Overview of Food Safety Regulations and Compliance and Testing of Packaging Materials (*National, International and Comparisons*)

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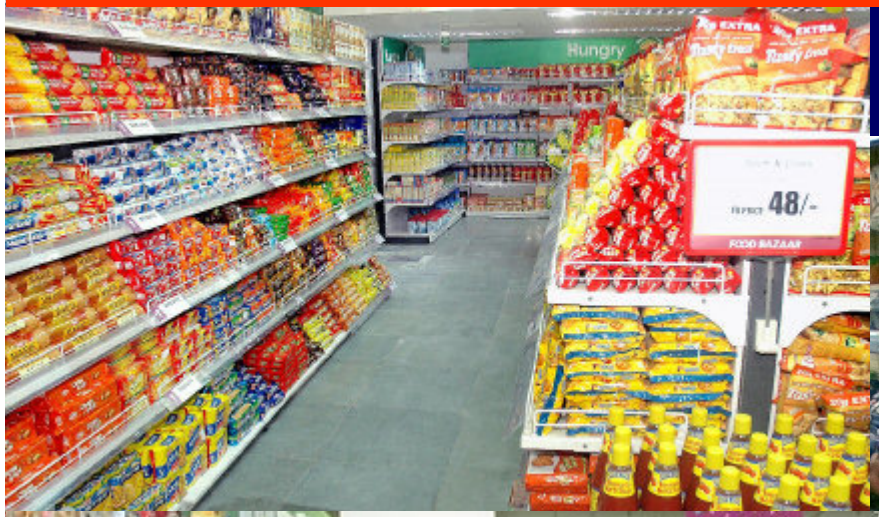
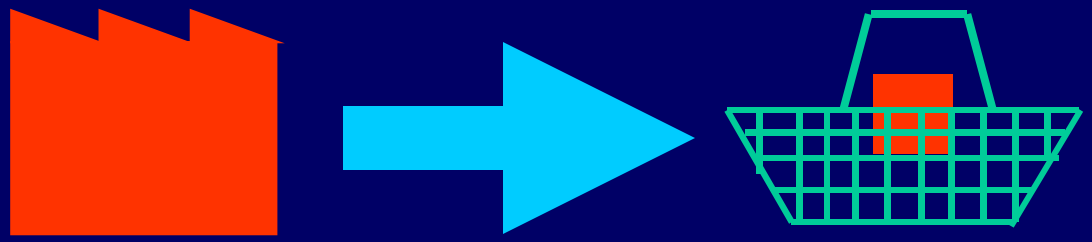
What you see in a Retail-store? Packages Packages Everywhere!



Marketing & Packaging

- **Marketing:**
  Direction of goods from producer to consumer.

- **Packaging:**
  A means of ensuring safe delivery of products to consumer.



PRODUCER CONSUMER

The Total Packaging System

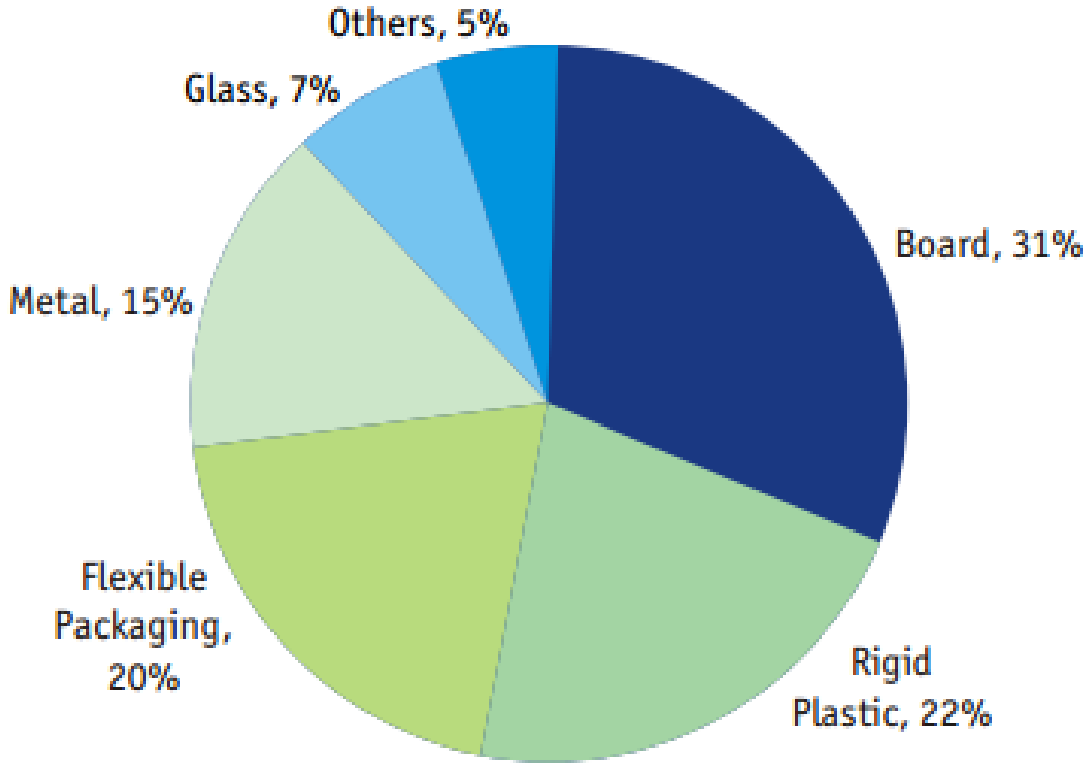
Packaging Functions:

- Contain
- Protect
- Perform
- Communicate

Food Packaging

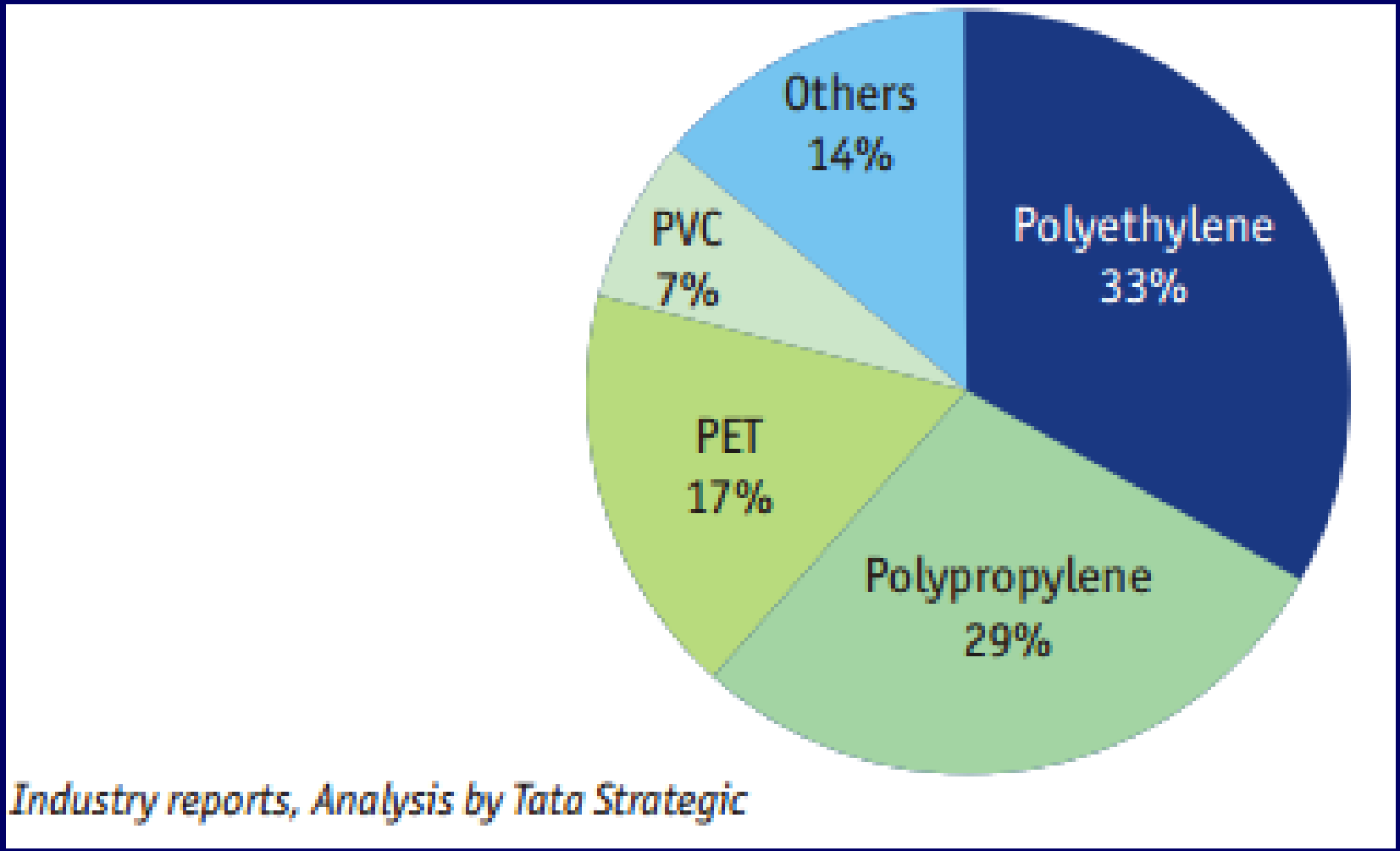
- The packaging keeps foods safe from contamination, retaining the nutritional properties and sensory characteristics, provides tamper evidence, and the display of product information, as well as reuse or recycling features.
- Materials intended to come into contact with food must be safe as it interacts with food during processing, storage, and the transportation
- Food Packaging is a rapidly evolving field with the development of newer and newer polymers.

Global segment breakup of packaging materials(%)



Source: Industry Reports, Analysis by Tata Strategic

End-usage share of plastic products (%)



Industry reports, Analysis by Tata Strategic

Plastics Used In Food Packaging

- Polyethylenes
  (LD, LLD, HD, HMHD)
- Polypropylenes
  (CPP, BOPP, Pearl BOPP)
- Polyethylene Terephthalate
  (PET, Polyester)
- Polyamides
  (Nylons)
- Polyvinyl Chloride
  (PVC)
- Polystyrene
  (PS)
- Polyacrylonitrile
  (PAN)
- Ethylene-acrylic Acid
  (EAA)
- Ethylene-methacrylic Acid
  (EMMA)
- Polycarbonate
  (PC)

Polyethylene

LDPE - HDPE

Uses:

- Bags for bread, vegetables, chicken, ham or meat for fridge and freezer,
- Containers (squeezable) for salt and sauces,
- Bowls for food storage
- Retail bags, yogurt and margarine tubs, cereal box liners

Polypropylene

Polypropylene (PP)

Uses:

- Containers and lids for hot food & drinks.
- Packaging of snacks, biscuits, crisps etc.
- Ketchup bottles, yogurt containers and margarine tubs.
- Microwaveable containers

Polyolefin based films and containers

Polystyrene (PS)

Uses:

- cups in vending coffee machines,
- trays for meats, vegetables and fruits in supermarkets.
- containers for dairy products such as yoghurt and cheese, ice-cream, syrups and honey.
- Packaging/trays for meat, fish and vegetables.
- Trays for cake and margarine tubes when is used as copolymer with acrylonitrile, butadiene.

Polycarbonate

Polycarbonate esters plasticizers e.g. **Bisphenol -A**

–

Uses:

- ~~infant feeding bottles,~~
- plates,
- mugs, jugs, beakers,
- microwave oven ware and storage containers

Polyethylene Terephthalate (PET or PETE)

PET

Uses:

- soft drink, water bottles,
- beer bottles,
- peanut butter
- salad dressing containers,
- food trays

Plastic Laminates and Co-extruded Films

- PET/AL-FOIL/LDPE
- METALLIZED PET/PE
- METALLIZED PET/HD-LDPE
- PAPER/AL-FOIL/PE
- PET/AL-FOIL/CPP
- PET/LDPE

- LDPE/LLDPE
- LDPE/HDPE
- LDPE/BA/PA/BA/EAA
- LD/PA/IONOMER
- LDPE/HDPE/LDPE
- PE/EVOH/PE

PLASTIC LABELLING

(Society of Plastic Industry)

- Polyethylene Terephthalate (PET)

- High Density Polyethylene (HDPE)

- Vinyl Polyvinyl Chloride (PVC)

- Low Density Polyethylene (LDPE)

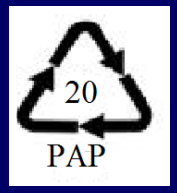
- Polypropylene (PP)

PLASTIC LABELLING

(Society of Plastic Industry)

- Polystyrene (PS)

- Other



- Paper/Cardboard

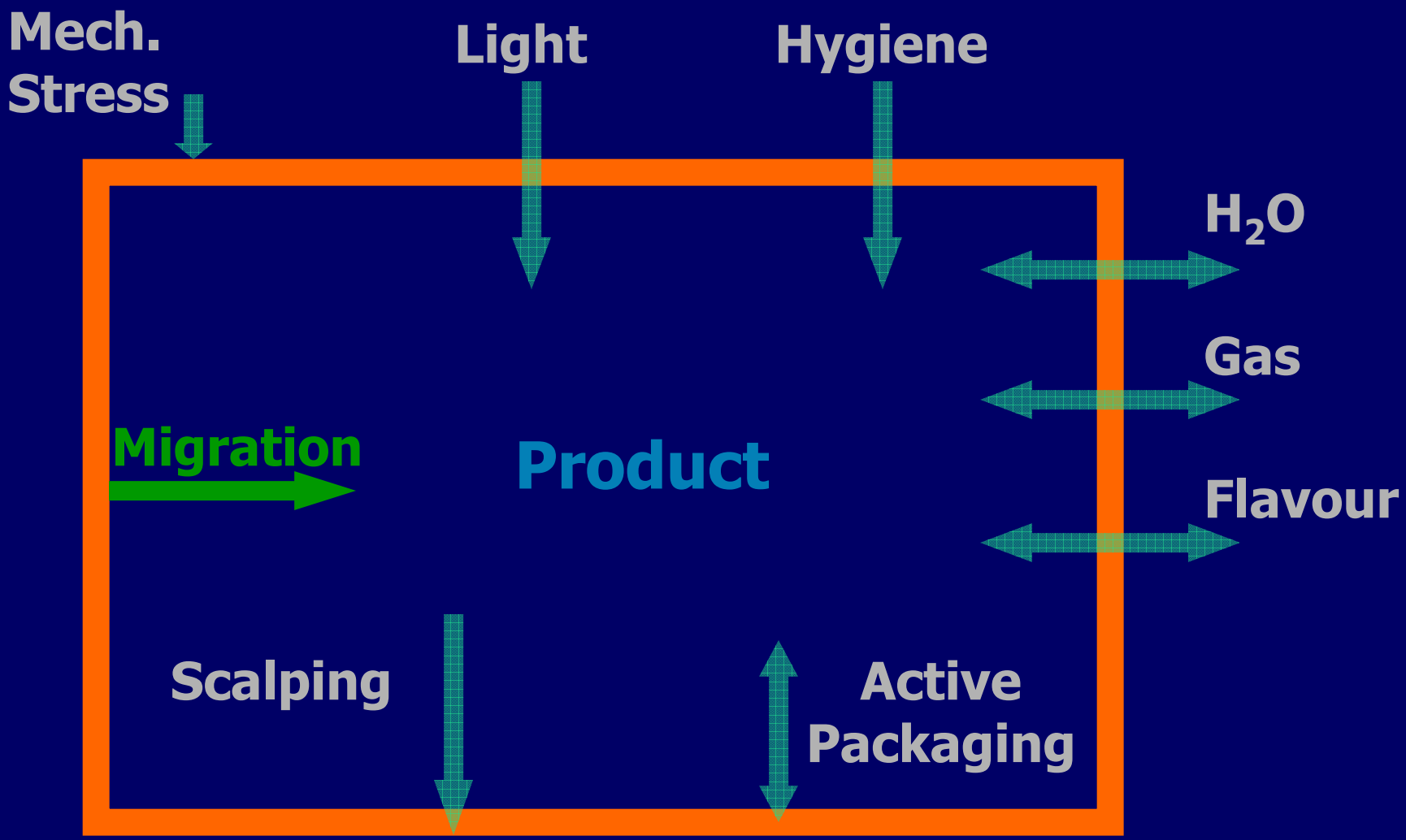
- Metals

- Glass

Is it safe to eat food from Plastic in contact?

- Whether chemicals in the plastic wrapper on your cheese can leach into the food you are about to eat?
- Or whether it is safer to buy your yogurt in a plastic pot or in a glass jar with a plastic lid?

Migration


Mech.
Stress
Light
Hygiene
H_2O
Gas
Flavour
Migration
Product
Scalping
Active
Packaging

Potential Migrants

- **Glass**
  - Silicates, heavy metals
- **Plastics**
  - Plasticizers, monomers, antistatics ...
- **Paper**
  - Additives and fillers (chalk etc.)
- **Metal**
  - Aluminium, tin, acid contents

Non-polymeric Components in Plastic Packaging Materials

Plastics

Basic Polymers

Non-polymeric (ppm to %)

Added
- Processing aids
- End-use additives

Unavoidable
- Polymer residues

Aditives in Plastics

Desired properties not manifested without them

Migrates to food when in direct contact.

Adhesive Materials in Food Packaging

Adhesives for Laminating/Bonding

Water soluble

- Dextrin,
- Starch

Paper lamination

Solvent soluble

- PE,
- EVA,
- PMMA,
- EAA
- PV-based

Polymerization Residues

Catalyst Remnants

- Peroxides, organic nitrogen compounds
- Copper & cobalt salts,
- Naphthenic acid, Other organic acids

Oligomers

- **Dimers, Tetramers (Mol. Wt. 200-400 pp)**

Polymerization Solvents

- **Aqueous Medium – Detergents, Soaps, Wetting Agents (PVC & PS)**

Catalyst Decomposition Agents:

- **Alkalies & alcohols for ziegler – Nutta catalysts**
- **Organo-aluminium titanium oxide.**

Monomers:

- **Vinyl chloride,**
- **Caprolactam,**
- **Acrylonitrile,**
- **Non-polymerization residues**
- **Ethyl benzene,**
- **Benzene,**
- **Styrene**

Polymerization Residues

Monomers in Addition Polymerization

Vinyl chloride	PVC
Ethylene	Polyethylene
Styrene	Polystyrene
Methyl acrylate	Plexiglass

In Condensation Polymerization

Amino acids,	Biological Proteins
Adipicacid- HMDA(Hexamethylenediamine)	Nylon 6,6
P-Phenylenediamine	Kevlar
Terephthalic acid Ethylene glycol and	PET
Bisphenol A	Polycarbonate Epoxy

Processing Aids

Additives play a vital role both in the process that the performance of polymer systems.

Additives for the transformation

- Process Stabilizers
- Lubricants
- Promoters of fusion

Modifying mechanical properties

- Plasticizers
- Reinforcing fillers
- Agents Impact Modifiers

Anti-aging additives

- Antioxidants
- Ultraviolet stabilizers

Modifying surface properties

- Surface antistatic agents
- Agents, anti-lock

Modifying the optical properties

- Pigments and dyes
- Nucleating agents

Flame retardant additives

- Inhibitors ignition
- Self-extinguishing agents
- Anti-smoke

Foaming additives

- Blowing agents

Under Normal/Foreseeable Conditions of Use

- There is no transfer of adjuvants to the packed contents beyond the safety limits.
- There is no deteriorative or unacceptable changes in the native substance or quality of food.

Hence There Is Need For

Regulations for food packaging materials and safety evaluation with regard to

- Streamlining proper and safe use
- Prevent indiscriminate/misuse
- Guard food hygiene and minimize health hazard.

Under Normal/Foreseeable Conditions of Use

Materials and articles must not

- Endanger human health
- Bring about an unacceptable change in the composition the food

  Bring about a deterioration in the organoleptic characteristics thereof
- Materials and articles shall be manufactured in compliance with good manufacturing practice(GMP)

Goal: securing the protection of human health

Regulations on Plastics in Food Packaging

For the safety of additives used:

"An adjuvant can be contained in a food packaging material at the ***absolute minimum*** required to accomplish the intended ***physical or technical effect***"

Materials and articles shall be manufactured in compliance with good manufacturing practice(GMP)

US:FDA, CFR Section 121.25 Sub-part F

Regulations on Plastics in Food Packaging

- How can we prevent an illegitimate amount of contents of the packaging migrates into the product?

Choosing the right packaging!

Compliance with : **Positive list**

- Overall migration limit (OML)
- Specific migration limits (SML)
- Maximum legitimate residual content of the substance in the finished food contact material (quantity of material in article QMA)
- Consideration of actual applied conditions

  (time and temperature combinations)

Factors That Affect Migration

- Concentration of the additives
- Type of plastic material
- Type of food product
- Type of ingredients
- Period of contact
- Temperature
- Thickness of the material
- Volume of solvents
- Type of exposure

BIS and US FDA Food simulants

	Foods Categorization	Food simulant
BIS	Non acid (pH>5.0).	Water
	acidic (pH< =5.0)	3% A A
	Oils and fats, aqueous, non acid and acid products with free oil or fat including water in oil emulsions	N-Heptane
	Alcoholic beverages < 10%	10% ethanol
	Alcoholic beverages > 10%	50% ethanol
FDA /US	Same as BIS except no 3% A A water for acidic food also. 8% ethanol in place of 10 %	

Selection of Food simulants BIS

Description	Example	Simu-lants
Aqueous, non-acidic foods (pH>5) without fat	Honey, mineral water, sugar syrups, molasses, skimmed milk, rasgulla, infusions, murabba, yeast paster etc	`A'
Aqueous, acidic foods (pH ≤ 5) without fat	Fruit juices, squashes, fruit chunks or puree or paste vinegar, jams, jellies, carbonated beverages, lemonade, processed vegetables, rennet, preparations of soups, broths, sauces RTS beverages etc	`B'
Alcoholic beverages: Alcohol ∠10 % Alcohol ≥10 %	Beer and some pharmaceutical syrups Wine, brandy, whiskey, arrack and other alcoholic drinks	`$C^1$' `C^2'
Fatty foods -oils and fats.	Vegetable oils, ghee, vanaspathi, cocoa butter lard, biscuits, spice powder, snacks & savoury, chocolate, caramels, malted foods, egg powder tea, coffee powder, confectionery, fried and roasted nuts etc	`D'

Selection of Food simulants

Description	Example	Simu-lants
Nonacidic foods(pH > 5) or high fat & having high moisture content	Butter, bread, pastry, shreekand with low cakes, milk based sweets, ice-cream, moist and fatty confectionery products	`A and D'
Acidic foods (pH<5) or high fat	Pickles, ketchup, cheese, with low curd, fresh and processed meat and fish products, sauces having fat, frozen foods, mayannaise etc	`B and D"
Dry processed foods without fat	Cereals and pulses, dehydrated vegetable and fruits, dried yeast, corn flakes, salt, sugar, milled products, barley powder, oats, vermicelli, spaghetti etc	No end test

A. Distilled water, B. 3% Acetic acid

C1. 10% Ethanol, C^2. 50% Ethanol, D. n-Heptane

EC Food simulants

Food simulant	Abbreviation
Ethanol 10 % (v/v)	Food simulant A
Acetic acid 3 % (w/v)	Food simulant B
Ethanol 20 % (v/v)	Food simulant C
Ethanol 50 % (v/v)	Food simulant D1
Any vegetable oil (containing less than 1 % unsaponifiable matter)	Food simulant D2
poly(2,6-diphenyl-p-phenylene oxide), particle size 60-80 mesh, pore size 200 nm (PPPO)	Food simulant E

EC Contact time in worst foreseeable use

Contact time	Test time
$t \leq 5$ min	5 min
5 min $< t \leq$ 0.5 hour	0.5 hour
0.5 hours $< t \leq$ 1 hour	1 hour
1 hour $< t \leq$ 2 hours	2 hours
2 hours $< t \leq$ 6 hours	6 hours
6 hours $< t \leq$ 24 hours	24 hours
1 day $< t \leq$ 3 days	3 days
3 days $< t \leq$ 30 days	10 days
Above 30 days	See specific conditions

EC Contact temperature in worst foreseeable use

Contact temperature	Test temperature
T ≤ 5 °C	5 °C
5 °C < T ≤ 20 °C	20 °C
20 °C < T ≤ 40 °C	40 °C
40 °C < T ≤ 70 °C	70 °C
70 °C < T ≤ 100 °C	100 °C or reflux temperature
100 °C < T ≤ 121 °C	121 °C (*)
121 °C < T ≤ 130 °C	130 °C (*)
130 °C < T ≤ 150 °C	150 °C (*)
150 °C < T < 175 °C	175 °C (*)
T > 175 °C	Adjust the temperature to the real temperature at the interface with the food (*)

(*) This temperature shall be used only for food simulants D2 and E. For applications heated under pressure migration testing under pressure at the relevant temperature may be performed. For food simulants A, B, C or D1 the test may be replaced by a test at 100 °C or at reflux temperature for duration of four times the time selected according to the conditions

EC Contact temperature in worst foreseeable use

	Contact time and temp[℃]	Intended food contact conditions
OM1	10 d a t 20 ℃	Any food contact at frozen and refrigerated conditions.
OM2	10 d at 40 ℃	Any long term storage at room temperature or below, including heating up to 70 ℃ for up to 2 hours, or heating up to 100 ℃ for up to 15 minutes.
OM3	2 h at 70 ℃	Any contact conditions that include heating up to 70 ℃ f or up to 2 hours, or up to 100 ℃ for up to 15 minutes, which are not followed by long term room or refrigerated temperature storage.
OM4	1 h at 100 ℃	High temperature applications for all food simulants at temperature up to 100 ℃.
OM5	2 h at 100 ℃ or at reflux or alternatively 1 h at 121 ℃	High temperature applications up to 121 ℃.
OM6	4 h at 100 ℃ or at reflux	Any food contact conditions with food simulants A, B or C, at temperature exceeding 40 ℃.
OM7	2 h at 175 ℃	High temperature applications with fatty foods exceeding the conditions OM5

Time-temperature conditions-Global Migration Tests

Test conditions			Simulant	Remarks
EEC	BIS	FDA/USA		
100 °C or at reflux temperature for duration of four times 2 h / 175 °C	NA	NA	ethanol 10% 3 % A Acid ethanol 20% ethanol 50% *Vegetable oil* *PPPO*	High temperature above 121°C with fatty foods
2 h at 100 °C / at reflux or 1 h/121 ℃ (Simulant of EEC)	121°C/2 h 121°C/2 h 66°C/2 h	121°C/2 h NA 66°C/2 h	Water 3 % A A Heptane	High temperature heat-sterilized upto 121 °C
(Simulant of EEC) 1 h at 100 °C	NA	100°C/30 min 49°C/30 min	Water Heptane	Boiling water-sterilized (USFDA) High temp applications for all food simulants at temp up to 100 C

Time-temperature conditions-Global Migration Tests

Test conditions			Simulant	Remarks
EEC	BIS	FDA/USA		
	100℃/2 h 100℃/2 h 49℃/ 30 m	Fill boiling, cool to 38°C NA 49°C/15 min	Water 3 % Acetic Acid Heptane	Hot filled or pasteurized above 66 °C
70℃ /2 h	70℃/2 h 70℃/2 h 70℃/2 h 70℃/2 h 38℃/ 30 m	66°C/2 h NA 66°C/2 h NA 38°C/30 min.	Water 3 % AA 10% (8) ethanol 50% ethanol Heptane	Hot filled or pasteurized below 66°C Any contact conditions that include heating up to 70 °C for up to 2 hours, or up to 100 °C for up to 15 minutes, which are not followed by long term room or refrigerated temperature storage.

Time-temperature conditions-Global Migration Tests

Test conditions			Simulant	Remarks
EEC	BIS	FDA/USA		
40 °C/10d	40 °C/10 d 40 °C/10 d 40 °C/10 d 38 °C/ 30 min	49°C/24 h NA 49°C/24 h 49°C/24 h 21°C/30 min	Water 3 % Acetic Acid 10% (8) ethanol 50% ethanol Heptane	Room temp. filled & stored Any long term storage at room temperature or below, including heating up to 70 °C for up to 2 hours, or heating up to 100 °C for up to 15 minutes.
20 °C/ 10d	-do-	21°C/48 h 21°C/48 h 21°C/48 h 21°C/30 min	Water 8% ethanol 50% ethanol Heptane	Refrigerated storage (no thermal treatment in the container)
20 °C/ 10d		21°C/24 h	Water	Frozen storage (no thermal treatment in the container)
		100°C/30 min	Water	Frozen storage: Ready-prepared foods intended to be reheated in container at time of use:
		49°C/30 min	Heptane	

Method-Global Migration Tests

Apparatus

Electric oven/waier bath ± 1

Electric hot plate

Analytical balance with a sensitivity of 0.1 mg.

Glass beakers, Pyrex of 1 000 ml

Stainless steel evaporating dish of 100 ml

Specimen Size

Sample of 1 000 sq cm surface area each replicate

Minimum triplicate/Quadriplicate samples representing

Simulant Quantity

Equal to nominal filling capacity or at least 1 ml/ sq cm of contact area.

Preparation of Specimen

Procedure

Method-Global Migration Tests

For finished containers within 2 litres capacity or sealable single/multi-layered flexible Films (one-side exposure)

sample of 1 000 sq cm surface area

Larger containers Made of single homogenous Material above 2 litres capacity

Minimum 3 containers, Cut 5 pieces each of size 10 cm x 10 cm from each

Both side exposure for Single homogenous film, which can not be heat sealed

A film sample of 1 000 sq cm surface area both sides with width not more than 10 cm

Method-Global Migration Tests

Closures, sealing Gaskets, liners and like materials

At least triplicate samples exposing about 100 cm2 contact area (or ten lids) per replicate in each representing a lot. Fill the glass container to their capacity or 100 ml, whichever is lower with simulant preheated and closed tight with the closures/lids lined with the test specimen. Place the closed containers upside down.

Materials of articles Intended to come into repeated Contact with foodstuffs

Test(s) shall be carried out three times on a same sample one after the other using fresh simulant(s) in each occasion. Its compliance shall be checked on the basis of the level of the migration found in the third test.

The Overall Migration Limit (OML)

BIS

- **The material shall comply with the overall migration limits of 60 mg/l, Max of simulants and 10 mg/dm2**

EEC

- **Overall Migration Limit (OML) is fixed to 10 mg/dm2 Articles designed for infants and small children foods the limit is always 60 mg/Kg of food.**

USFDA

- **0.5 mg/in2 & 50 ppm in general but varies with material. Extractions in some cases**

The Overall Migration Limit (OML)

USFDA

Extractions (Over all additives in polymers)

- **Olefins (PE, PP)**

  Xylene, Hexene

- **Nylon**

  Water, 95 % ethanol Ethyl acetate, Benzene

- **PTFE**

  distilled water, 50 % ethanol, n-heptane, and ethyl acetate.

- **Polycarbonate**

  distilled water, 50 % ethanol, n-heptane,

The Overall Migration Limit (OML)

Standard/Country	Global Migration Limits (GML)
1. BPF/UK, EC/Europe PF	60 mg/kg or and 10 mg/dm^2 for all polymers for which specifications are available
2. FDA/USA	b) 21-197 mg/m^2 for rubber articles
	c) 0.15 mg/in^2 (water) for phenol-formaldehyde moulded articles.
	d) 0.02-0.5 wt. Percent for various nylons depending on extractive solvent.
3. JIS/Japan	a) 150 mg/litre for PE, PP
	b) 30 mg/litre for containers to be used at > 100°C
	c) 15-30 mg/litre for nylon
	d) 240 mg/litre for polystyrene

Method-Global Migration Tests

Colour Migration

In the case of coloured plastic materials, colour migrated to

simulant or
decolourised coconut oil or
food packed

shall not be apparent to naked eye.

If the colour migrated is clearly visible, such materials are not suitable for food contact applications, even though the extractive value is within the limit.

Method-Global Migration Tests :Colour Migration

Pigments and colourants used shall have a high degree of purity. Impurities shall not exceed the limit

Lead, percent by mass, Max	**0.01**
Arsenic, percent by mass, Max	**0.005**
Mercury, percent by mass, Max	**0.005**

soluble in N/10 HCl

Cadmium, percent by mass, Max	**0.10**
Zinc, percent by mass, Max	**0.20**
Selenium, percent by mass, Max	**0.01**
Barium, percent by mass, Max	**0.01**
Chromium, percent by mass, Max	**0.025**
Antimony, percent by mass, Max	**0.025**
Total aromatic amines, percent by mass, Max	**0.05**

Carbon black, if used, a) Benzene extract — 0.1 percent by mass, Max; and
b) 3, 4 Benzpyrene — no traces

Is testing for specific migration really necessary?

- If an overall migration test is sufficient to state compliance with regulation ? no
- An overall migration is a very important part of the documentation needed to prove compliance with regulation – but it is not enough.
- An overall migration is basically a hygienic precaution to ensure the inertness of the product.

Is testing for specific migration really necessary?

Regulation states that a product for contact with foodstuff must not

- Endanger human health
- Bring about an unacceptable change in the composition of the food
- Bring about a deterioration in the organoleptic characteristics of the food -

- And this cannot be complied with on the basis of an overall migration test

Specific Migration Limits

Country	Limits of monomers	
BIS ,India	VCM 1ppm in Plastics 10 ppb in foodstuffs Styrene in PS -0.1 % (1000ppm) Caprolatum in nylon6 – 1%	Pb 1 ppm and others 0.0188 ppm in PVC
EEC	VCM in PVC - 1ppm	-
USFDA	styrene monomer 0.3% and maleic anhydride 0.1% In Styrene-maleic anhydride	
BPF-U.K	VCM in PVC - 1ppm; Styrene in PS – 5000 ppm	-

Specific Migration Limits

Country	Limits of monomers	
Japan	VCM in PVC: 1ppm	100 ppm dibutyletin 1000 ppm cresy phosphate in PVC
	Styren maleic anhydride in PS – 1500 ppm	
	VNC in PVDC: 6ppm	Pb, cd, and Ba 100 ppm in PVDC
	Caprolatum in nylon: 15 ppm (15 μg/ml)	0.05 ppm Sb 0.1 ppm Ge in PET

Plastic materials and articles shall not release the following substances in quantities exceeding the specific migration limits below:

substances	specific migration limits
Aluminium	1 mg/kg food or food simulant
Barium	1 mg/kg food or food simulant
Cobalt	0.05 mg/kg food or food simulant
copper	5 mg/kg food or food simulant
Iron	45 mg/kg food or food simulant
Lithium	0.6 mg/kg food or food simulant
Manganese	0.6 mg/kg food or food simulant
Zinc	5 mg/kg food or food simulant

EEC Specific Migration Limits

	Specific additives	SML	
PET	polyethylene glycol (EO = 1-30, typically 5) ether of butyl 2-cyano 3-(4-hydroxy-3-methoxyphenyl) acrylate	0.05	
	Polyethylene glycol (EO = 1-30, typically 5) ether of butyl-2-cyano-3-(4-hydroxyphenyl) acrylate	0.05	
	bis(2,6-diisopropylphenyl) carbodiimide	0.05	For indirect food contact only, behind a PET layer
	glycolic acid		-- do---
	N,N′-bis[4-(ethoxycarbonyl) phenyl]-1,4,5,8-naphthalenetetracarboxydiimide	0.05	Purity > 98,1 % Only to be used as co-monomer (max 4 %) for polyesters (PET, PBT).
	N-(2,6-diisopropylphenyl)-6-[4-(1,1,3,3-tetramethylbutyl) phenoxy]-1H-benzo[de] isoquinolin-1,3(2H)-dione	0.05	Only used in PET

EU Specific Migration Limits

	Specific additives	SML	
PET	polyethylene glycol (EO = 1-30, typically 5) ether of butyl 2-cyano 3-(4-hydroxy-3-methoxyphenyl) acrylate	0.05	
PVC	vinyl chloride	1 final product	
	2,4-diamino-6-hydroxypyrimidine	5	Only to be used in rigid poly(vinyl chloride) (PVC) in contact with non-acidic and non-alcoholic aqueous food
PP	3-methyl-1-butene	ND	

EU Specific Migration Limits

material	Specific additives	SML	
Polyolefin	perfluoromethyl perfluorovinyl ether	0.05	Only to be used in anti-stick coatings
Polycarbonates	1,1,1-tris(4-hydroxyphenol) ethane		Only to be used in polycarbonates
Multilayer	silicic acid, magnesium-sodium-fluoride salt	0.15	SML expressed as fluoride. Only to be used in layers of multi-layer materials not coming into direct contact with food.
General	phthalic acid, dibutyl ester (platisizer)	0.3	Only to be used as: (a) plasticiser in repeated use materials and articles contacting non-fatty foods; (b) technical support agent in polyolefins in concentrations up to 0.05 % in the final product.

EU Specific Migration Limits platisizer

Specific additives	SML	
phthalic acid, benzyl butyl ester	30	Only to be used as: (a) plasticiser in repeated use materials and articles; (b) plasticiser in single-use materials and articles contacting non-fatty foods except for infant formulae and follow-on formulae (c) technical support agent in concentrations up to 0.1 % in the final product.
phthalic acid, bis(2-ethylhexyl) ester	1.5	Only to be used as: (a) plasticiser in repeated use materials and articles contacting non-fatty foods; (b) technical support agent in concentrations up to 0.1 % in the final product.

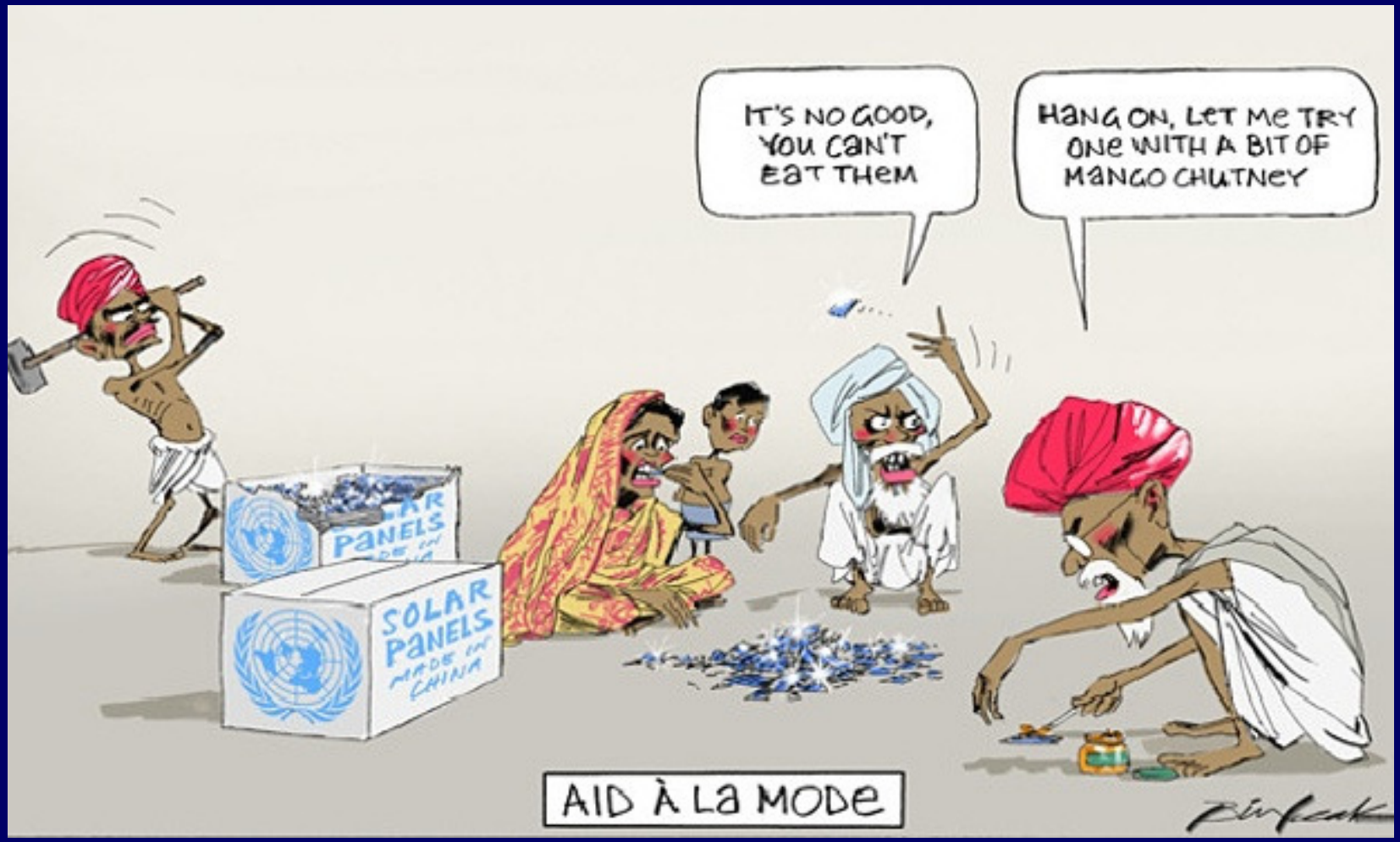
EU Specific Migration Limits

Packaging material	
waxes, paraffinic, refined, derived from petroleum based or synthetic hydrocarbon feedstocks, low viscosity	Not to be used for articles in contact with fatty foods for which simulant D is laid down.

BOX: Which materials are regulated?

EU laws exist for only five of the 17 different types of food contact materials.

Regulated	Not regulated	Not regulated, high priority
Ceramics	Cork	Paper and Board
Regenerated Cellulose Film	Adhesives	Varnishes & Coatings
Active & Intelligent Materials	Silicones	Printing Inks
Plastics	Elastomers & Rubbers	
Recycled Plastics	Glass	
	Metal & Alloys	
	Ion Exchange Resins	
	Wood	
	Textiles	
	Waxes	


IT'S NO GOOD, YOU CAN'T EAT THEM
HANG ON, LET ME TRY ONE WITH A BIT OF MANGO CHUTNEY
SOLAR PANELS MADE IN CHINA
AID À LA MODE

Food in Paper and paper board

paper wrappers, paperboard, and drink containers, for a class of chemicals called PFASs (per- and polyfluoroalkyl substances), also known as PFCs

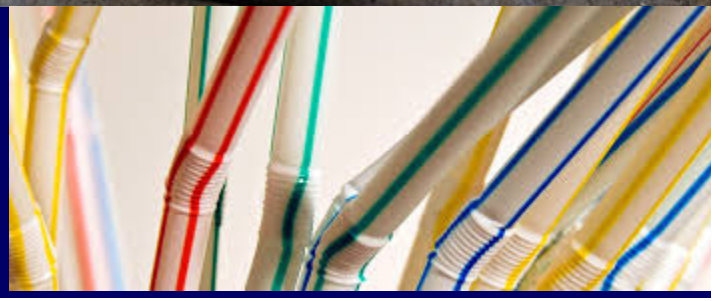
Exposure to these chemicals and some health problems such as low birth weight, delayed puberty onset, elevated cholesterol levels, and reduced immunologic responses to vaccination

Food in News Paper?

Food in News Paper?

water containers

Straws recycled ?



Indian status:

- standards are **borrowed (relevant?)**
- Very few specific migration test
- No **systematic** studies for standards
- **No standards,** paper and paper, printing inks, coatings and varnishes, Polylactic acid (PLA) biodegradable
- Use of **nano** materials in food contact?
- Active and intelligent packaging?

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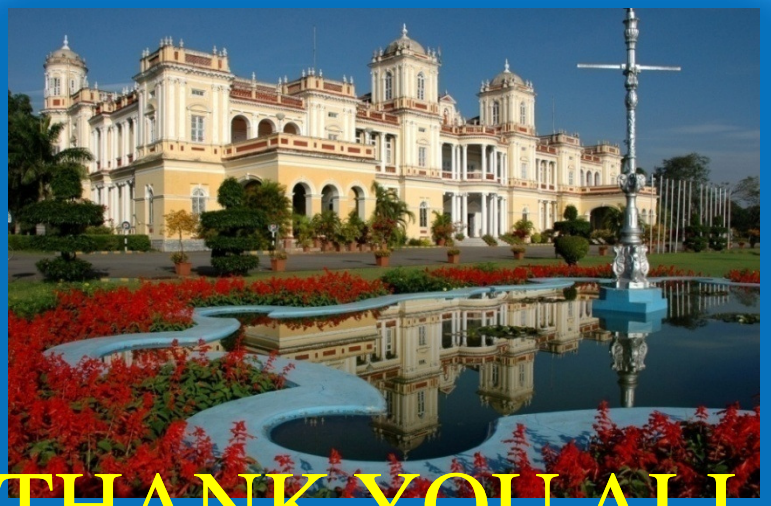

THANK YOU ALL