Melamine: Potential Endocrine, Reproductive, and Neurotoxic Activities

Ashley L. Bolden, MS
The Endocrine Disruption Exchange
mel · a · mine
A white crystalline compound used in the making of plastics.
But…
More than baby formula
Cyromazine?
What other impacts might melamine have???

2011

The effect of exogenous melamine on rat hippocampal neurons
Yan Wang¹, Fei Liu², Yuejiao Wei¹ and Daicheng Liu¹

Effect of melamine on potassium currents in rat hippocampal CA1 neurons
Jia-Jia Yang³, Yu-Tao Tian³, Zhuo Yang⁴, Tao Zhang³,*
³Key Laboratory of Bioactive Materials, Ministry of Education and College of Life Science, Nankai University, Tianjin 300071, PR China
⁴College of Medicine, Nankai University, Tianjin 300071, PR China

2013

The reproductive toxicity of melamine in the absence and presence of cyanuric acid in male mice
Rong H. Yin³, Xin Z. Wang³, Wen L. Bai³,* Chang D. Wu³, Rong L. Yin⁵, Chang Li⁵, Jiao Liu³, Bao S. Liu⁴, Jian B. He³,*

... fast forward 2016
Scoping Reviews

• New to environmental health research.

• Determination of body of evidence maturity.

• Identification of research gaps.

• Pinpoint bodies of evidence for systematic review.
Objectives of study

• Determine if a recommendation for systematic review of a specific endpoint is feasible.

• Identify research gaps.

• Prioritize future research.
Methods

• Developed search logic.

• Performed electronic searches using PubMed and Web of Science up to November 2016.

• Screened articles using DistillerSR®.

• Completed summary level data extraction.
Results

• 100% published between 2010-2016
• 74% assessed in vivo models
• 35% assessed in vitro models
Endpoint Distribution

- Reproductive: 15 Human, 0 Animal, 2 In vitro
- Neurophysiological: 14 Human, 0 Animal, 8 In vitro
- Anthropometric: 1 Human, 0 Animal, 19 In vitro
Anthropometric

- Endpoints for analysis included body weight, body length, and fetal growth.

- Studies had measures from several different life stages.

- Models included fish, rodent, human, and chicken.

- No relevant mechanistic data seems to be available.
Reproductive

• Studies of both male and female reproduction were found. Endpoints included sperm count, follicular atresia, and oocyte competence.

• There were studies that might provide mechanistic support.

• Replication of endpoints maybe lacking.

• While different models included rodents and chicken there are no human studies available.
Neurophysiological

• There were several studies that replicated similar endpoints primarily evaluations related to hippocampal function.

• *In vitro* assessments were completed that might provide mechanistic support.

• Relevant studies were completed in rodents and fish but none in humans.

• There were also behavioral studies that could be incorporated that assessed learning and memory.
Future Directions

• Lack of human studies.

• Lack of mechanistic studies.

• Little to no research on immune, cardiovascular, respiratory, metabolic endpoints.
Recommendations

• Identified three areas that could be assessed using systematic review.

• For reproduction and anthropometric endpoints more studies in humans and more mechanistic support might strengthen these bodies of evidence.

• Neurophysiological area had the most robust literature base and is likely the best to move forward to systematic review.
Thanks

Staff: Johanna Rochester, PhD and Carol Kwaitkowski, PhD. Theo Colborn, PhD, Lynn Carroll, PhD, and Christina Ribbens.

Funders: The International Chemical Secretariat (ChemSec), Tides Foundation, Arkansas Community Trust, Wallace Genetic Foundation, and Winslow Foundation.

Follow us on Twitter @endo_exchange
Sign up for our mailing list at endocrinedisruption.org