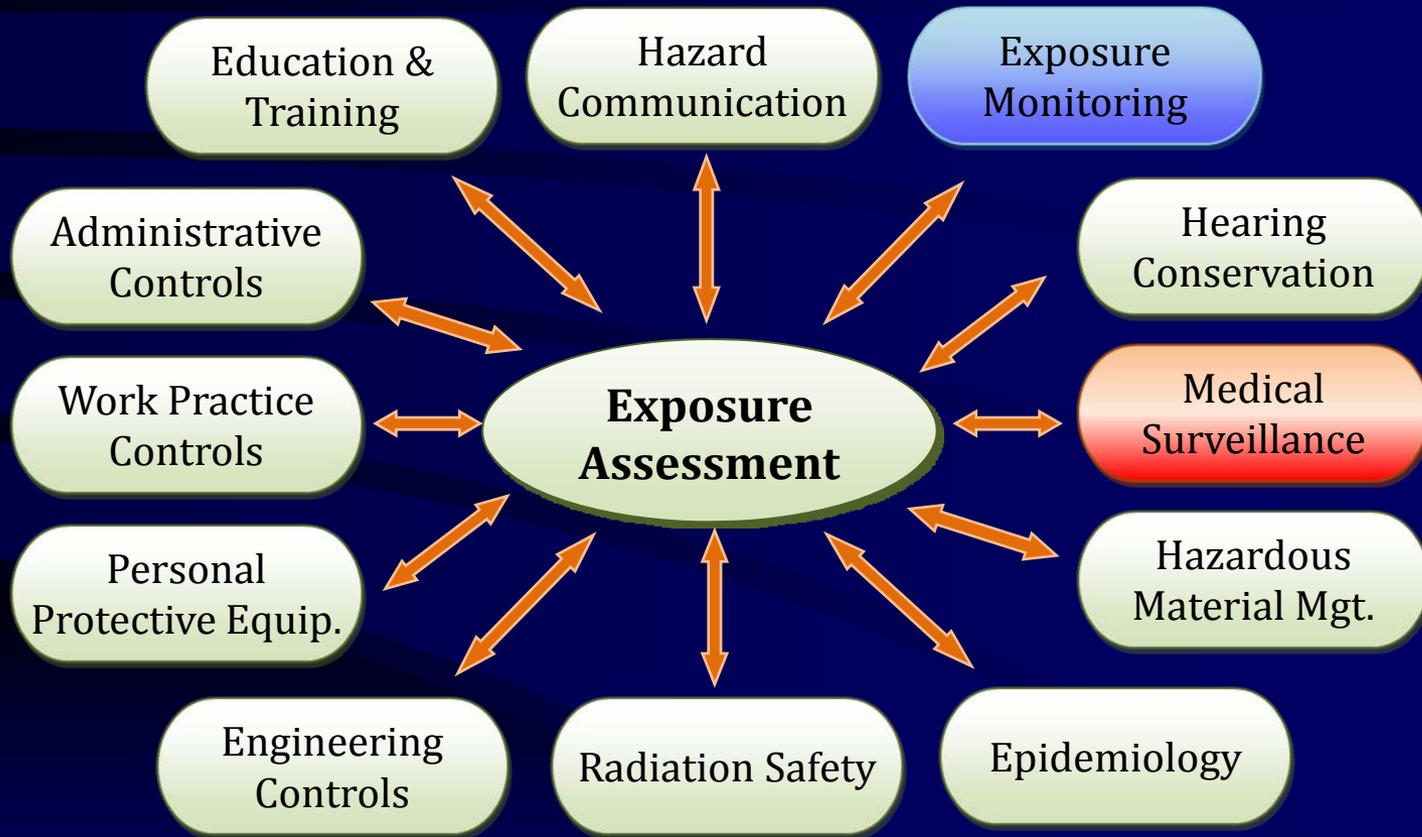
uncontrolled, unacceptable exposure



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Exposure Assessment



Assessing Occupational Exposure

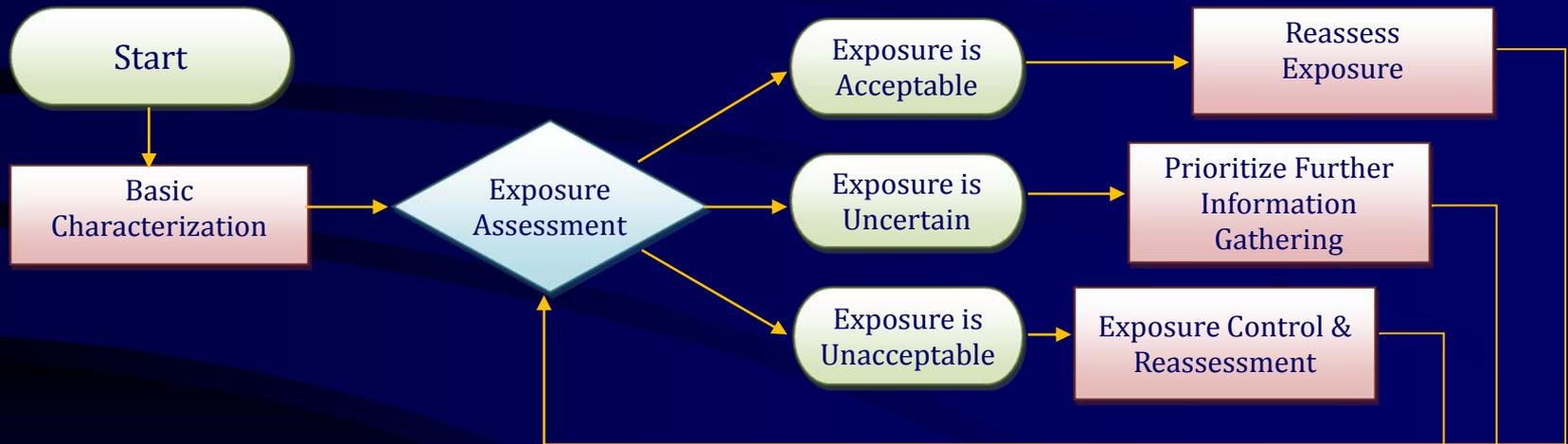
Good risk assessment ⇒ Good risk management

Establish needs and priorities for health hazard control

Demonstrate regulatory compliance



An Exposure Assessment Strategy



An Exposure Assessment Strategy

1. Start
2. Basic Characterization
3. Exposure Assessment
4. Further Information Gathering (FIG)
5. Health Hazard Control
6. Reassessment
7. Communication & Documentation

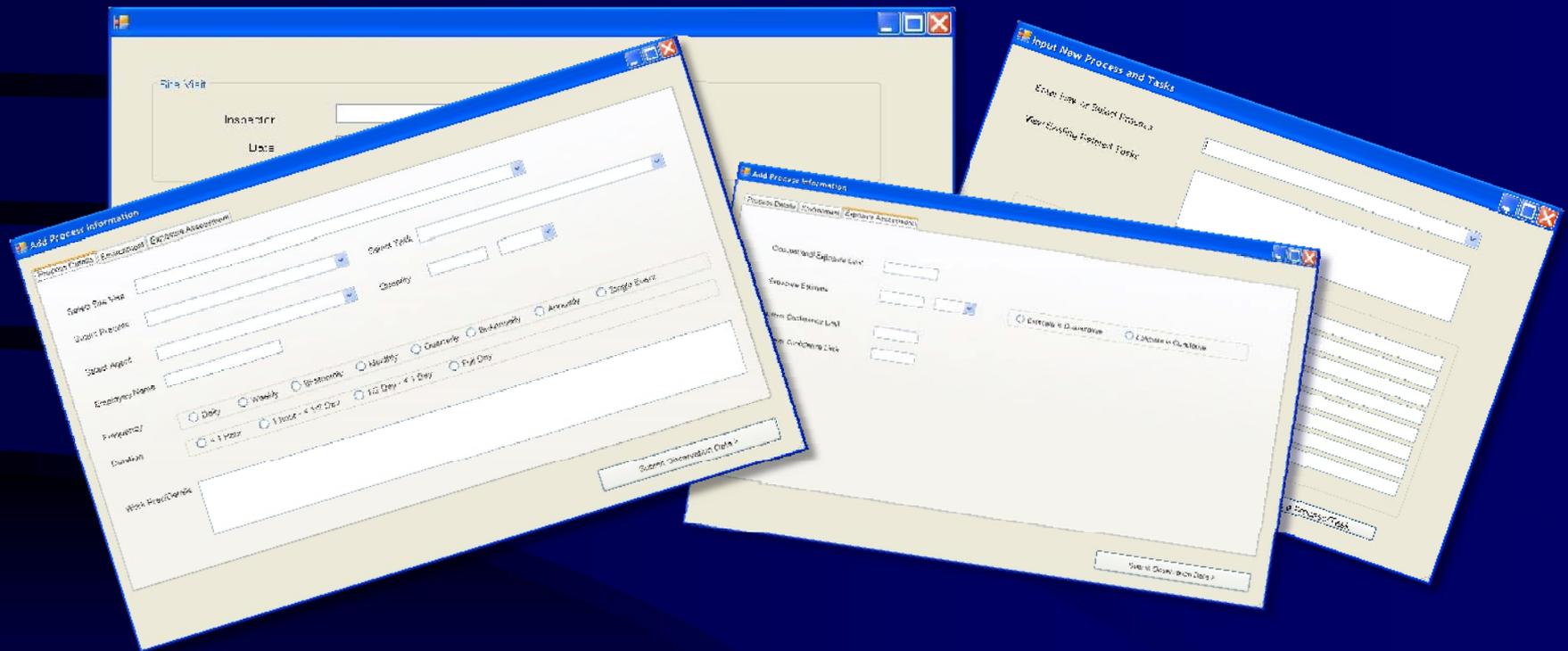


Basic Characterization

- Workplace Agents
 - Health effects associated w. excessive exposure
 - OEL
- Workforce
 - Organization; assignment of tasks
- Sources of Exposure
 - Processes, operations, tasks, work practices
 - Existing controls



Data Organization and Storage



Thanks Ray Fiorillo



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Exposure Assessment

Define Exposure Profile

Compare:

Exposure Profile  OEL

Categorized Exposure

Acceptable

Uncertain

Unacceptable



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What's the Problem?

Goal:

Assess exposure and occupational health risks of all workers to all agents on all days

Accurately and efficiently

So that all workers are protected

Thousands of workers

Exposures Vary



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Similar Exposure Group (SEG)

A group of workers having:

- same general exposure profile
 - Similarity & frequency of tasks
 - Similarity of materials and processes
 - Similarity in how tasks are performed

Assignment is **dynamic & flexible**

**A tool for stratification & allocation of
limited resources**



SEG Classification

Process-Job Classification-Agent

Task-Agent

Process-Agent

Work Teams

Non-repetitive Tasks



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Two Perspectives on SEGs

1. EA conducted at facility

Assign workers to SEGs for health risk management

2. SEG Catalogue

As a tool for Basic Characterization



Exposure Profile

An estimate of an exposure & its variability
plus uncertainty

Quantitative:

mean, standard deviation

statistical confidence limits

Qualitative:

knowledge, experience, professional judgment



Define the Exposure Profile

Exposure Rating: a useful tool...

Rating	Exposure	
4	>OEL	95 th %tile > OEL
3	50-100 % OEL	95 th %tile between 0.5 & 1.0 of OEL
2	10-50 % OEL	95 th %tile between 0.1 & 0.5 of OEL
1	< OEL	95 th %tile < 0.1 of OEL



Basis of Exposure Rating

Monitoring data

- Personal

- Screening measurements

Surrogate data

- Exposure data from another agent

- Exposure data from another operation

Predictive modeling



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Predictive Modeling

“All models are false but some are useful.”

Box & Draper 1987

Examples:

Saturation vapor models

Well mixed room

Far-Near field models



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Select an OEL

PELs, TLVs, RELs

In absence of an OEL?

setting OELs for carcinogens

non-carcinogens NOELs

FDA uncertainty factors...

Consultation with a toxicologist.

Performance-based exposure control limits.



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Health Effects Rating

Hold that thought...

...we'll talk about that tool later.

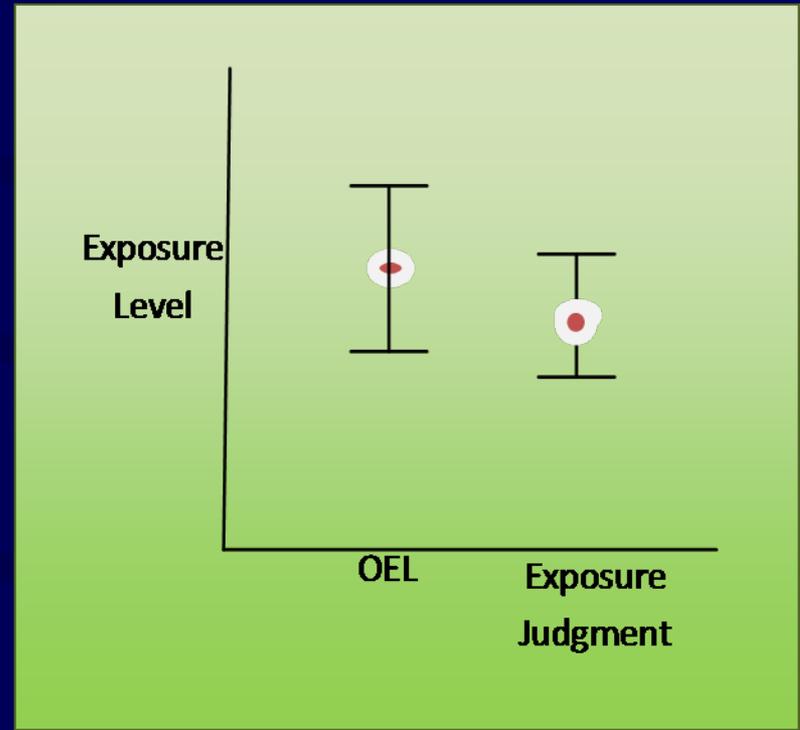
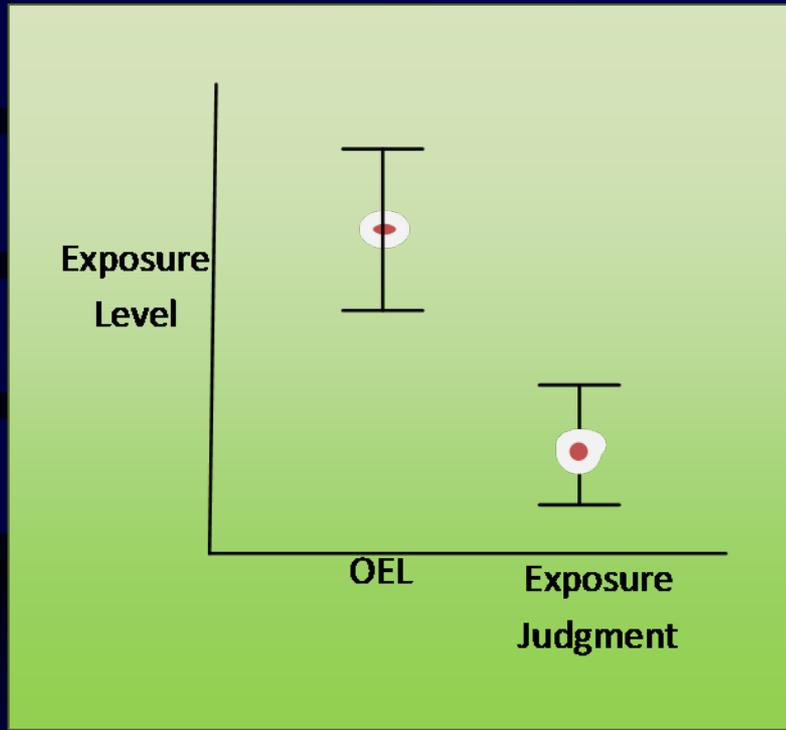
For now we will use the OEL.



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Judging Exposure



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Performance-Based Exposure Control Limits

Bruce Naumann, et.al. 1996

Performance-based Control Limits for
Pharmaceutical Active Ingredients



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Exposure Control & Management



Exposure Control & Management

Critical Exposures

Potential worker exposure
may result in significant risk



Medical Surveillance Action

Regulation triggered Medical Surveillance

Critical Exposures



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Medical Surveillance Action

What is OMSEP ?



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Further Information Gathering

Prioritization

Control actions priority list

FIG priority list

Don't forget regulation-triggered actions.



Health Effects Rating

Rating	Health Effect
4	Life-threatening or disabling injury or illness
3	Irreversible health effects of concern
2	Severe, reversible health effects of concern
1	Reversible health effects of concern
0	Reversible effects of little concern



Health Risk Rating

Health Effects Rating	4	4	8	12	16
	3	3	6	9	12
	2	2	4	6	8
	1	1	2	3	4
		1	2	3	4
		Exposure Rating			



Uncertainty Rating

Rating		
2	Highly Uncertain	Significant information absent on exposure profile or health effects
1	Uncertain	Adequate information available for judgment, but FIG warranted to verify exposure
0	Certain	Agent's exposure profile and health effects well understood



Priority

Health Risk
Rating

16
12
9
8
6
4
3
2
1

0	16	36
0	12	24
0	9	18
0	8	16
0	6	12
0	4	8
0	3	6
0	2	4
0	1	2
0	1	2

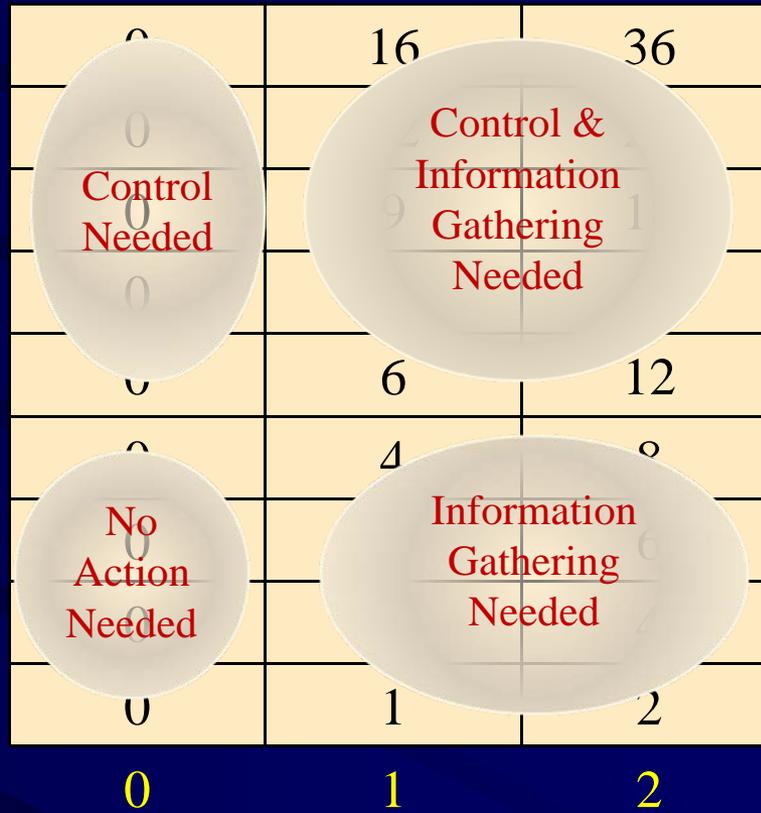
Uncertainty Rating



Priority and Action

Health Risk
Rating

16
12
9
8
6
4
3
2
1



Uncertainty Rating



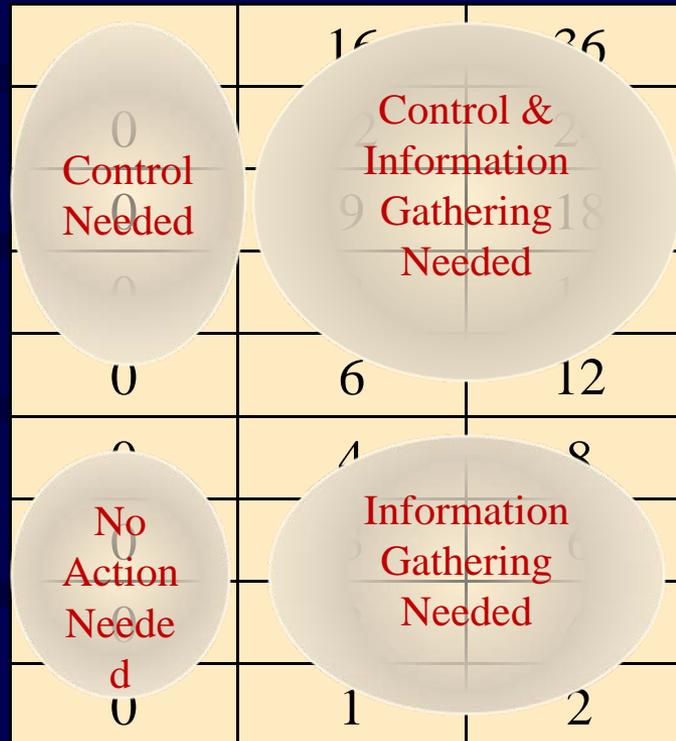
Priority and Action

Increasing Control Priority



Health Risk Rating

16
12
9
8
6
4
3
2
1



Uncertainty Rating



Increasing FIG Priority



Exposure to Biological Agents

Risk Factors

Pathogenicity

Route of transmission

Agent stability, concentration

Host susceptibility

Availability of prophylaxis



NIH: Classification of Human Etiologic Agents

Qualitative Risk Groups for Biological Agents

RG1	No disease in healthy adults
RG2	Disease, but rarely serious; prevention & therapy available
RG3	Serious, lethal disease; prevention & therapy may be available
RG4	Serious, lethal disease; prevention & therapy not available



Dermal Exposure Assessment

Screening incidental contact

Routine contact

Immersion of hands

$$DA = (S) (Q) (FQ) (ABS) (WF)$$



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