

Evaluating the Public Health Impact of Synthetic Food Dyes

Ajay Mahenthiran BS, MPH Candidate₁, Ainur Aiykhanova DrPH, MHA₂,

1: Department of Population & Quantitative Health Sciences, Case Western Reserve University
2: Indiana Department of Health: Division of Chronic Disease, Primary Care, and Rural Health



Master of Public Health Program

Background

The Indiana Department of Health's "Make Indiana Healthy Again" workgroup conducted a comprehensive review of six FDA-certified synthetic food dyes (Red No. 40, Yellow No. 5, Yellow No. 6, Blue No. 1, Blue No. 2, and Green No. 3).

This project supports Indiana Executive Order 25-56.



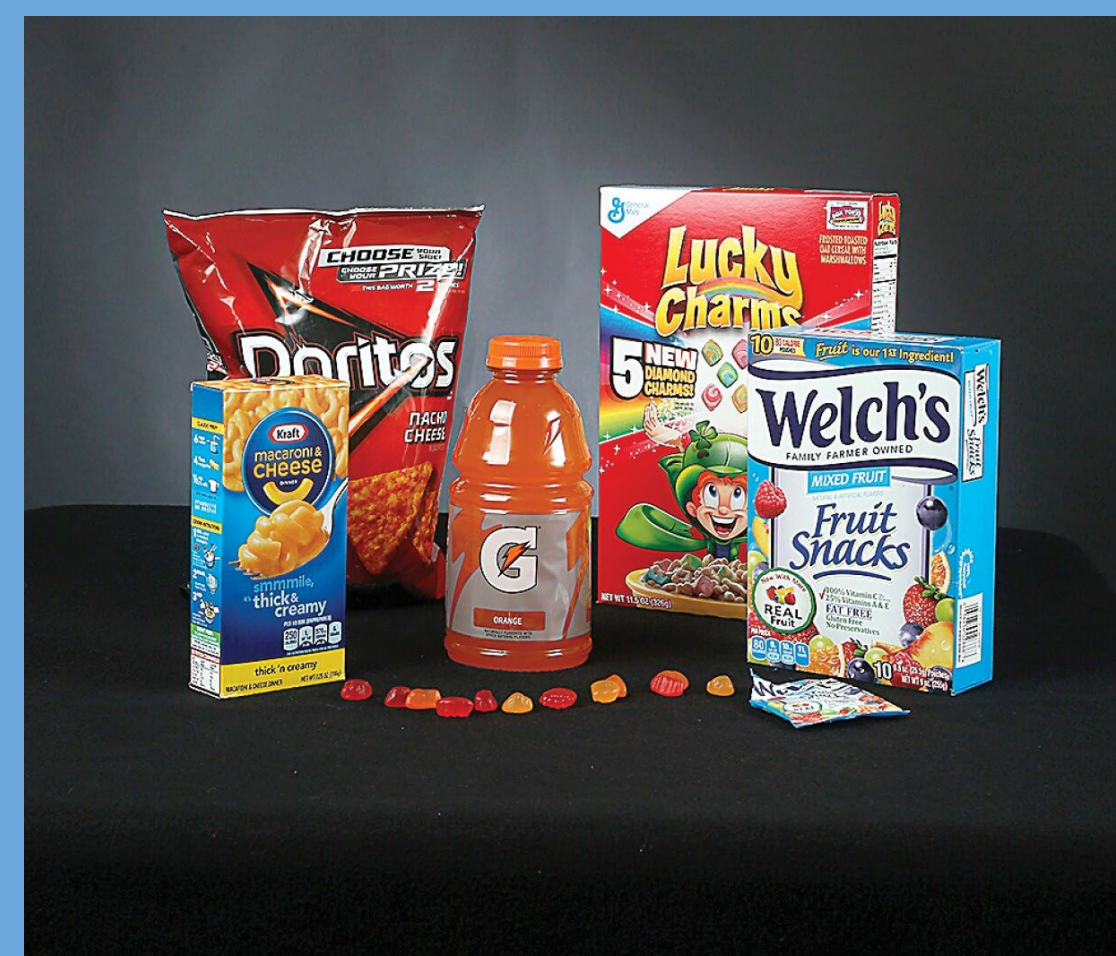
Learning Objectives

- Analyze and synthesize scientific/regulatory literature on artificial food dyes (AFCs) for summaries on toxicology, regulatory status, and use patterns.
- Evaluate existing AFC research quality and public health relevance to inform policy discussions on Indiana Executive Order 25-56.
- Develop review reports to translate scientific findings into clear summaries and presentations for IDOH public health supervisors.

Population

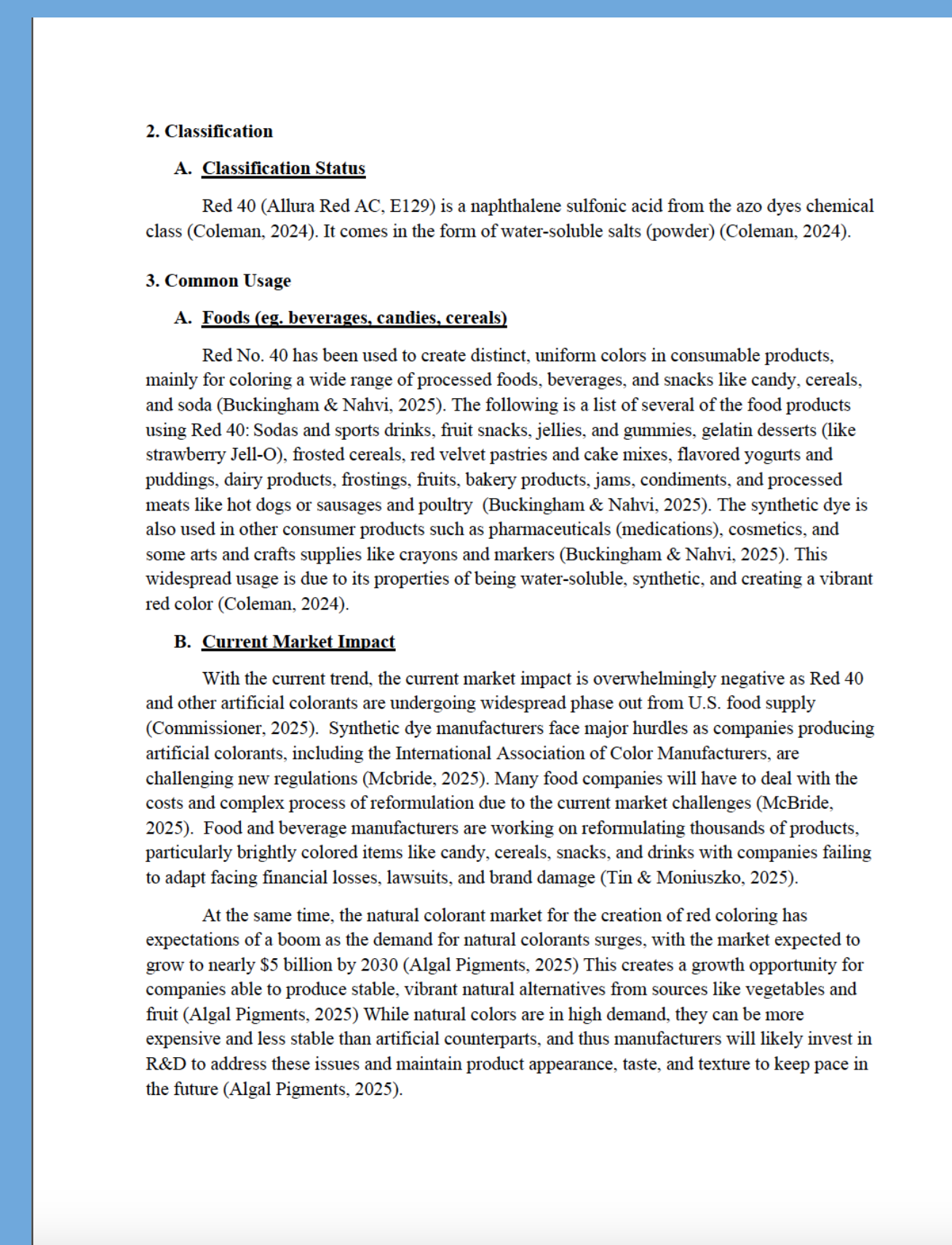
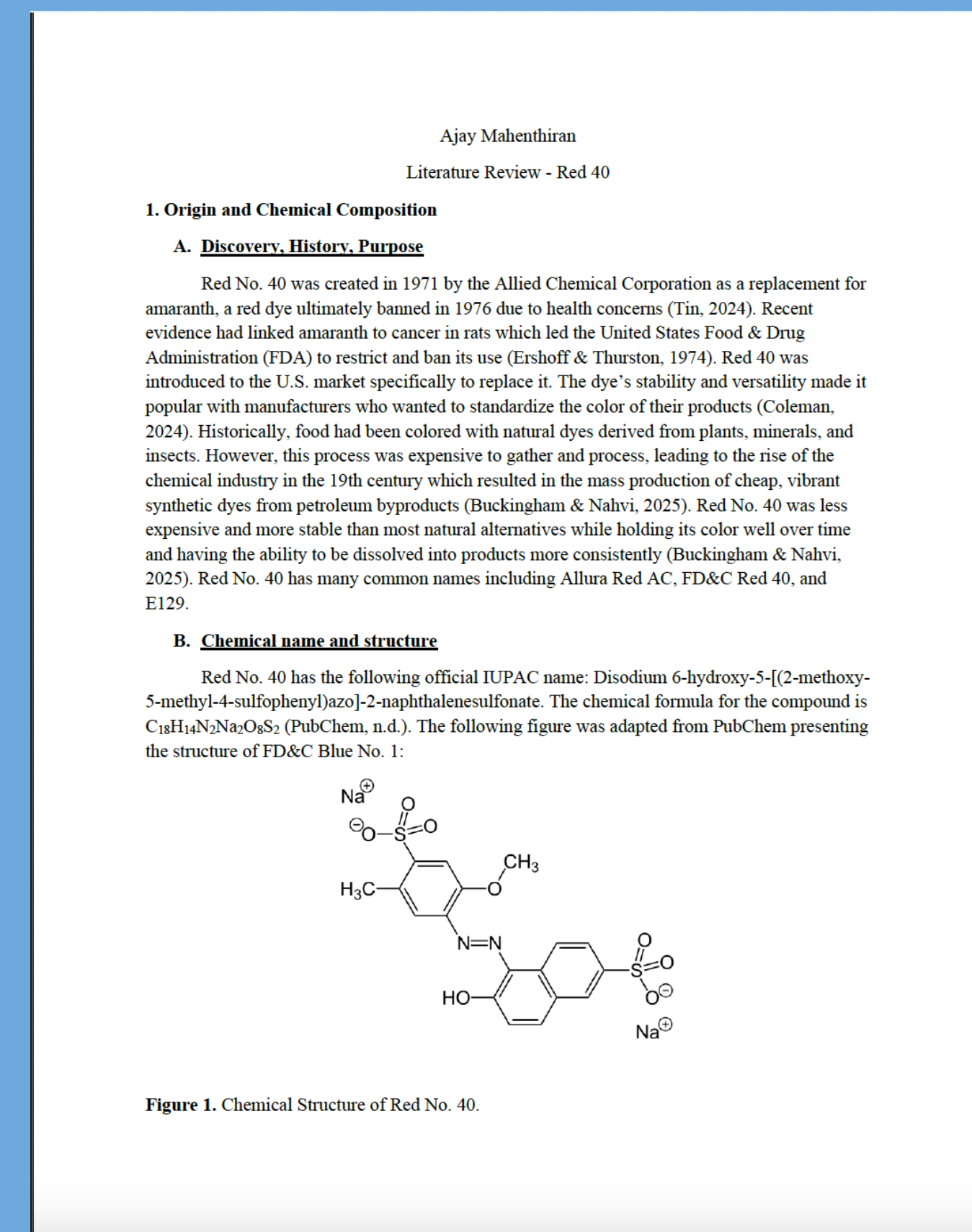
My work focused on populations most likely to be affected by artificial food dye exposure. Particular emphasis on:

- Children, who consume the greatest amount of artificially colored foods and are more susceptible to behavioral and hypersensitivity effects
- Pregnant women and women of childbearing age
- Individuals with food allergies, asthma, or sensitivities to food additives
- Indiana consumers broadly, as findings will inform future state public health policy and recommendations



Deliverables

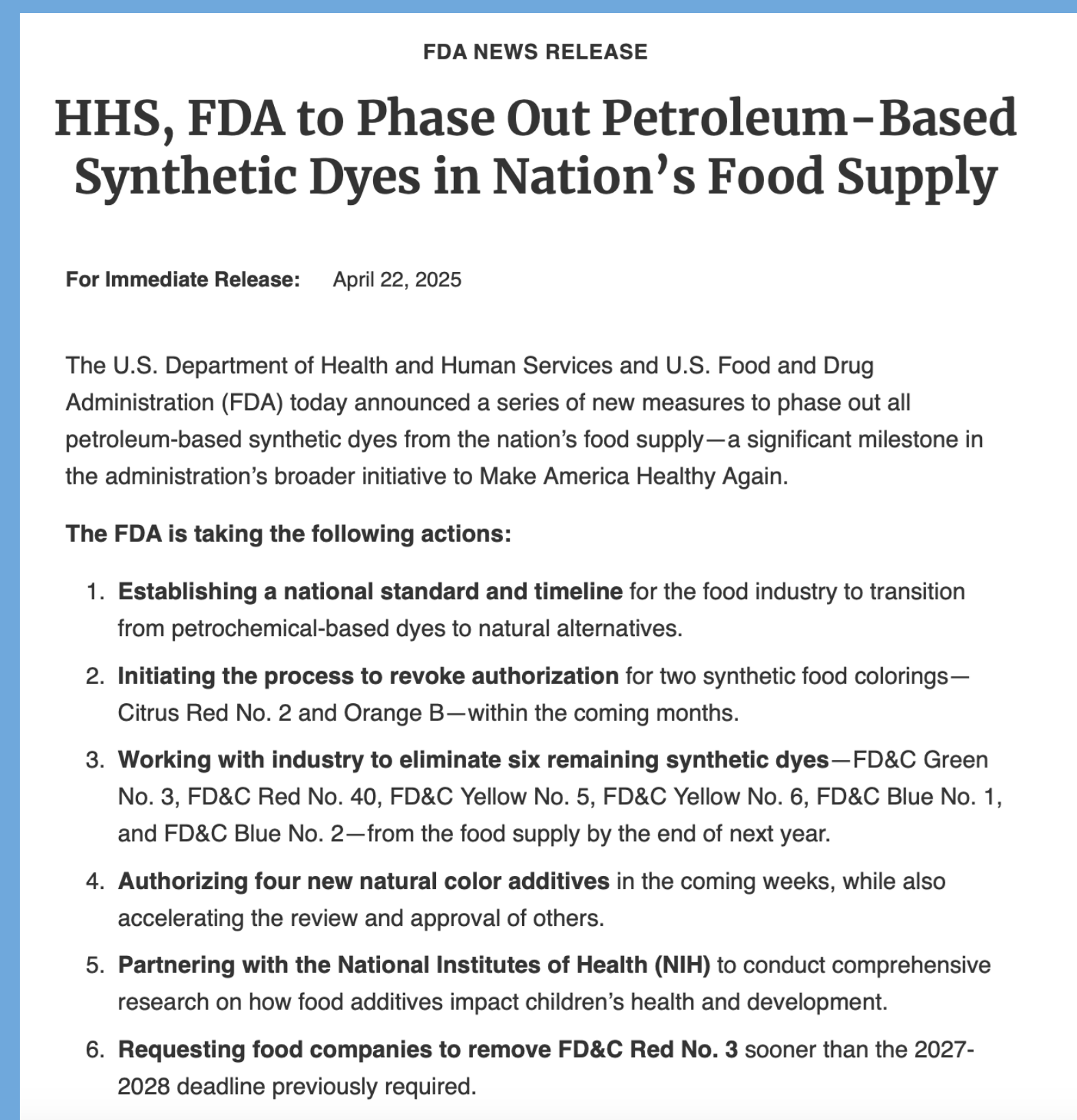
- Six detailed literature reviews on Red No. 40, Yellow No. 5, Yellow No. 6, Blue No. 1, Blue No. 2, and Green No. 3
- PowerPoint presentations summarizing key findings on Red 40 for state officials
- Each summary of the six dyes included:
 - Regulatory status, Common food sources, Potential health concerns, Vulnerable populations



Activities

- Reviewed peer-reviewed journal articles, FDA regulations, EFSA statements, & toxicology reports
- Synthesized information regarding regulatory status, manufacturing, chemical composition, common uses, and potential health concerns
- Prepared written reports and PowerPoint presentations for the Indiana Department of Health
- Meetings with the Indiana Department of Health "Make Indiana Healthy Again" workgroup
- Communicated findings to public health professionals and revised materials based on stakeholder feedback

Key Findings

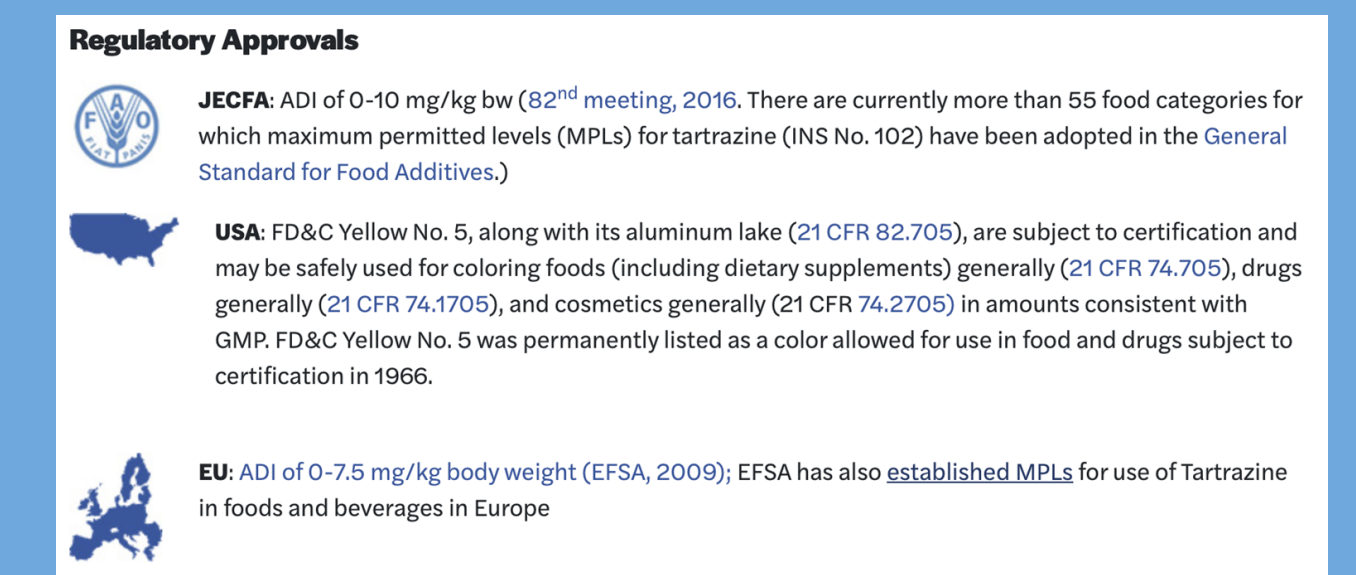


Food dye	Allergic reactions	Carcinogenic contaminants	Tests for cancer*		
			Mouse	Rat	Other†
Blue 1	Yes		No in utero studies. One abstract (study not published) reported kidney tumors	No tumors in the only good study	Test tube study found inhibition of nerve cell development
Blue 2			Both studies were too brief and did not include in utero exposure	Dosage was likely too low; possible brain and bladder tumors	Bladder tumors
Green 3			The only study did not include in utero exposure	Possible bladder and other tumors	
Orange B (no longer used; in 1978 FDA proposed, but never finalized, a ban)			The only two studies did not include in utero exposure	Toxic	
Red 3 (FDA has banned it from cosmetics, externally applied drugs, and lakes)			The only study did not include in utero exposure	Thyroid tumors	
Red 40	Yes	Aniline (not all agencies consider aniline to be carcinogenic)	Possible reticuloendothelial tumors of the immune system	No tumors in the only good study	
Yellow 5	Yes	Benzidine, 4-amino-biphenyl	The only mouse study was too brief, used too few mice, and did not include in utero exposure	No tumors in the only good study	6 of 13 studies showed genotoxicity. Hypersensitivity in children
Yellow 6	Yes	Benzidine, 4-amino-biphenyl	Neither study included in utero exposure	Possible adrenal and testicular tumors	

Note: *Tests should be done on both sexes of two rodent species, use sufficient numbers of animals, include in utero exposure, last at least 2 years after birth, and use maximally tolerated dosages. Ideally, tests would be conducted by independent labs, but most tests on dyes were conducted by industry. In addition, numerous studies have found that mixtures of dyes cause hypersensitivity and other behavioral impairments in children.

Lessons Learned

- The importance of translating scientific papers and evidence into everyday language for consumers to understand
- How epidemiological studies can be used to guide real-world public health decision-making
- The complexity of regulations around artificial food dyes due to varying findings across study design, population, and regulatory agencies



Public Health Implications

- Artificial food dyes remain widely used in processed foods, beverages, medications, and consumer products worldwide
 - Although the FDA has aimed to phase out all synthetic dyes, industry compliance must be monitored closely
- Lack of consumer awareness of the harmful effects of the dyes in everyday items remains a persistent challenge
- This work highlights the importance of state public health agencies in evaluating emerging evidence and using it to protect community health



Synthetic Dye	New Alternative	Common Uses
Red 40	Beet juice, purple carrot	Fruit snacks, candies, medicine
Blue 1	Spirulina, butterfly pea flower	Marshmallows, Gatorade
Yellow 5	Turmeric, annatto	Mac & Cheese
Yellow 6	Paprika, carrot juice	Jell-O, snacks
Red 3	Gardenia blue, algae extract	Ice cream, cereals
Titanium Dioxide	Calcium phosphate	Frostings, donuts

References and Acknowledgements

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