LIVE ONLINE | **October 5-8, 2020**

USAID
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The Future of Food Assistance for Nutrition: Evidence Summit II

Tuesday, October 6th

9:00-10:30 EDT

Panel 2: Packaging of Food Assistance Products: Challenges and Outlook

Moderator

Carole Manceau
World Food Programme

Moderator

Ruffo Perez
USAID

Speaker 1

Rachel Goldstein
Mars, Incorporated

Speaker 2

Rafael Auras
Michigan State University

Speaker 3

Greg Rulifson
USAID

Speaker 4

Michael Brady
ProAmpac

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The Future of Food Assistance for Nutrition: Evidence Summit II

Panel 2: Packaging of Food Assistance Products: Challenges and Outlook

Overview of challenges and ongoing efforts

Carole Manceau

World Food Programme

WFP
World Food Programme

Emergency foods – HEB 2.0

Project background

2009: WFP issued its first HEB spec – 24 months

2016: Rancid biscuits reported by 8 COs*

WFP revised its spec to reflect 12 mo SL

HEB 2.0 project

Improvements:

- Min 18m shelf life
- Nutrition profile for dual use (emergency & development)
- Packaging

*CO: country office

Emergency foods – HEB 2.0

Packaging project process steps

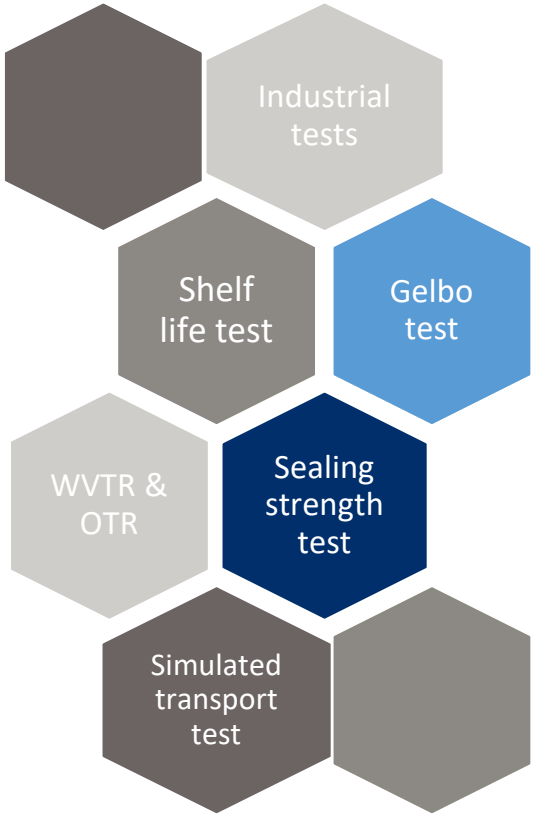
Field interview audit / Observations

Leading root causes of packaging failure identified:

- Film specification. End-up in losing barrier properties
- Sealing issues
- Packaging size vs. product size

Lab Analysis

- Forensic analysis of samples from different suppliers
- Analysis on failure root causes on selected field samples
- Evaluation of different film alternatives



Materials and Specification

- Discussion with suppliers to change film composition
- Write enhanced specifications
- Define/Refine Performance Test Protocols

Manufacturing issues and field/supplier collaboration

- Discussions on specification standardization across all agencies based on WFP improved specification
- Quality Testing implementation
- Leverage Partnership and Information with suppliers

Emergency foods – HEB 2.0

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Achievements and next steps

	HEB	HEB 2.0 Phase I	HEB 2.0 Phase II	*HEB 2.0 Phase III*
Specification version	**Version: 16.0, adopted 20/07/2016**	**Version: 1.1, adopted 10/12/2019**	**Version: 2, Adopted 05/09/2020**	***Version: 3, Q4'2021***
Packaging material in spec	2- layer metalized laminate	Aluminum based material	Aluminum based OR 3-layer metalized laminate	*Aluminum based OR 3-layer metalized laminate*
Shelf life in spec (when stored at 30 °C)	12* (not fulfilled)	12	18	*24*
Revision reason	•Management decision to reduce shelf life from 24 to 12 months according to SC Director memo	•Pack material to ensure shelf life of 12 m •New vitamin & mineral premix requirements	•Extend shelf life to 18 m and include a 2nd packaging material	•*Extend shelf life to 24 m (pending results of real condition shelf life test)*

Fortified flour blend

- WFP recommendation: modification of packaging specification

Risks:

- Food fraud
- Shelf life stability
- Traceability
- Beneficiaries convenience

25kg PP woven bag + inner liner

1.5-3kg metallized sachets

- Bulging issue happening in high altitude warehouse

Fortified flour blend

- Size of boxes not standardized between suppliers
  - Logistic challenges (transport, storage
  - Environmental impact

S.No	Commodity	Packaging Type	Unit weight(kg)		Pack Dimension(in Cm.)			Volume in m3
			Net	Gross	Length	Width	Height	
1	Super Cereal Plus (CSB++)	C29	13.5	14.146	0.38	0.28	0.18	0.019152
2	Super Cereal Plus (CSB++)	C30-Type I	15	15.5	0.45	0.27	0.18	0.02187
3	Super Cereal Plus (CSB++)	C30-Type II	15	15.989	0.51	0.33	0.2	0.03366
4	Super Cereal Plus (CSB++)	C30-Type III	15	16.1	0.4	0.33	0.31	0.04092

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Lipid-based nutrient supplement

Re-thinking packaging

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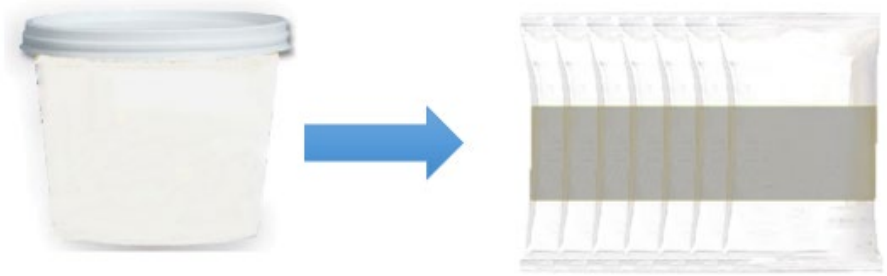

325 gram pot
1 week feeding

7 x 50 grams
Monodose sachets

- ✔ **+12%:** 44'000 additional children who received LNS for 1 year
- ✔ Ease of consumption
- ✔ Minimize risk of sharing
- ✔ Reduces risks of contamination & hygiene issues

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LNS packaging

- Product leakage or oil sweating from the sachets:
  - Stains on boxes
  - Ink adhesion
  - Delamination of sachets
- Packaging material– removal environmental impact

Vegetable oil jerrycans

Improvement project

Vegetable oil

Enhanced specification approved

3. PRIMARY PACKAGING: CONTAINERS AND CLOSURES REQUIREMENTS

3.1 General requirements

- All the materials (including sealing foils and/or closures) in contact with the oil must be food grade and compliant with the regulation of the country where the product is bottled. The supplier must attach a letter of compliance :
  - To the last version of the EU law Regulation (EC) No 1935/2004 regarding to food contact
  - AND/OR to the last version of the FDA law Regulation included in the 21 CFR regarding to food contact – more information also on e-CFR
  - OR certifying the above and completing the WFP form relative to food contact ANNEX 1

HDPE (High Density Polyethylene)

- Square or rectangular to avoid space loss
- Opacity at a level that allows a user to view the product fill level
- Preferable color is white translucent. Any other color must be agreed with WFP
- The final relative density of the blended material must be less than 1.0
- No other additives are allowed except the one to color the container
- Recycled material could be used following the below conditions:
  - In the external layers, not in direct contact with the food and as long as the food grade compliance is respected.
  - Outside regrind sources are not allowed.
  - In-house (from the same manufacturing plant) regrind materials are allowed up to 30%, with regrind generated from the containers own trim operation while using a closed loop system for manufacturing and handling. This self-generated regrind must be kept clean and free from foreign materials.
- Typical wall thickness: 1.0 mm (middle of side panels) and minimum 0,6mm on the corners

3.6 Container performance parameters required

- Every container tested empty should be able to support a minimum top load of (ASTM D2659 or equivalent– Certificate of compliance to be provided) :

VOLUME	MINIMUM TOP LOAD (EMPTY CONTAINER)*
1 L	6 kg = 59 N
1.5 L	9 kg = 88 N
2 L	12 kg = 118 N

5. FINISHED PRODUCT REQUIRED PERFORMANCE

- The final product must pass the ISTA 3A standard test. After each drop, there shall be no rupture or loss of contents – Certificate of compliance to be provided.

- The final product (filled containers + cartons) working together need to support a minimum of static compression load of (ISO 12048 or eq – certificate of compliance to be provided) :

VOLUME	CONTAINER PER CARTON	FINISH PRODUCT COMPRESSION LOAD RESISTANCE
1L	12	**3100 N** = 316 kg

Vegetable oil

Primary packaging

- Main issues:
  - Poor packaging resilience ☐ leakage ☐ reconditioning ☐ safety issue and losses
  - Plug is inconvenient to dispense ☐ people need to puncture the pack to be able to dispense
  - Plug is easily removable ☐ risk of food fraud (pilfering)
  - Corrosion
  - Round shape ☐ increase storage/transpo

Vegetable oil

Primary & secondary packaging

- Ways of improvements:
  - Optimize the pouring system
  - Optimize the glue used to close flaps of cartons
  - Modify the design to improve strength of metal can & storage
  - Material specification should be improved to avoid corrosion – tin layer consistency

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Vegetable oil

Tertiary packaging

Oil leaking from container

Leaking cartons at the bottom of the pallet

Broken pallets

Cartons from the bottom of the pallet

World Food Programme

Bulk oil project

The F

ion:

- Join initiative between WFP and USAID/BHA
- Objective is to improve the delivery of oil in terms of **flexibility**, **cost** while **reducing losses** of food and packaging.

WFP to receive **refined and fortified oil** (IK donation from USAID) in a port in **flexibag** in container

WFP to arrange for bulk oil transport from port to refinery

Pack at the repacker

Transport from refinery to FDP

- QC checks will be done :
  - At receipt/before packing (by supplier)
  - At packing/release (by supplier)
  - At release by Inspection company
- WFP and USAID/BHA will also conduct downstream compliance testing and shelf life tests

WFP World Food Programme

Miscellaneous

- Dissociation of product specification and packaging specification to enhance packaging requirements (veg oil bottles and PP woven bags specifications)
- Improve quality of packaging through quality controls at food manufacturers and by performing compliance testing
- Packaging waste management
- Sustainability or bleached box to untreated brow

Thank you

October 2020
C.Manceau

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Panel 2: Packaging of Food Assistance Products: Challenges and Outlook

Why Packaging Matters in Humanitarian Food Programs

Ruffo Perez

Senior Food Technology Advisor

Bureau for Humanitarian Assistance

United States Agency for International Development

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Organized by USAID's Bureau for Humanitarian Assistance and the Food Aid Quality Review (FAQR) Project

Why Packaging matters in humanitarian food programs?

by

Ruffo Perez,
U.S. Agency for International Development
Washington DC

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Whom do we serve? Why Evidence-based Food Assistance Packaging?

Nutrition Specific Feeding

Specialized Foods

Specialized Packaging

Mom to-be

Lactating teens

Wasted Children

HIV-impacted Children

Refugees

Healthier Communities

Help create resilience/ self-sustainability

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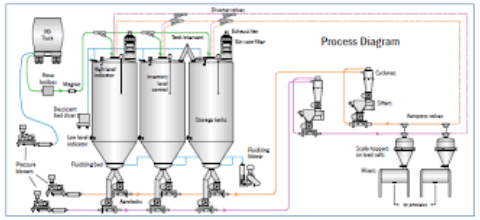
The International Humanitarian Community already uses an array of specialized nutritious foods

Specialized Nutritious Foods ==➔ Specialized Packaging Technologies

Inadequate food aid commodity packaging can hamper USG ability to cost-effectively deliver the right nutrition at the right time

Ingredients



Processing

Packaging

Impact of deficient packaging affecting delivery at the last mile

Storage

Distribution

Feeding

Food safety Issues

Infestation

Difficulty using the product

Leakage

Bad stacking

Bad logistic

MNs Oxidation

Expensive Product

Need for Rebagging

No gender sensitive

Current process for food aid packaging assessment, research and innovation: the case of fortified veggie oil

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Evidence-based Packaging Revisions and Updates

- The Packaging revision process is a collaborative effort that must involve food aid stakeholders from all levels of the supply chain

Identify packaging challenges

- Engage stakeholders
- Organize meetings/Workshops
- Review specifications

Develop a comprehensive assessment method

- Evaluate cost, performance and functionality
- Assess cost-effectiveness

Test potential packaging options

- Agree on technology prototypes, scope, and timeframe
- i.e. Assess Bulk-Oil Packaging/shipping

Veg Oil Packaging: We can do better

We need to address functionality, leaking, cost-efficiency

Possible optimization routes

Bulk-Oil Packaging and Shipping

Thank you

ruperez@usaid.gov

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Panel 2: Packaging of Food Assistance Products: Challenges and Outlook

Global Packaging Sustainability

Rachel Goldstein

Mars, Incorporated

MARS

MARS

Tomorrow starts today

The Future of Food Assistance for Nutrition Evidence Summit II

Rachel Goldstein, Global Packaging Sustainability


The world we want tomorrow starts with how we do business today
MARS
The Five Principles
Quality Responsibility Mutuality Efficiency Freedom
125,000+ Associates
are united and guided by The Five Principles of Mars which span geographies, languages, cultures and generations.
1911
Frank C. Mars made the first Mars candies in his Tacoma, Wash., kitchen
80+
countries in operation
454
SITES
2,500+
VETERINARY HOSPITALS
FORTUNE
Great Place To Work.
World's Best Workplaces
HQ
Global HQ in McLean, Va.
Private, family-owned company
$35B+
NET SALES
Billion Dollar Brands
MARS Petcare
A Better World For Pets
MARS WRIGLEY
better moments make the world smile
MARS Food
Better food today
A better world tomorrow
MARS Edge
Better Lives
Through Nutrition

What we are doing about it

Remove unnecessary packaging
Packaging weight reduction; removal of layers; 10 reuse programs

Redesign for circularity
100% of paper based packaging from certified, verified or recycled sources (by 2020); Eliminate PVC (by 2020)

Invest to close the loop
Supporting EPR schemes; investing in and advocating for a scale-up of recycling systems; using 30% recycled content on average across our plastic portfolio; providing guidance to consumers in all major markets

Why packaging matters

- It ensures products meet the highest standards for food safety
- It helps preserve the freshness of products
- It provides consumers with helpful information

Anchor goals

100%
of our plastic packaging to be reusable, recyclable or compostable*

25%
reduction in virgin plastic use**

Partners

We're working to advance our packaging plans by collaborating with Ellen MacArthur Foundation, Consumer Goods Forum, Loop and others.

* Per EMF definitions
** Target dependent on advancement of mechanical, chemical and organic recycling at pace and scale & alignment of food safety regulations

Why Packaging Matters

Packaging plays many important roles in ensuring products meet the highest market and food safety standards.

Get food to people
Make it safe
Don't waste it

- Protects ingredients and products
- Preserves freshness
- Minimizes food waste

The Challenges with Today's Packaging

Packaging today is made of many different kinds of materials….

including sturdy cardboard boxes for shipping, lightweight papers, metal cans, glass jars and a variety of different plastic materials……rigid, flexible, multi-material

Glass, metal, paper and rigid plastics are frequently recycled materials, where infrastructure exists….and in some informal recycling markets

Flexible plastics are lightweight and can have a low carbon footprint, but they are recycled far less or not at all.

In developed markets there is waste collection, but still relatively low recycling rates, particularly for flexible plastics.

In developing markets there is little or no collection and consequ very low recycling and high leakage to nature.

Fundamental redesign – upstream
Reuse- different delivery models
Recycling- adding value at end of life

Fundamental redesign – upstream

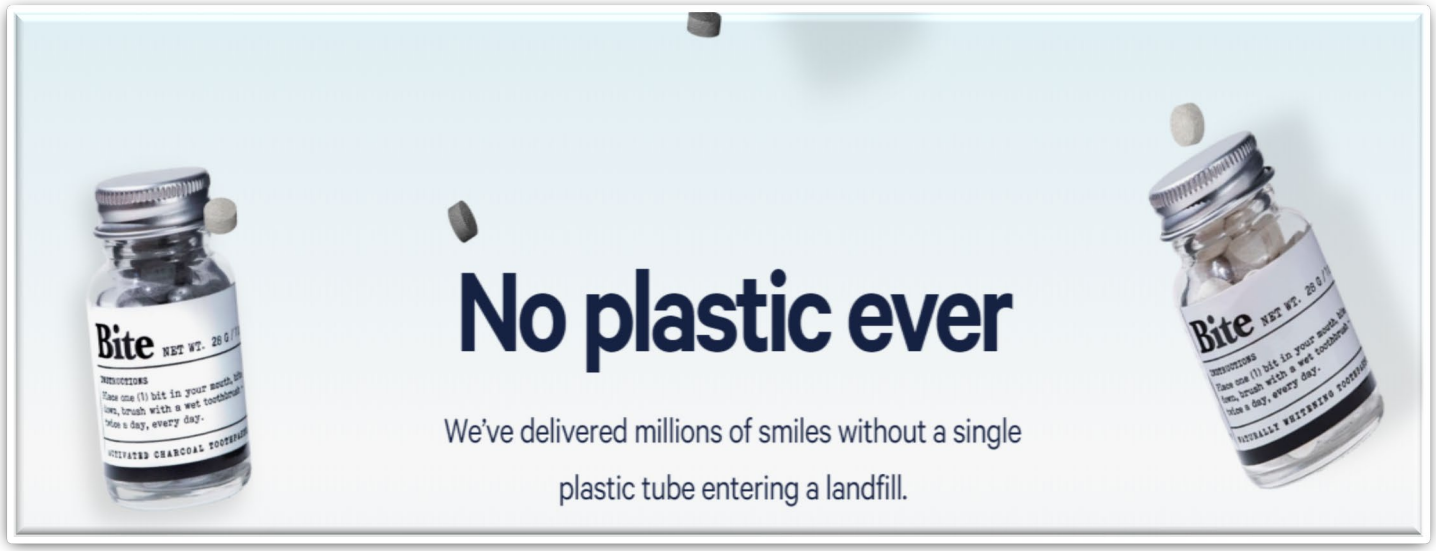
Reduce Fossil Based Plastic

Bio-based/biodegradable/compostable
Paper, metal, glass
Need awareness of tradeoffs, infrastructure, fit for purpose

Fundamental redesign – upstream

Reduce materials

What can you eliminate or lightweight



Reuse/ Refill- new delivery models and transport packaging

- Reusable pallets
- Pallet collars
- Reusable handheld containers
- Reusable bulk containers
- Reusable dunnage
- Reusable wraps and straps

MIWA

Pilots during 2019 • Prague

MIWA creates a business ecosystem for packaging-free sales.

RFID-enabled monitoring of inventory, automatic reordering of stock, and real-time data on flow of goods, improves the supply-chain efficiency and operational convenience.

Hepi Circle

Pilot • Indonesia

Household goods like detergent sold in small-format reusable bottles to replace single-use sachets.

Every time a customer returns a Hepi Circle bottle they receive a Hepi point that can be used towards purchasing new products in reusable packaging or food.

Ref: New Plastics Economy Reuse Guide

Reuse/ Refill- new delivery models and transport packaging

Looks to replace single use sachets

Buy as much or as little of a product as you want

Photo: Algramo

Recycling- adding value at end of life

plasticbank

SOCIAL PLASTIC®

Social Plastic® is ethically recovered plastic that upholds the UN Sustainable Development Goals by transferring its value to emerging economies.

FA Shower Gel Henkel – Germany

Eco-shopping bag Marks & Spencers – United Kingdom

Ref: https://plasticbank.com/

Recycling- adding value at end of life

How Bricks Made Of Plastic Waste Is Helping Spread Education In Ivory Coast & We Can Take Note

https://www.indiatimes.com/news/world/how-bricks-made-of-plastic-waste-is-helping-spread-education-in-ivory-coast-505137.html

Recycling- adding value at end of life

RenewOne - Plastic to fuel small scale, mobile system

Conversion

RENEWLOGY

RenewOne

Plastics which have been collected and aren't able to be recycled will be converted into fuels. RenewOne is mobile and can operate off-grid to produce fuels such as diesel. The simple touch screen creates a user-friendly interface.

Sustainable in a Generation Plan MARS

Ref: http://renewlogy.com/

Thank you

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Panel 2: Packaging of Food Assistance Products: Challenges and Outlook

Packaging Solutions for Extending Shelf Life

Rafael Auras

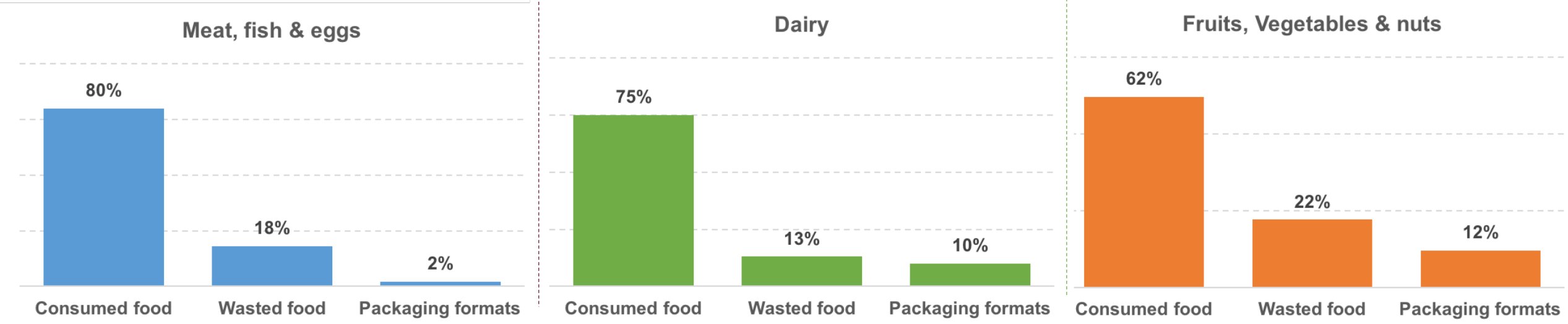
School of Packaging, Michigan State University,

East Lansing, MI, USA, 48824-1223

Food Packaging

Click Here to View Food Packaging Video

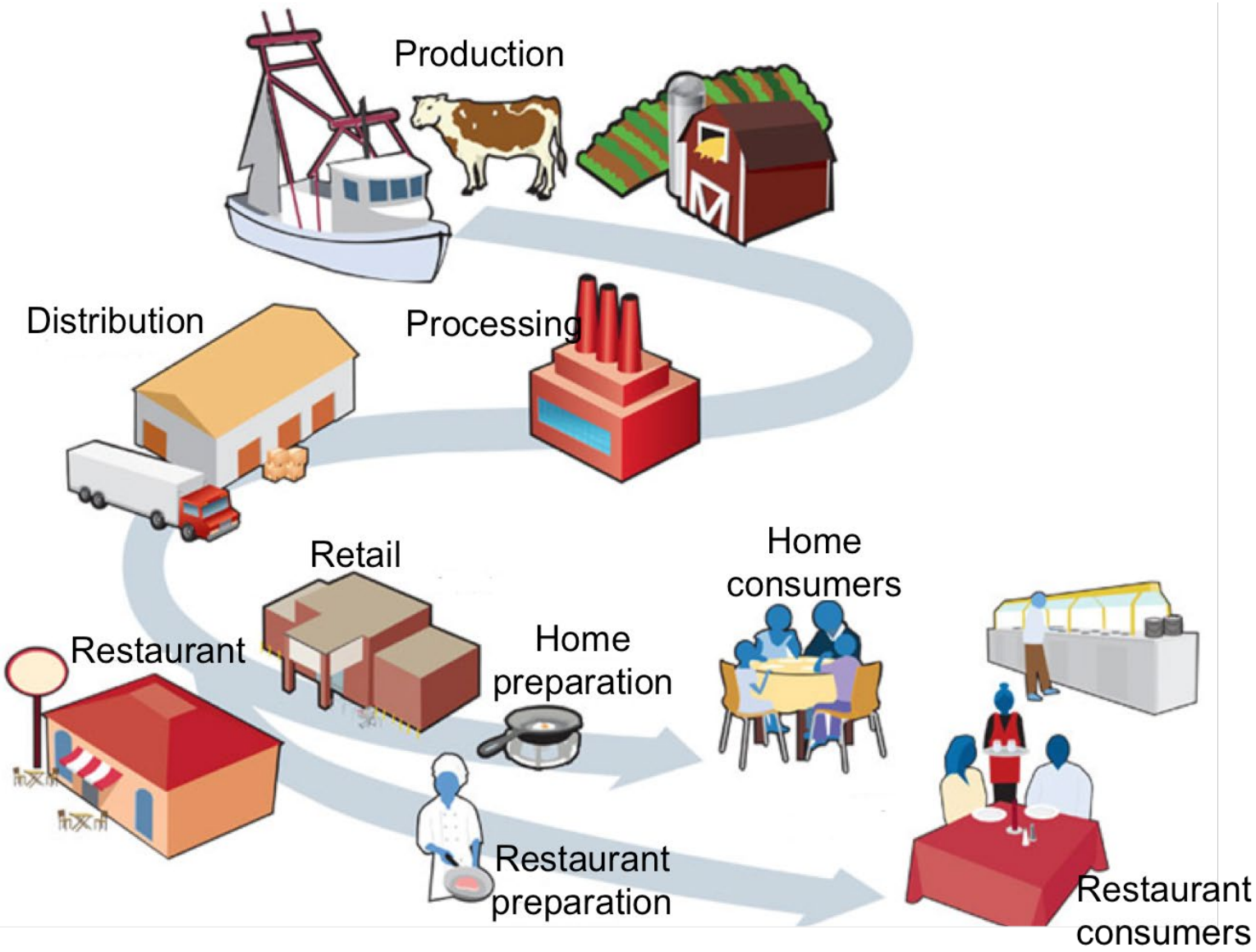
Environmental, keeping in perspective



Greenhouse gas distribution between food consumed, food wasted, and packaging materials of meat, fish and eggs, dairy, and fruits and vegetables for a 4-person household over 1 week, adapted from Verghese and colleagues (2014). The climate impact is larger for the food wasted than that of the packaging in all cases. Number may not round to 100% due to food and packaging waste management components.

Figure adapted from: Wikström, F. , Verghese, K. , Auras, R. , Olsson, A. , Williams, H. , Wever, R. , Grönman, K. , Kvalvåg Pettersen, M. , Møller, H. and Soukka, R. (2018), Packaging Strategies That Save Food: A Research Agenda for 2030. Journal of Industrial Ecology. Available online doi:10.1111/jiec.12769

Shelf Life – Supply chain



"The period between the manufacture and the retail purchase of a food product, during which time the product is in a state of satisfactory quality in terms of nutritional value, taste, texture, and appearance," IFT, U.S., 1974

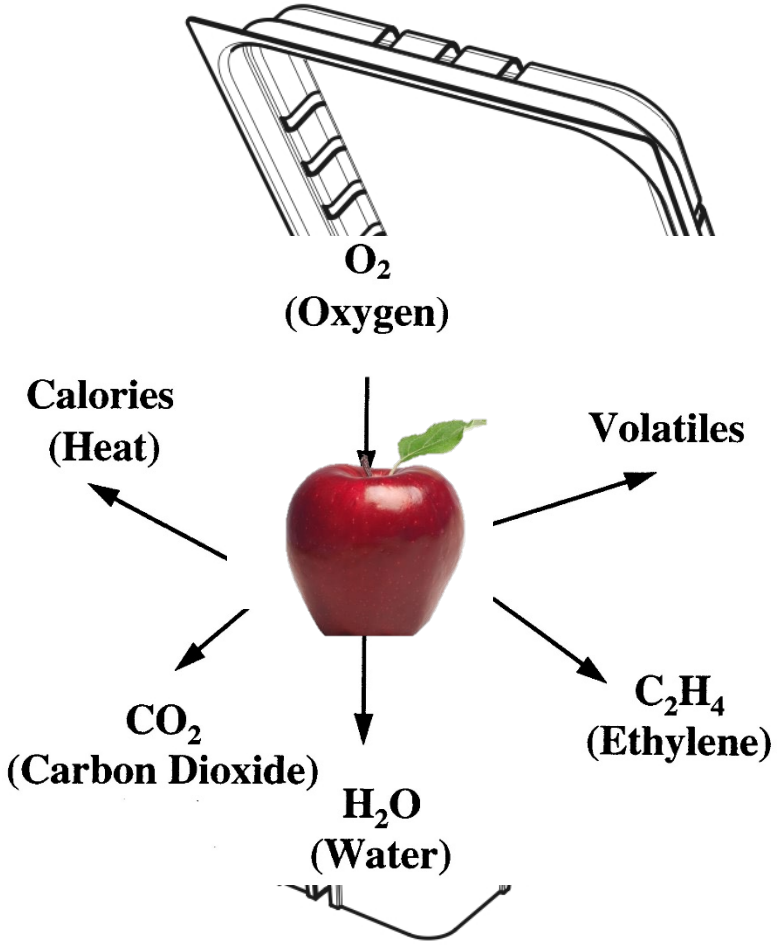
"The period of time during which the food product will remain safe, be certain to retain desired sensory, chemical, physical, microbiological and functional characteristics; and comply with any label declaration of nutritional data when stored under the recommended conditions," IFST, UK,

"best before" date - most food

"used by" date – highly perisable

Image reproduced from (Centers for Disease Control and Prevention 2010)

Food Packaging, Requirements for shelf life



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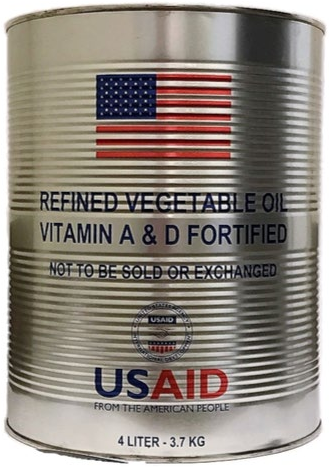


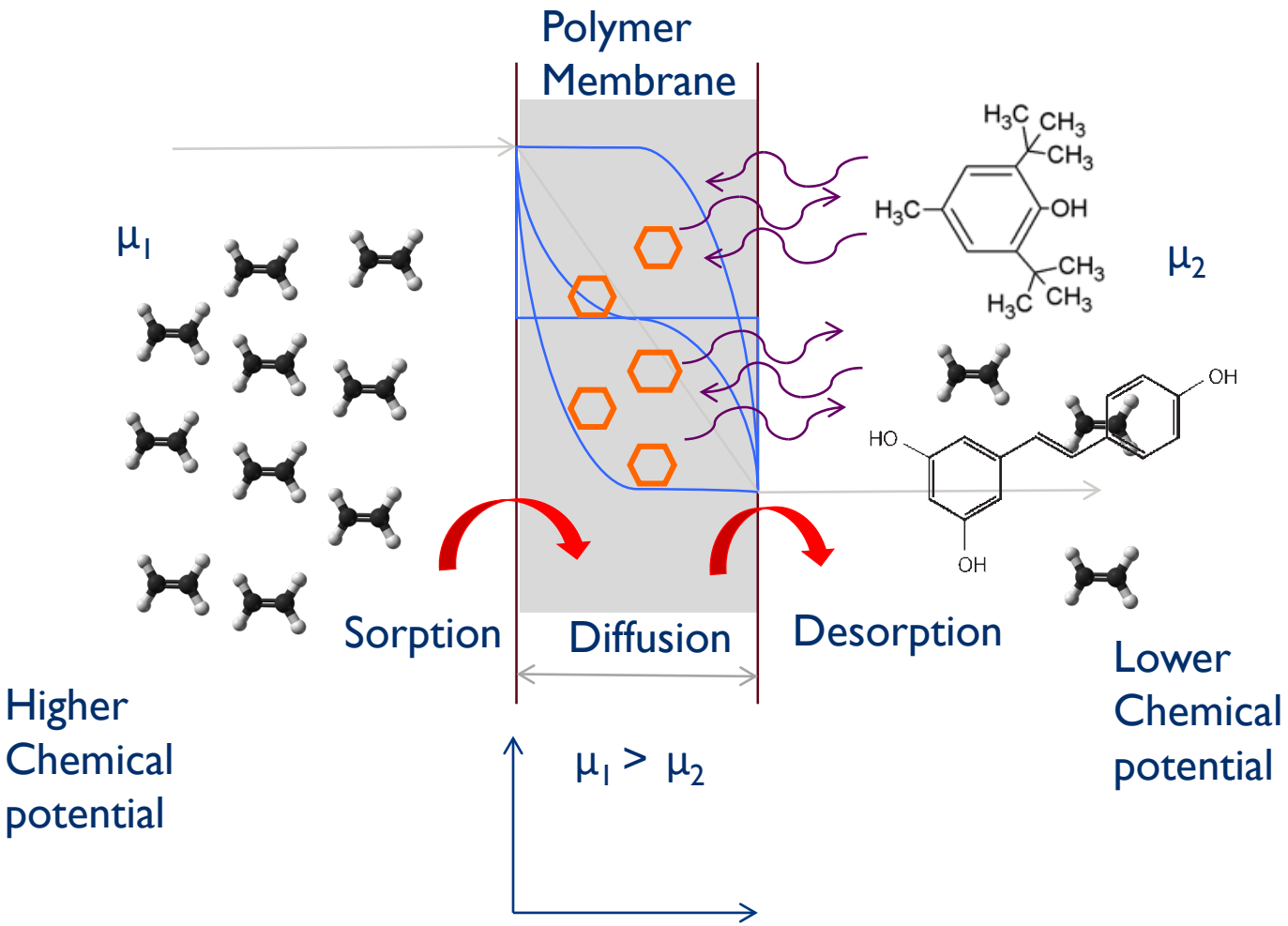
Images reproduced from https://www.usaid.gov/sites/default/files/documents/1866/FoodAidProduct_InfoGuide.pdf#page=27,Accessed date 03/02/2020

Shelf life determination, some methods.

1. Literature study: Data from literature about a similar product.
2. Turnover time: Data about the average time that a product spends on the retail.
3. Endpoint time: Random samples purchase from retail.
4. Accelerated shelf life time (ASLT): Laboratory studies with accelerated conditions so that the product deteriorates faster.
5. Shelf life modeling: Prediction of shelf using theoretical approaches.

Additional information at:
Food Packaging. Principles and Practice. 2013.
Robertson, G. CRC Press, Boca Raton, FL

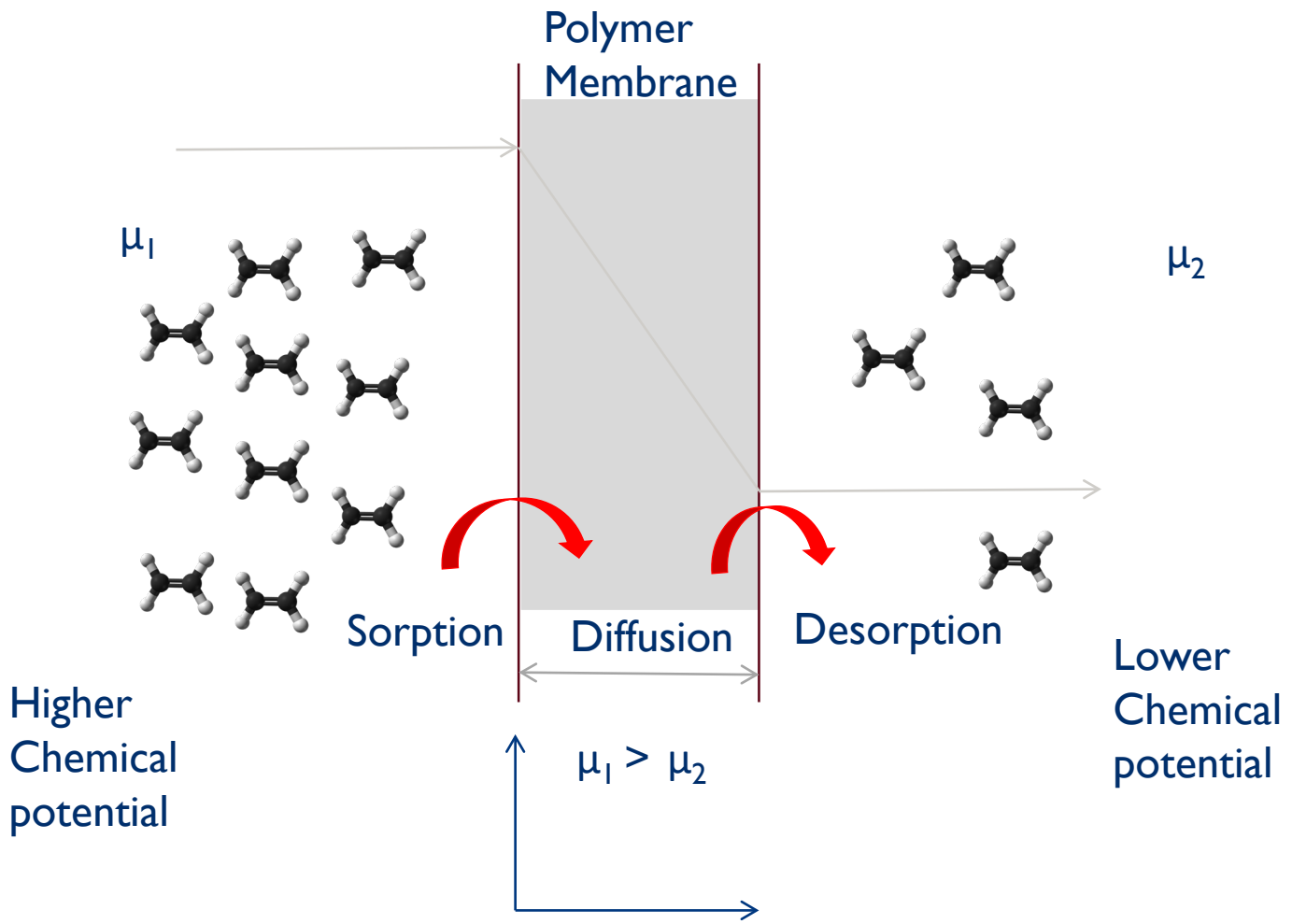
Food Packaging Requirements, barrier



Packaging Solutions to Extend Shelf Life, examples:

- Sterilization
- Tailoring barrier properties
  - Modified atmospheric pkg.
- Improving barrier through:
  - Multilayer structures
  - Gas absorbing materials
- Releasing functional compounds such as antioxidants

Food Packaging Requirements, Right barrier



Food Packaging Requirements, Bad right barrier - Example

Food Packaging Requirements, Right barrier – Example – Spice herbs

Bay leave

Main aroma compounds in herbal spices

Herbal spices	Aroma compounds
Basil, Sweet	Estragol, linalool, methyl eugenol
Bay laurel	Eucalyptol
Galangal	Eugenol, eucalyptol
Kaffir lime leave	Citronellal, linalool
Lemongrass	Citral, Myrcene
Marjoram	e- and t-sabinene hydrates, terpinen-4-ol
Oregano	Carvacrol, thymol
Origanum	Thymol, carvacrol
Rosemary Verbenone,	Eucalyptol, camphor, linanool
Sage, Clary	Salvial-4 (14)-en-1-one, linalool
Sage,	Dalmation Thujone, eucalyptol, camphor
Sage, Spanish	e- and t-sabinylacetate, eucalyptol, camphor
Savory	Carvacrol
Tarragon	Estragol, anethole
Thyme	Thymol, carvacrol
Peppermint	1-menthol, menthone, menthfuran
Spear mint	1-carvone, carvone derivatives

Basil

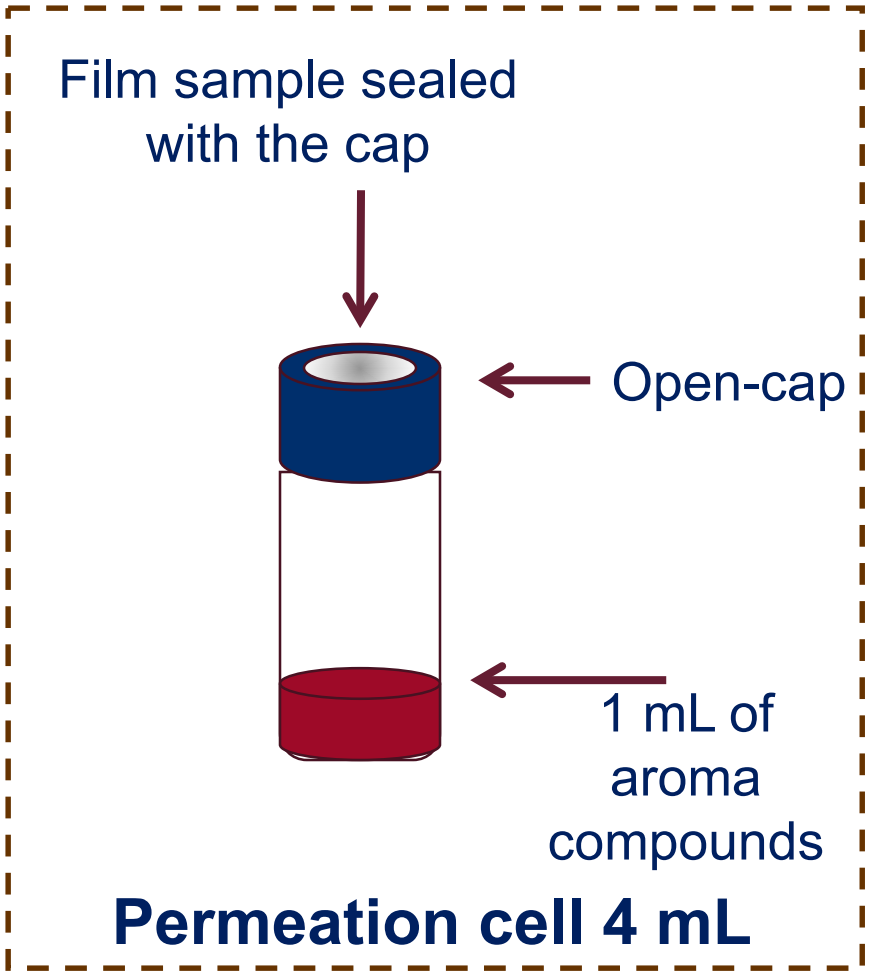
Rosemary

Sage

Tarragone

Lemon Grass

Food Packaging Requirements, Right barrier – Example – Spice herbs

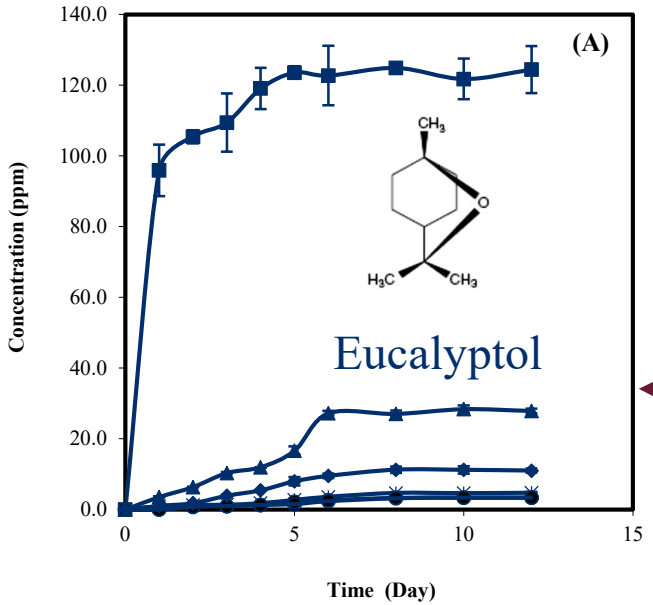


40 mL vial with Mininert™ valve cap

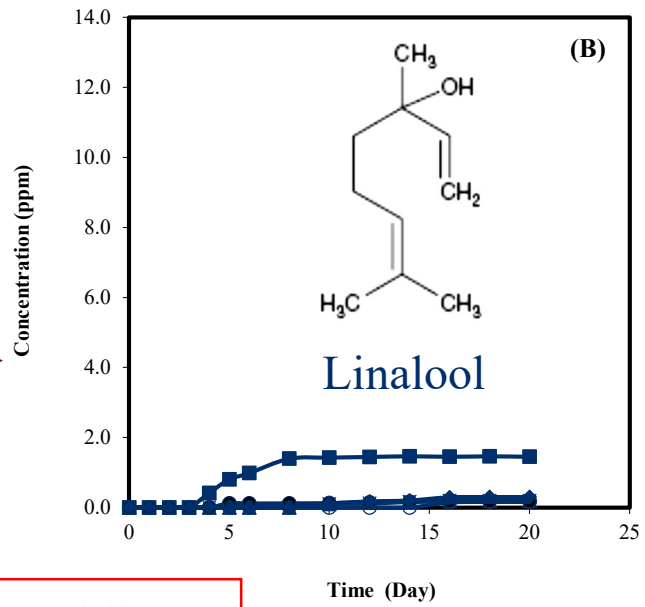
Leelaphiwat, P., Auras, R.A., Burgess, G.J., Harte, J.B. and Chonhenchob, V. (2018), Preliminary quantification of the permeability, solubility and diffusion coefficients of major aroma compounds present in herbs through various plastic packaging materials. J. Sci. Food Agric, 98: 1545-1553. doi:10.1002/jsfa.8626

INTERACTIONS BETWEEN KEY AROMA COMPOUNDS IN HERBS and DIFFERENT PACKAGING MATERIALS

Bay leave

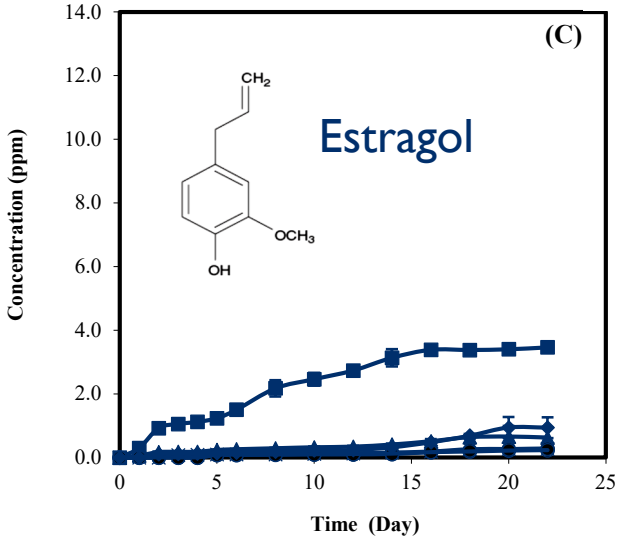


Basil
Rosemary
Sage



PE PP Nylon PET MPET PLA

Tarragone



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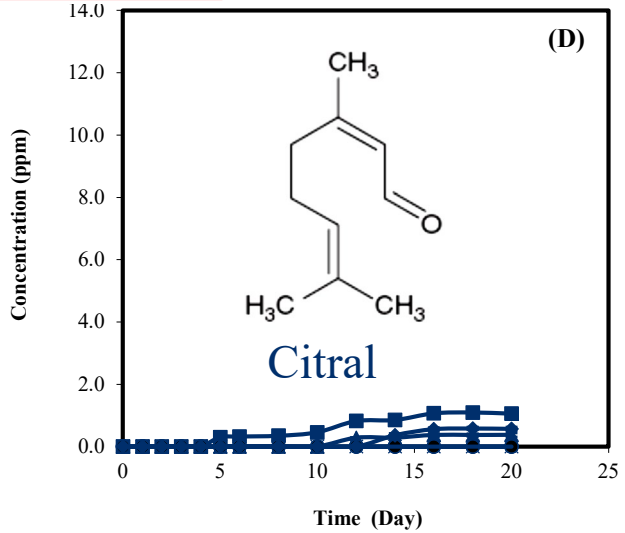
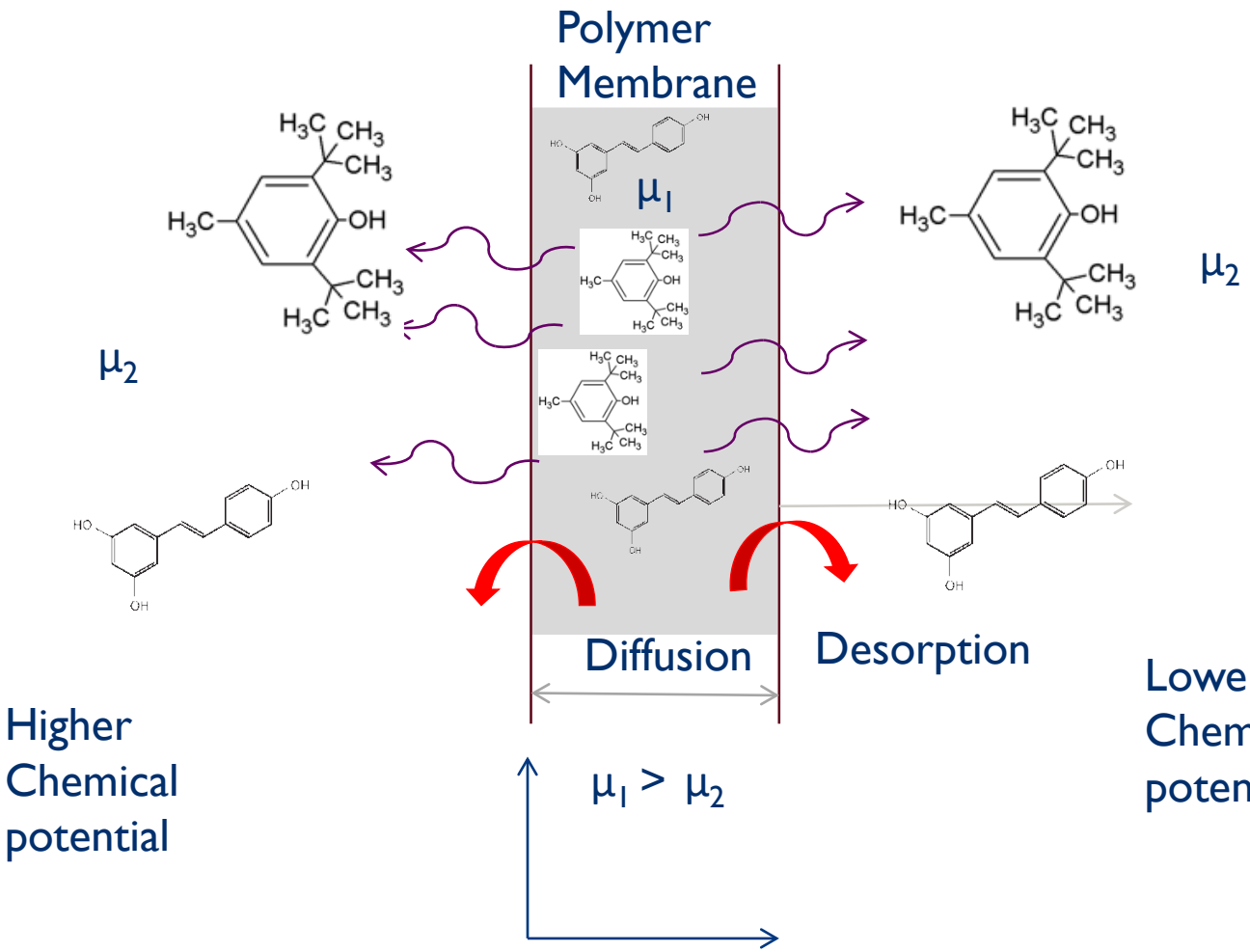
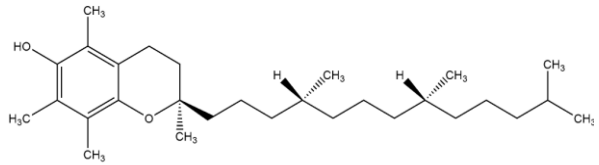
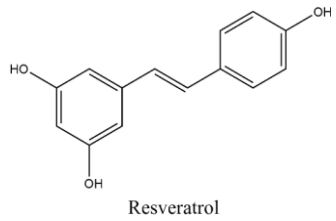


Lemon Grass

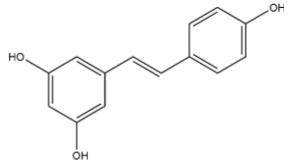
Food Packaging Requirements, Release of functional compounds







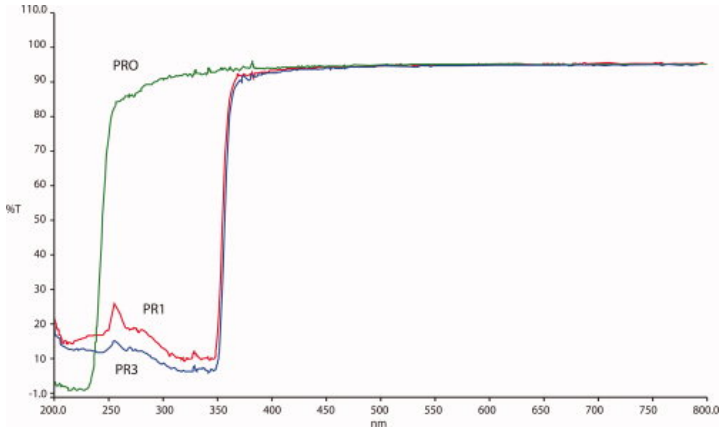
PLLA+ resveratrol



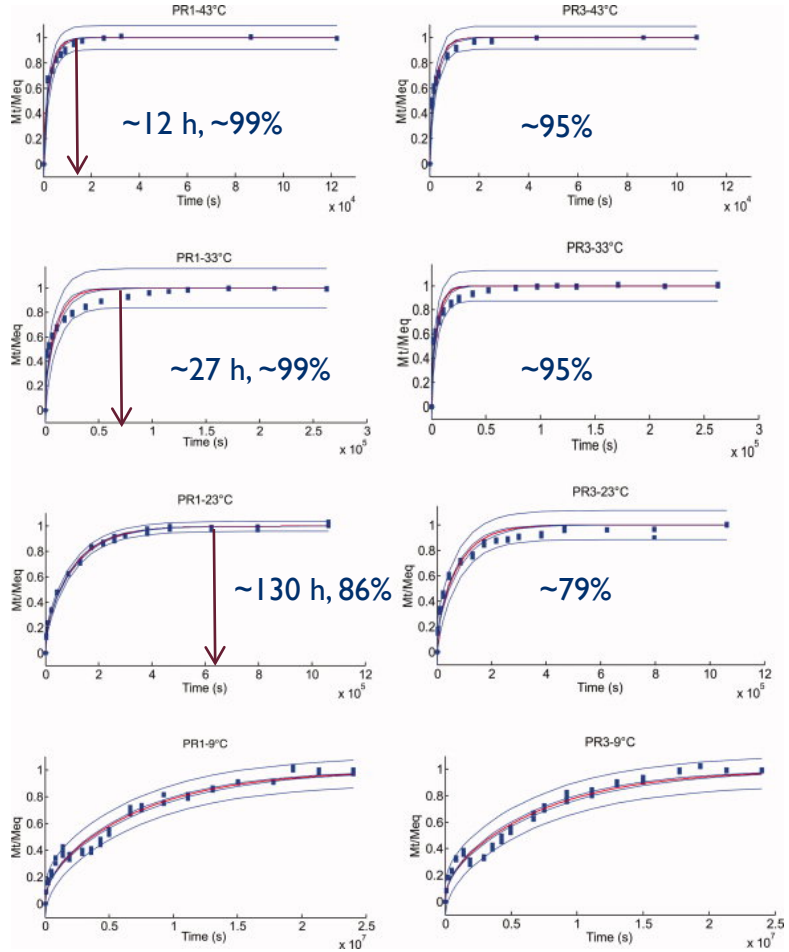
Resveratrol

0 % 1% 3 %

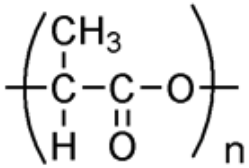
Remaining 83.3 & 74.5%



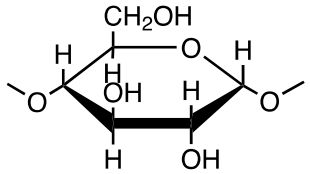
Herlinda Soto-Valdez, Rafael Auras, Elizabeth Peralta, 2010, *Journal of Applied Polymer Science*, Vol. 121 (2) pp. 970-978 DOI 10.1002/app.33687



Diffusion of resveratrol from PR1 and PR3 into ethanol at 43, 33, 23, and 9°C, according to Fick's second law [eq. (2)]. The *y*-axis is the ratio of the concentration of resveratrol in solution at time *t* to the concentration of resveratrol in solution at equilibrium (Mt/M_{eq}), and the *x*-axes are time (*t*) in s. The central line shows the best fit to the experimental data, and the outer lines are the predicted intervals for the experimental values. The inner lines around the best fit curve are the confidence intervals.



PLLA & Starch



PLA film Nominal blend ratio of PLLA/starch blends
DCP 0.1 phr, MA 2.0 phr

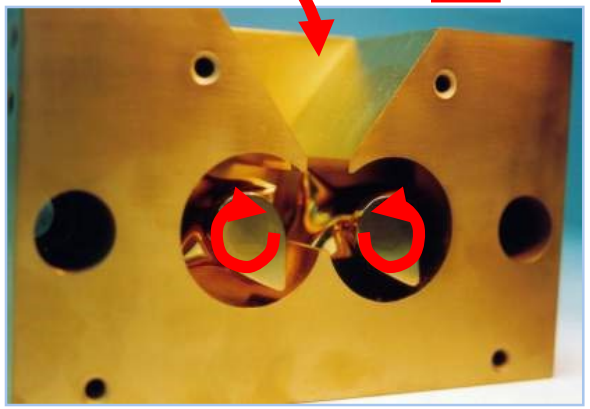
PLA/starch blend film

PLLA: 2 min

1

Antioxidants: 3 min

2



Plasti-Corder® Rheometer
190°C, 60 rpm

Compression molded film
150 ~ 200 μm

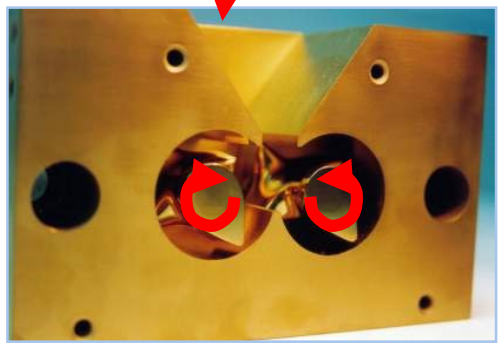
PLLA & Starch: 2 min

1

2 DCP: 2 min

3 MAH: 3 min

4 Antioxidants: 5 min

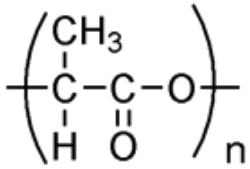


Plasti-Corder® Rheometer
190°C, 60 rpm

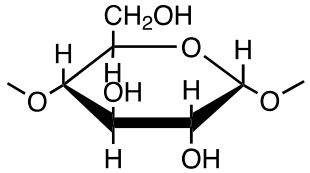
Compression molded film
220 ~ 270 μm

DCP: dicumyl peroxide
MA: Maleic anhydride

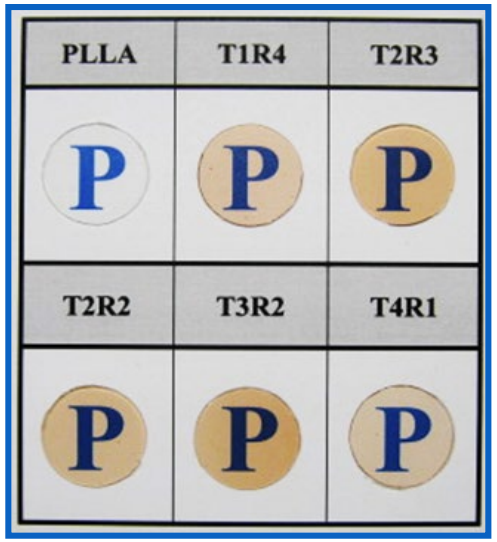
Sung W. Hwang, Sang Bong Lee, Chang Kee Lee, Jun Young Lee, Jin Kie Shim, Susan Selke, Herlinda Soto-Valdez, Laurent Matuana, Maria Rubino, Rafael Auras. 2012. "Grafting of Maleic Anhydride on Poly(L-lactic acid). Effects on Physical and Mechanical Properties," *Polymer Testing*. Available Online. DOI: 10.1016/j.polymertesting.2011.12.005



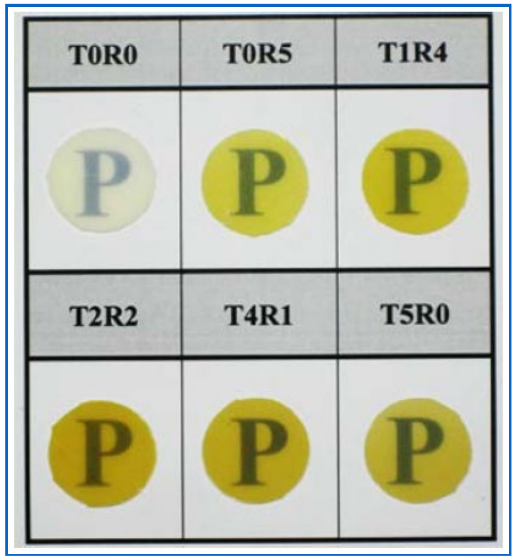
PLLA & Starch

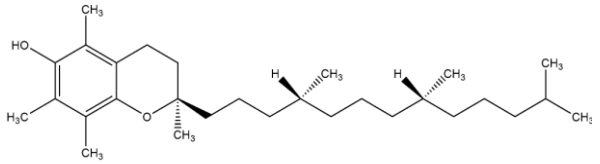


PLLA film

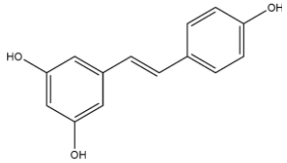


PLLA/starch blend film



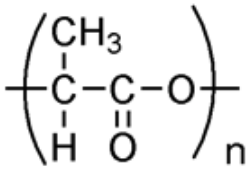


α-Tocopherol

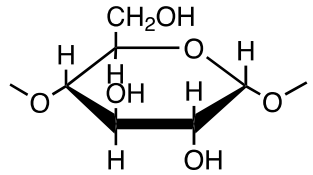


Resveratrol

Sung Wook Hwang, Jin Kie Shim, Susan Selke, Herlinda Soto-Valdez, Laurent Matuana, Maria Rubino, and Rafael Auras *Release Kinetics of α-Tocopherol and Resveratrol from Poly(lactic acid)/starch blends film into food simulants*. JFoE, http://dx.doi.org/10.1016/j.jfoodeng.2013.01.032



PLLA & Starch



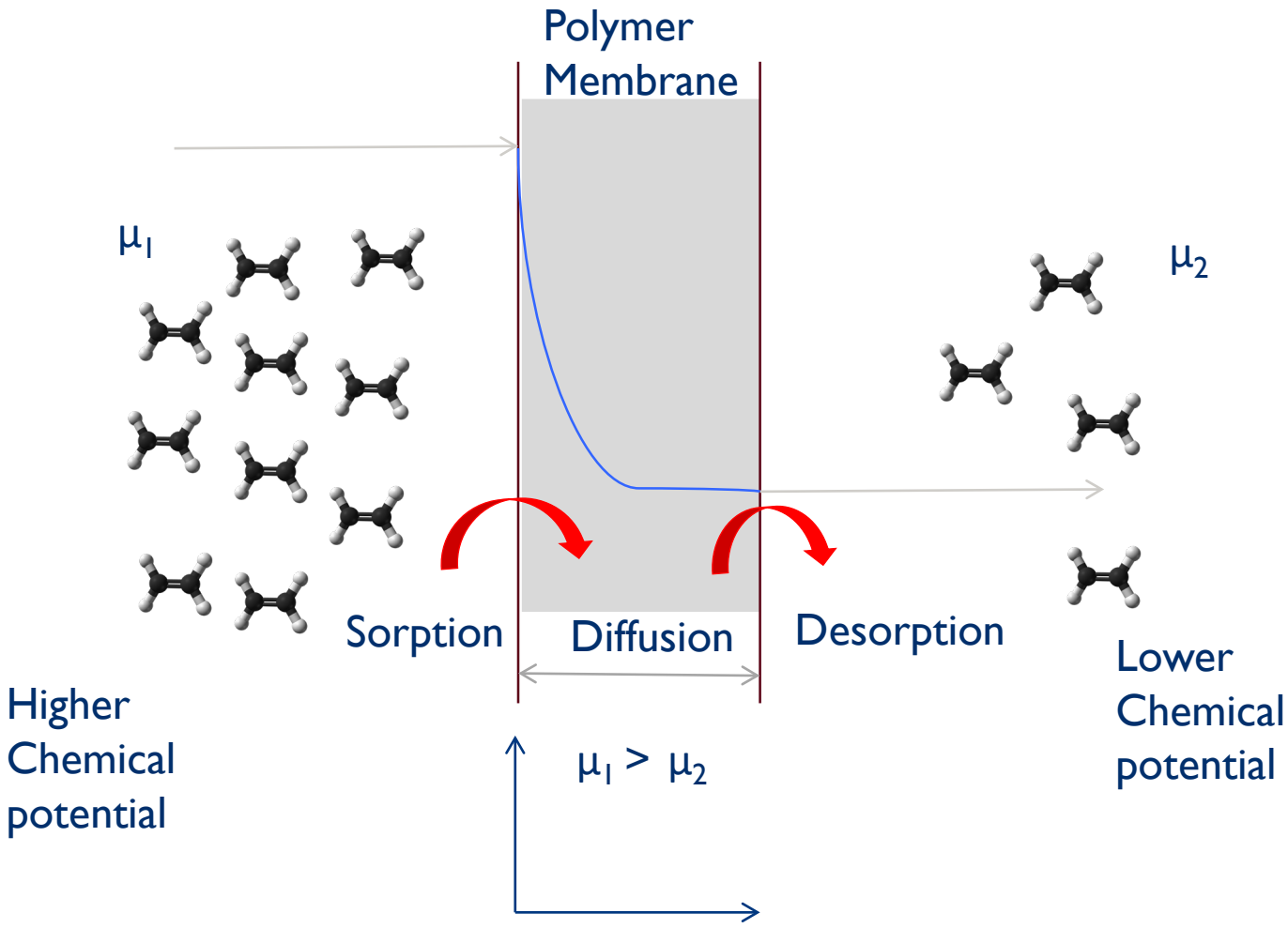
Diffusion Coefficient (*D*) of Resveratrol from PLLA and PLLA/starch blend films into Ethanol at 13, 23, 43 °C

Sample	Parameter $\times 10^{-10}(cm^2 \cdot s^{-1})$	Temperature, °C					
		13		23		43	
		PLLA	PLLA/Starch	PLLA	PLLA/Starch	PLLA	PLLA/Starch
T0R5	*D*	n/a	6.93 ± 0.06^{a}	n/a	22.3 ± 0.4^{a}	n/a	309 ± 3.0^{a}
T1R4		0.54 ± 0.00^{a}	4.16 ± 0.05^{b}	2.30 ± 0.03^{a}	16.5 ± 0.6^{b}	74.3 ± 0.4^{a}	263 ± 5.0^{b}
T2R3		0.090 ± 0.00^{b}	n/a	3.44 ± 0.03^{b}	n/a	74.1 ± 0.4^{a}	n/a
T2R2		0.073 ± 0.00^{c}	1.42 ± 0.12^{c}	2.14 ± 0.04^{c}	14.8 ± 0.7^{c}	55.6 ± 0.3^{b}	124 ± 6.0^{c}
T3R2		0.073 ± 0.00^{c}	n/a	2.32 ± 0.03^{a}	n/a	48.4 ± 0.4^{c}	n/a
T4R1		0.085 ± 0.00^{b}	1.66 ± 0.08^{d}	0.90 ± 0.03^{d}	4.16 ± 0.05	24.8 ± 0.3^{d}	40.1 ± 0.5^{d}

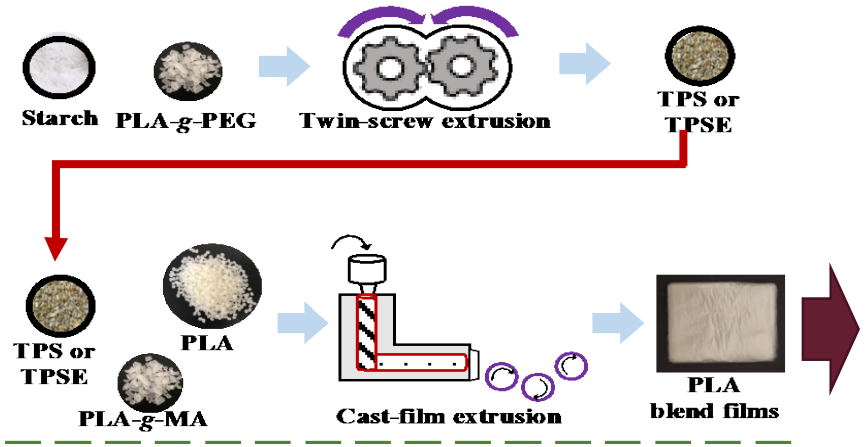
Values in the same column with different superscript letters were significantly different at $\alpha = 0.05$; All of the values are expressed as average values and standard error.

_Sung Wook Hwang, Jin Kie Shim, Susan Selke, Herlinda Soto-Valdez, Laurent Matuana, Maria Rubino, and Rafael Auras *Release Kinetics of α-Tocopherol and Resveratrol from Poly(lactic acid)/starch blends film into food simulants*. JFOE, http://dx.doi.org/10.1016/j.jfoodeng.2013.01.032

Food Packaging Requirements,
100% Biobased & compostable high oxygen and water barrier



100% Biobased & compostable high oxygen and water barrier



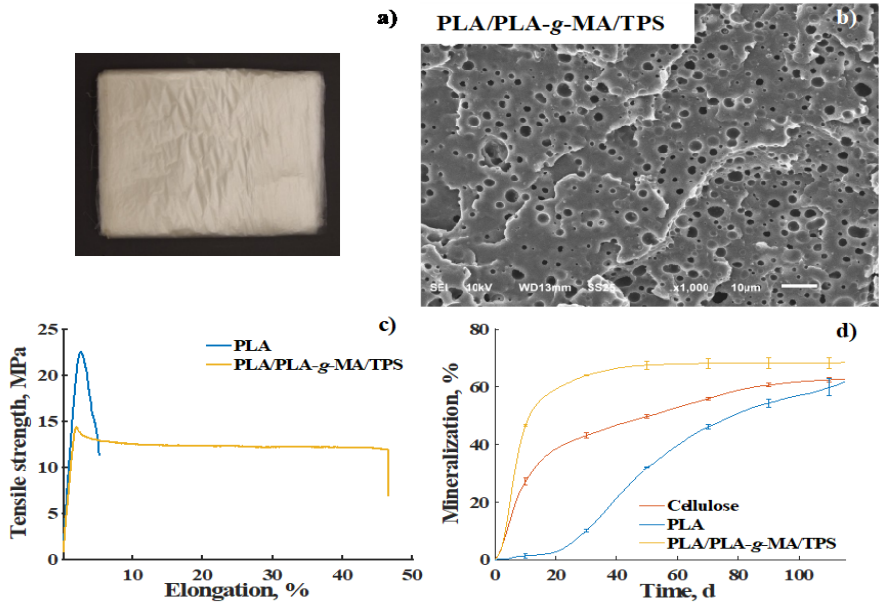
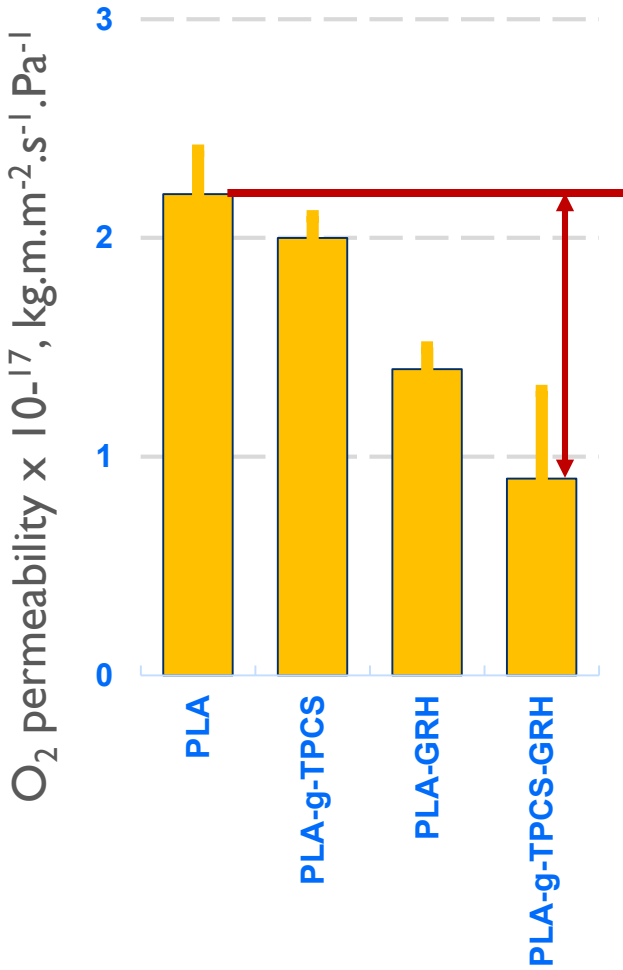


Figure 1. Previous work and efforts to develop PLA/PLA-*g*-MA/TPS films: a) produced PLA/PLA-*g*-MA/TPS films; **b)** microscopy of PLA/PLA-*g*-MA/TPS films; **c)** tensile strength versus elongation at break for PLA and PLA/PLA-*g*-MA/TPS (reactive blend); **d)** biodegradation of PLA, PLA/PLA-*g*-MA/TPS, and cellulose in simulated composting conditions.



Bher, Anibal; *Unalan, I. U.*; Auras, Rafael; Rubino, Maria; Schvezov, Carlos. 2019. Graphene modifies the biodegradation of poly(lactic acid)-thermoplastic cassava starch reactive blend films. *Polymer Degradation and Stability*. 164: 187-197.

Merci
Danke
Thank You
ขอบคุณครับ
Terima kasih
Dhanyavad
Kam sah hamnida
Xièxie
Gracias
Vielen dank

Thank you!

aurasraf@msu.edu

LIVE ONLINE | October 5-8, 2020

USAID
FROM THE AMERICAN PEOPLE

The Future of Food Assistance for Nutrition: Evidence Summit II

Panel 2: Packaging of Food Assistance Products: Challenges and Outlook

Joint Initiative for Sustainable Humanitarian Packaging Waste Management

Greg Rulifson, PhD, PE

AAAS Science and Technology Policy Fellow
USAID Bureau for Humanitarian Assistance
Office of Field and Response Operations
Supply Chain Management Division

Acknowledgements

- Greg Olson, Deputy Director of Office of Field and Response Operations
- Erika Clesceri, BHA Bureau Environmental Officer
- Contractors under ECOS: Mandy George, Chris Pettit, Mike Minkoff
- FARO staff on the (informal) Environmental Performance Team
  - Elise Bell, Gurmeet Philora, Pablo Torres, Courtney Crossgrove
- Scoping Study participants

Packaging Sustainability in HA

- Our Packaging Waste Challenge
- Priorities Identified in the Scoping Study
- Workstreams for Assessment
- Next Steps

Packaging Often Becomes Waste

- Unintended consequence of vitally important services
- Few systems to manage waste in most humanitarian contexts.

Joint Initiative: Collaborative Effort

- Collaborative Roadmapping with Humanitarian Partners
- Coordinate with related USAID efforts (Marine Plastics, Waste Management)
- Quality, Social, Environmental Procurement Sub-group
- Align existing contracts and mutual interests with other donors
- Partnering for Pilots and Implementation

OCHA UN environment WFP World Food Programme IOM UN MIGRATION UNHCR The UN Refugee Agency COMITE INTERNATIONAL GENEVE INTERNATIONAL FEDERATION WWF

Scoping – Priorities Identified

1. Enhance Humanitarian Coordination
2. Private Sector Engagement in Policy and Standard Setting
3. Detailed Assessments and Case Studies
4. Production, Procurement, Distribution, Usage
5. End of Life Management
6. Develop a Solid Waste Management Planning Framework

Scoping – Priorities Identified

1. Enhance Humanitarian Coordination
2. Private Sector Engagement in Policy and Standard Setting
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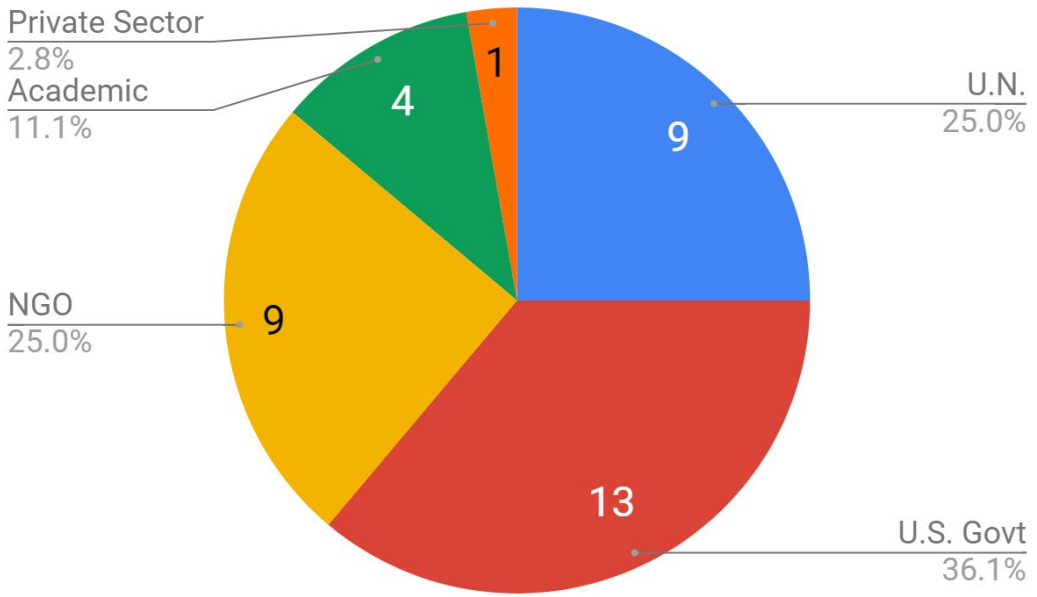
6. Develop a Solid Waste Management Planning Framework

Scoping – Priorities Identified

1. Enhance Humanitarian Coordination

- Collective Roadmapping
- Establish or Expand on Mechanisms
  - Clusters
  - QSE



Scoping – Priorities Identified

1. Enhance Humanitarian Coordination
2. Private Sector Engagement in Policy and Standard Setting
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Scoping – Priorities Identified

2. Private Sector Engagement in Policy and Standard Setting
   - Circular Economy Framing
   - Identify and Collaborate with Recycling Companies
   - Corporate Recycled Content Targets

Scoping – Priorities Identified

1. Enhance Humanitarian Coordination
2. Private Sector Engagement in Policy and Standard Setting
3. Detailed Assessments and Case Studies
4. Production, Procurement, Distribution, Usage
5. End of Life Management
6. Develop a Solid Waste Management Planning Framework

Scoping – Priorities Identified

3. Detailed Assessments and Case Studies

- Compendium of Best Practices and Lessons Learned
- Additional Assessments
  - Individual Items / Commodities
  - Organizational

Scoping – Priorities Identified

1. Enhance Humanitarian Coordination
2. Private Sector Engagement in Policy and Standard Setting
3. Detailed Assessments and Case Studies
4. **Production, Procurement, Distribution, Usage**
5. End of Life Management
6. Develop a Solid Waste Management Planning Framework

Scoping – Priorities Identified

4. Production, Procurement, Distribution, Usage
   - Packaging-related policy mapping
   - Harmonize standards for procurement, distribution and usage
   - Packaging design research and development with academic and/or private sector partners

Scoping – Priorities Identified

1. Enhance Humanitarian Coordination
2. Private Sector Engagement in Policy and Standard Setting
3. Detailed Assessments and Case Studies
4. Production, Procurement, Distribution, Usage
5. **End of Life Management**
6. Develop a Solid Waste Management Planning Framework

Scoping – Priorities Identified

5. End of Life Management

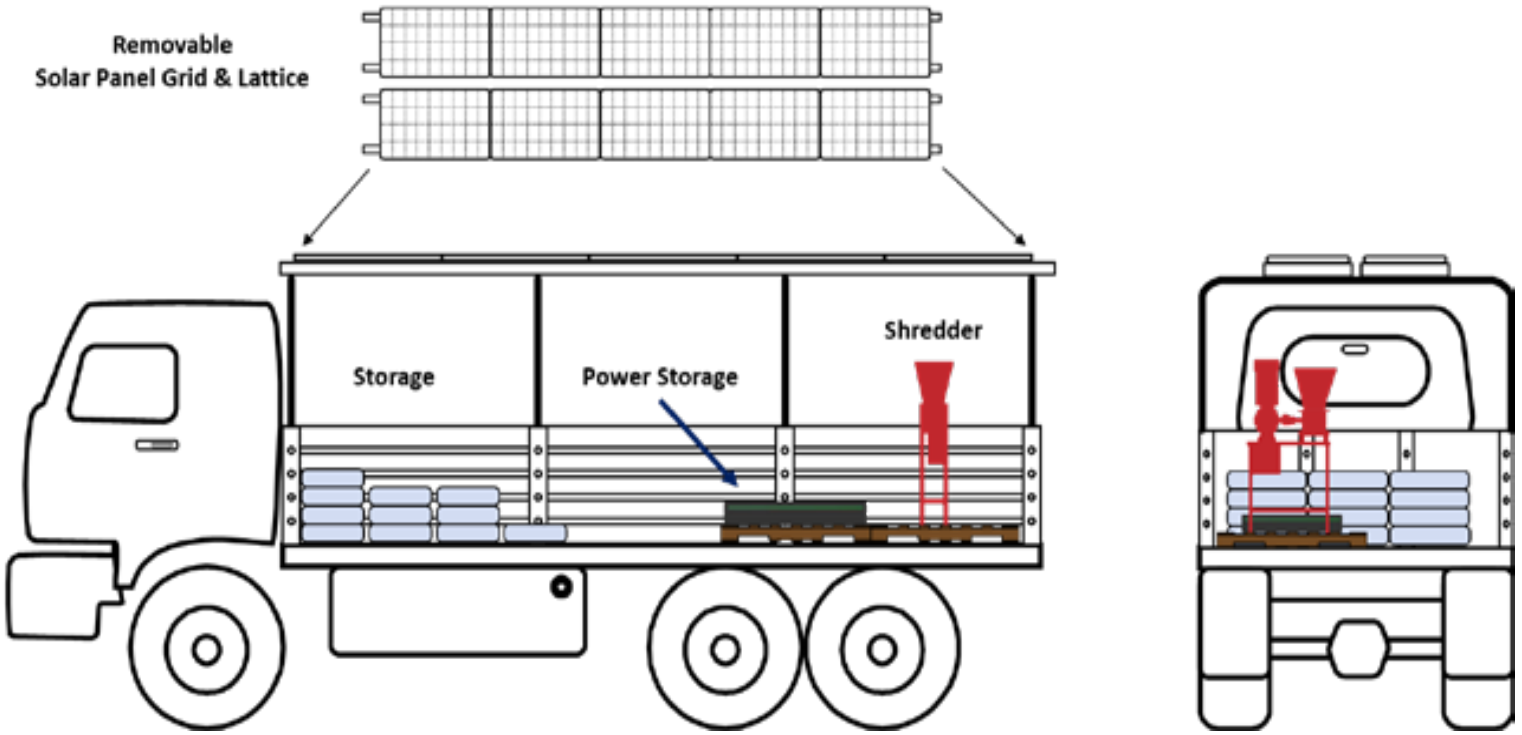
- Research waste management infrastructure and capacity at the local, country, regional levels
- Research reuse and recycling technologies
- Map solid waste management hubs

Weeco Recycling Facility, Nairobi, Kenya; PHOTO CREDIT: Reuters

MIT Lincoln Laboratory Research

- Solar-Powered Mobile Recycling
  - On-site packaging management
  - Power Access
  - Livelihoods
  - Inspire Circular Economy

MIT Lincoln Laboratory



Scoping – Priorities Identified

1. Enhance Humanitarian Coordination
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4. Production, Procurement, Distribution, Usage
5. End of Life Management
6. Develop a Solid Waste Management Planning Framework

Scoping – Priorities Identified

6. Develop a Solid Waste Management Planning Framework

- Support or design SWM framework to assist evaluating impact of packaging
- Assess packaging waste created from a single event to illustrate opportunities

Next Steps

- Assessing, Planning, Design
  - Nov 17-18 Workshop
  - Logical Framework
  - Workstreams Assigned between Collaborators
  - Begin Logistics / Transportation Environmental Performance

- Implementation 2021-2022
  - Learn from and Scale Pilots
  - Provide Guidance
  - Develop Standards

Thank you very much!

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Sustainable Packaging Waste Management
Scoping Report and Fact Sheet

LIVE ONLINE | October 5-8, 2020

USAID FROM THE AMERICAN PEOPLE

The Future of Food Assistance for Nutrition: Evidence Summit II

Panel 2: Packaging of Food Assistance Products: Challenges and Outlook

Packaging solutions for reducing infestation and waste

Michael J. Brady

ProAmpac

ProAmpac

This presentation is not currently available.

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FROM THE AMERICAN PEOPLE

The Future of Food Assistance for Nutrition: Evidence Summit II

Question & Answer Discussion Leader

Jennifer Esterle
Sales & Operations Planning Manager
Edesia Nutrition