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# Cold chain conditions of meat and dairy products in Mexican retail food stores

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# Outline

- ✓ Introduction
- ✓ Objective
- ✓ Methods
- ✓ Results
- ✓ Conclusion



# Introduction



- ✓ Temperature control - supply chain - quality and quantity of perishable foodstuff
- ✓ Non-compliance of temperature holding and cleanliness and temperatures of refrigeration equipment
- ✓ Food safety management of cold chain in retail food stores - key issue in food products
- ✓ Cold chain problems in retail stores during storage - a threat to consumer health - poor product shelf-life

# Introduction...

- ✓ Own-checking routines of temperature control within a self-planning tailored for each store - food safety policy
- ✓ Failure in keeping temperature within range - as a critical violation
- ✓ Foodstuff losses - related to temperature fluctuations while in storage
- ✓ Official Mexican Norms (OMN) - protocols and standards - applied in the cooling storage temperatures for food products



Source: Asociación Nacional de Establecimientos TIF (ANETIF). 2016.

# Objective

To determine the conditions of meat and dairy products displayed and cleanliness of the surrounding display area in five retail food stores of different national food chains established in a municipality of Mexico to compare them against OMN standards



Source: El Financiero. 13 abril 2013

# Material and methods

- ✓ Five retail food stores established in a municipality of Mexico
- ✓ Four different national food-chain stores
- ✓ Variables:
  - ✧ surface food temperature
  - ✧ cleanliness of display area
- ✓ Temperature - on-site-inspection - an infrared thermometer
- ✓ Cleanliness was visually scored based on a set scale



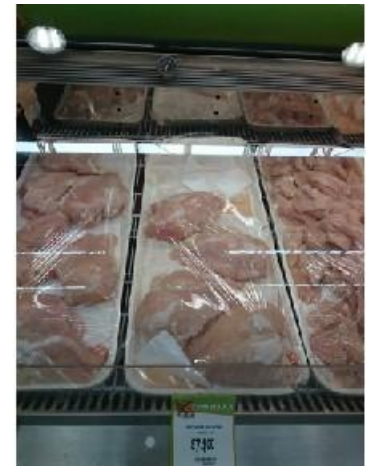
Source: Asociación Nacional de Establecimientos TIF (ANETIF). 2016.

# Material and methods...

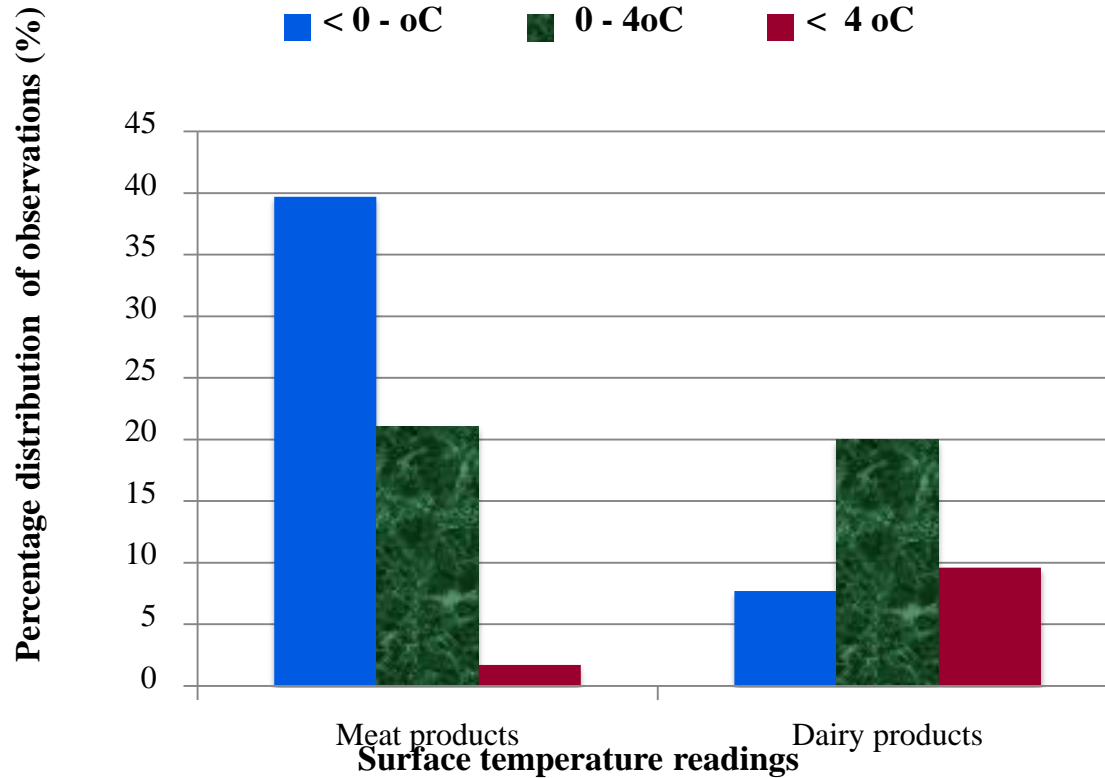
- ✓ Statistical analysis based on frequency of surface temperature
- ✓ Above the OMN set for products:
  - ✓ 4° C - meat
  - ✓ 6° C- dairy
- ✓ On-site inspection restricted to the display area
- ✓ Cleanliness evaluated one time for each store
- ✓ Statistical analysis based on failure frequencies by store and product



Source: Inocuidad de los quesos artesanales mexicanos  
21Oct 2013 Fuente: <http://www.foodnewlatam.com>



# Results

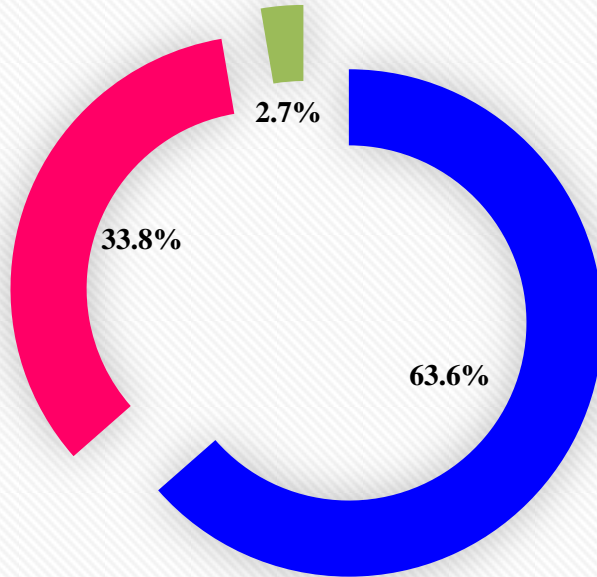


- N= 360 temperature readings
- OMNs optimal range surface temperature
- Meat products: *breaded beef, chicken breast and pork chops* (0 - 4 °C)
- Dairy products: *fluid milk, Oaxaca cheese type and smoothen yogurt* (0 - 6 °C)



# Results...

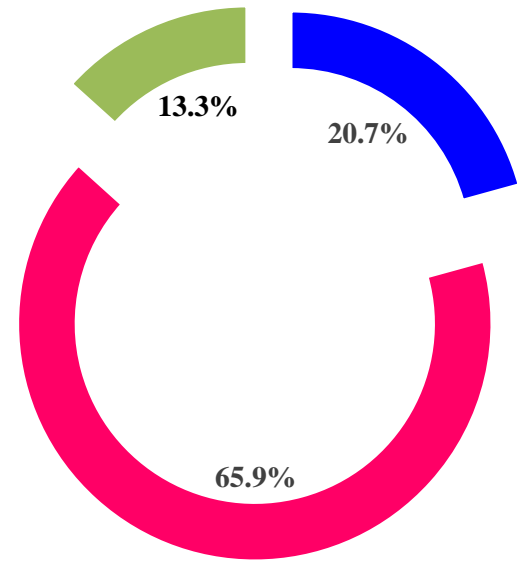
## Meat products



N= 225

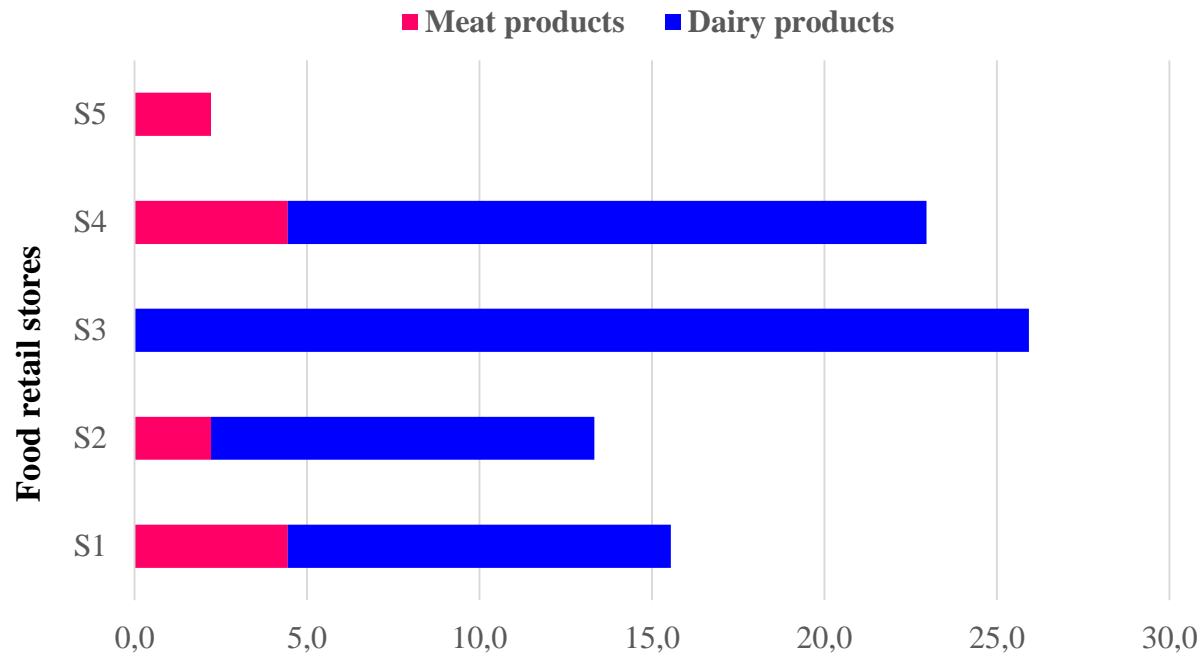
■ < 0 oC ■ 0 - 4 oC ■ > 4 oC

## Dairy products



■ < 0 oC ■ 0 - 6 oC ■ > 6 oC

# Results...



**Distribution (%) of temperature readings above the standard**

( $p \leq 0.05$ )

Non-compliance:

- Meat products 2.2 and 4.4% over 4 °C (S1, S2; S4 and S5)
- Dairy products 11.1 and 25.9 over 6 °C (S1, S2, S3 and S4)

# Results...

## Non-compliance related to cleanliness in retail food stores (N = 5)

<i>Unclean area</i>	Number of food stores with non-compliance (%)
Facilities out of reach of customers	3(60.0)
Cleaning equipment room	3(60.0)
Cleaning equipment	4(80.0)
Service area	1(20.0)
Self service area	1(20.0)
Total	4(80.0)

- Particularly three places out of sight for customers registered the highest percentages
- Statistical significance differences between food stores were not possible because of low number of stores

# Conclusions

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- ✓ Lack of awareness in these retail food stores
- ✓ Most of meat and dairy food products refrigerated on the maximum cooling temperature of compliance
- ✓ These products might show poor shelf life, quality and safety
- ✓ Monitoring of surface temperature must be frequently and accurately
- ✓ It is recommended a continues research into the Mexican food retail stores

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# Thank you