



ASPECTS OF COLD CHAIN IN MEXICAN CARRIERS OF MEAT PRODUCTS

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INTRODUCTION

- Demand for processed meat products in the Mexican market is on the rising as family income and working women have increased
- Food processing has to be done in controlled environments and high hygiene standards
- An effective cold chain is needed through-out production, processing, transportation, and storage of meat and meat products
- Cooling enterprises must have a quick and accurate procedure to adjust¹:
 - Equipment parameters
 - Transportation conditions of each unit of transportation
 - Route to be covered
 - Geographic area of operation
 - External environmental conditions

¹Rodríguez and Álvarez, 2011.



INTRODUCTION...

- Mexican carriers that have cooling equipments usually carry perishable foodstuffs¹:
 - meat, seafood, fish, fruits and vegetables.
- Other goods as drugs are also carried and required temperature control
- Common products from the Southeast routes are:
 - mango, pineapple, papaya, chili, cucumber, some chemicals, and flowers.
- In the Middle region carried products are:
 - tomato, avocado, broccoli, zucchini, blackberries, mango and lemon

¹ Morales and De la Torre, 2006.



INTRODUCTION...

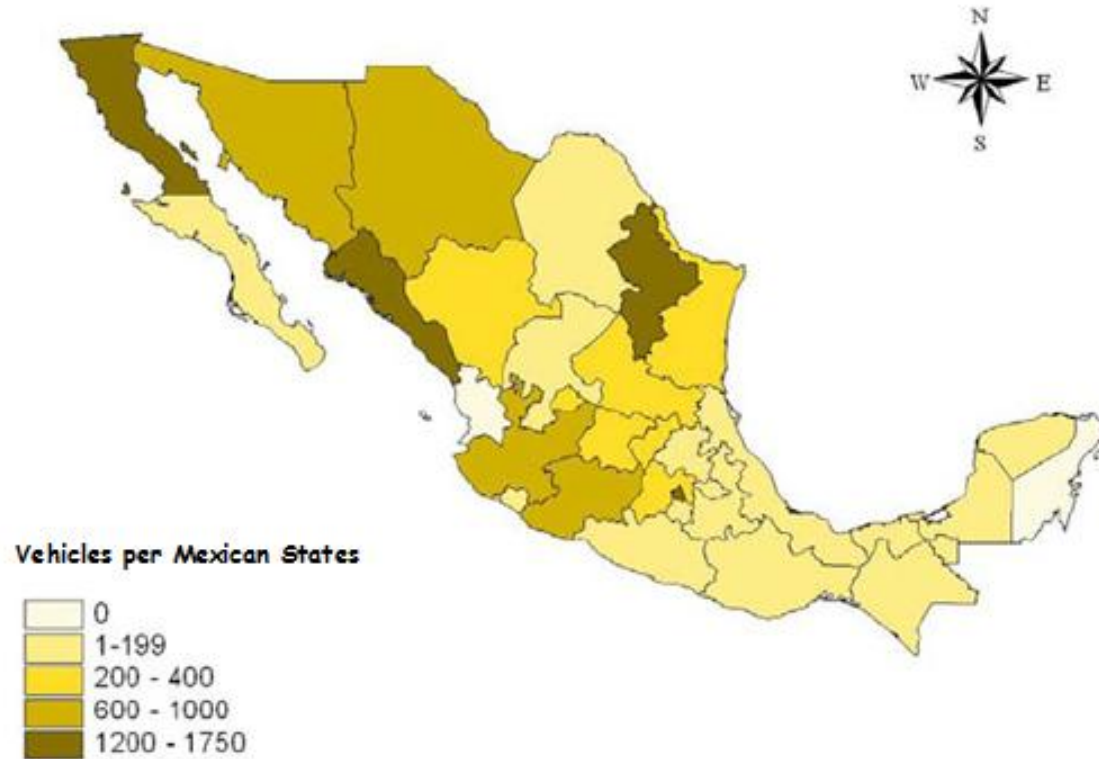
- Temperature range inside the refrigerated chamber of the vehicle¹:
 - Fresh foods common temperature range from 0° to 8°C
 - Frozen products is -18° to -22°C
- Other goods also require temperature control:
 - Drugs²
 - Cooling +2° to +8°C
 - Frozen -15° to -25°C
- Importing flow moves high amounts of groceries
- Exports move a significant proportion of fruits and vegetables

¹ Morales and De la Torre, 2006.

² IMSS, 2005



RECORDS OF REFRIGERATED FLEET OFFER IN MEXICO



¹Morales and De la Torre, 2006.



PURPOSE



- to describe the service of Mexican carriers in the cold chain transportation of meat and meat products



MATERIAL AND METHODS

- Survey was conducted in 52 major companies
- Six major Mexican cities in terms of shipping or receiving meat and meat products.
- Questionnaire¹ was organized in three segments:
 - a. vehicle characteristics, cooling-freezing technologies and measuring procedures
 - b. goods being carried, shipment frequency and length
 - c. control systems and monitoring technology applied
- Data was analysed by Chi Square²



¹ Raab, et al., 2008.

² SAS., 2009.



RESULTS



COMPANY HEADQUARTERS IN SIX MAJOR MEXICAN CITIES





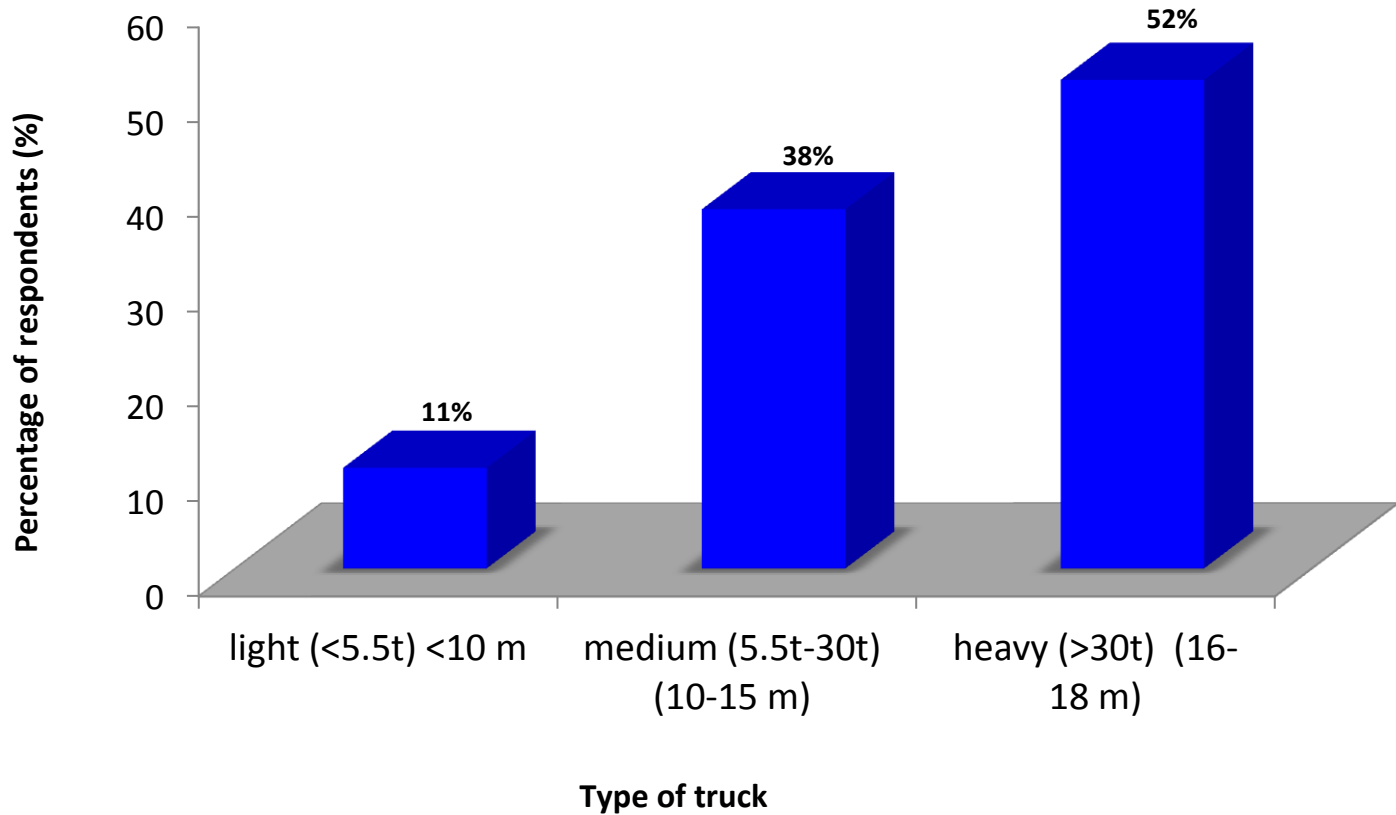
SEASONAL MEAN OF MINIMUM AND MAXIMUM ENVIRONMENTAL TEMPERATURES (°C)

| Cities | Spring | | Summer | | Autumn | | Winter | |
|----------------------|--------|------|--------|------|--------|------|--------|------|
| | Min | Max | Min | Max | Min | Max | Min | Max |
| Ciudad Juárez, Chih. | 13.5 | 30.8 | 18.8 | 33.7 | 4.5 | 20.5 | 1.6 | 17.9 |
| Colombia, N. L. | 19.4 | 32.0 | 21.6 | 33.6 | 12.6 | 24.6 | 10.2 | 23.7 |
| Mexicali, B. C. | 16.7 | 35.0 | 24.2 | 40.9 | 10.3 | 26.2 | 7.6 | 23.1 |
| Mexico City | 12.4 | 28.3 | 12.6 | 25.2 | 8.4 | 22.1 | 7.6 | 23.0 |
| Nvo. Laredo, Tamps. | 20.2 | 32.6 | 22.8 | 35.9 | 13.5 | 26.9 | 9.7 | 21.2 |
| Tijuana, B. C. | 12.5 | 19.2 | 16.5 | 22.9 | 10.7 | 19.4 | 8.6 | 16.7 |

Source: IMTA, 2006

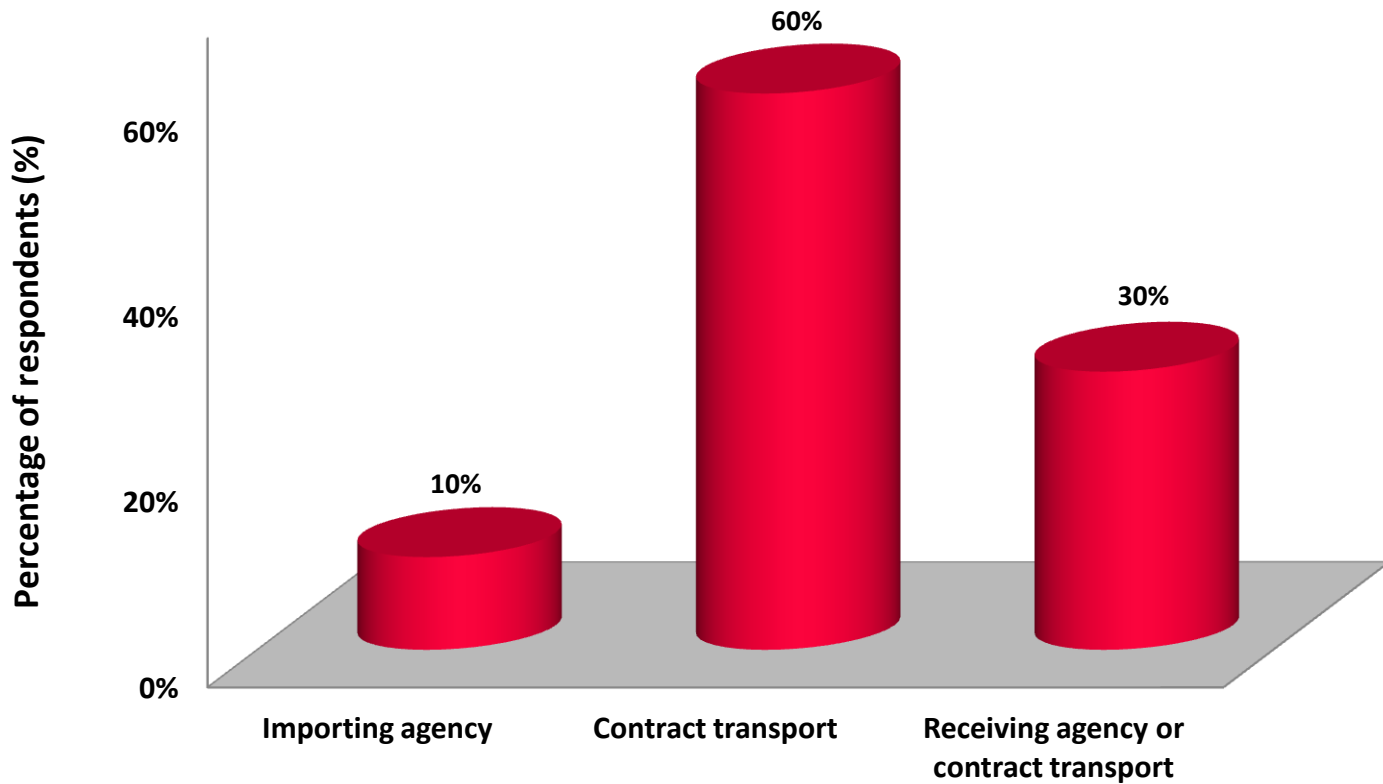


VEHICLES AND SIZE MOSTLY USE IN COOLING TRANSPORTATION



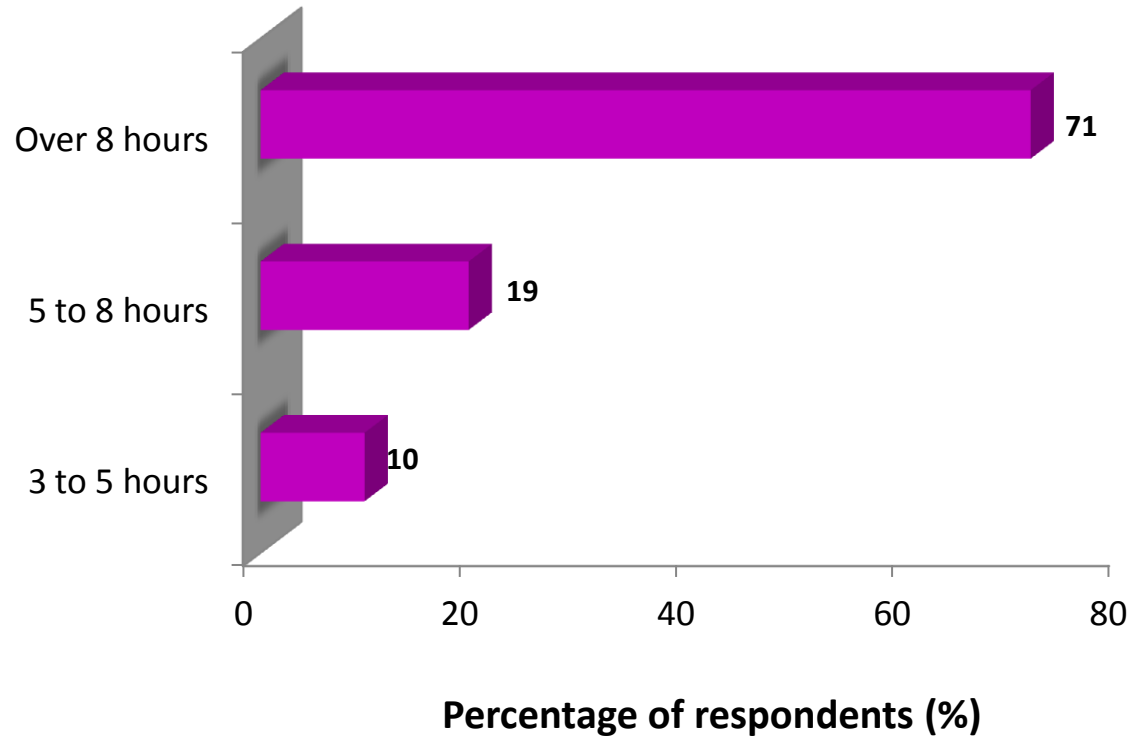


TYPE OF CONTRACT OF COOLING TRANSPORTATION



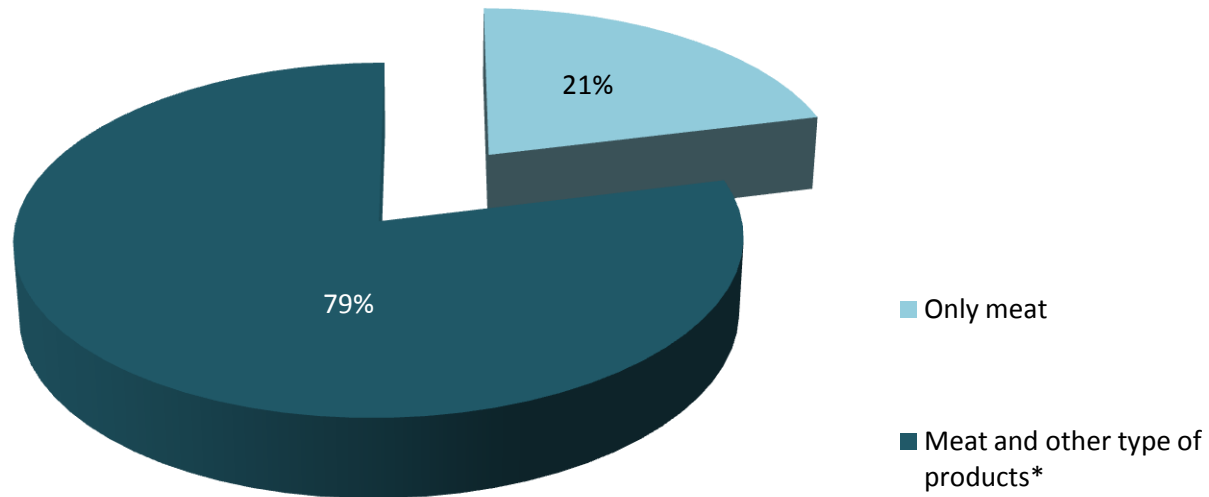


AVERAGE TIME OF TRANSPORTATION





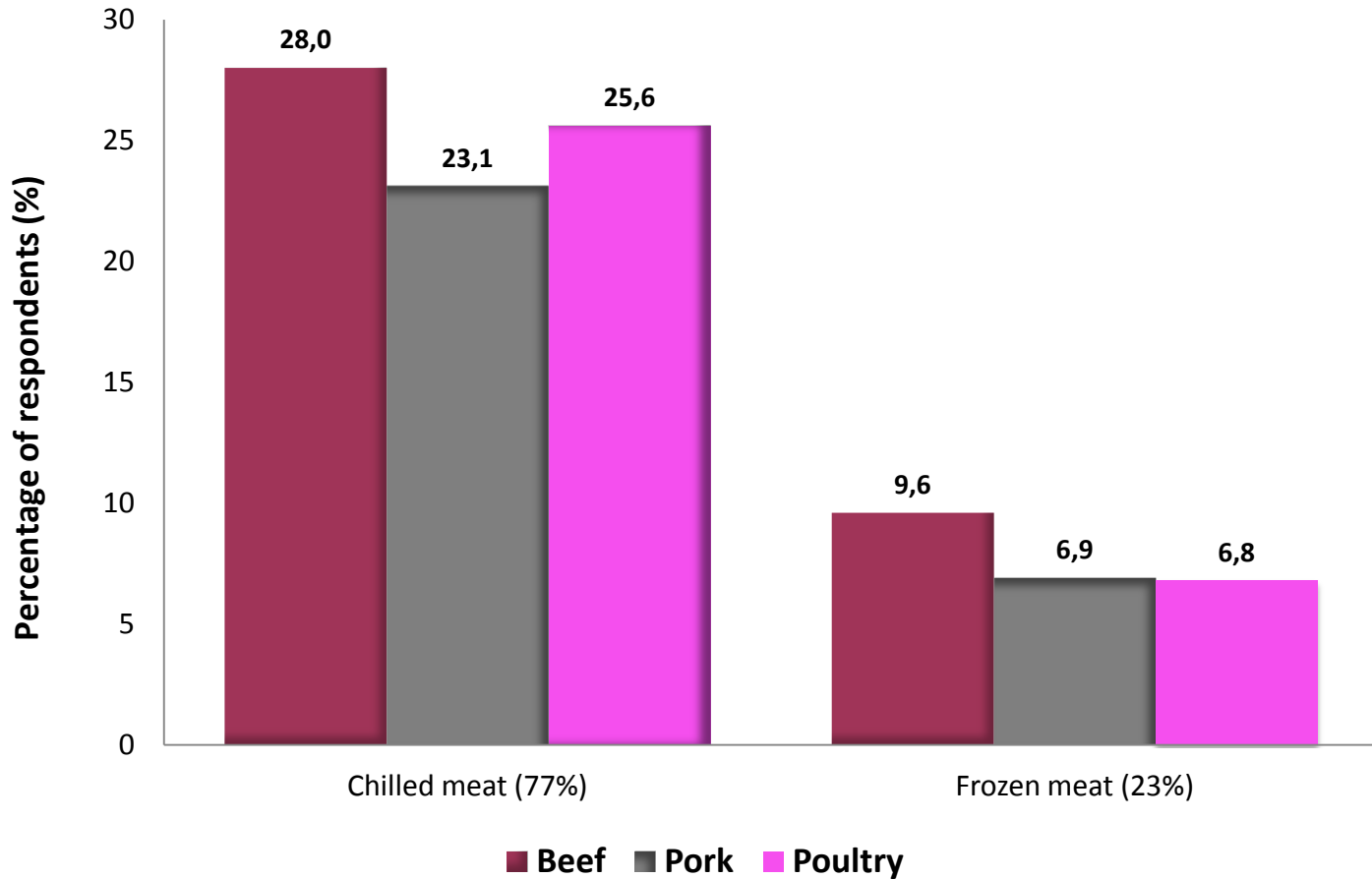
KIND OF PRODUCTS TRANSPORTED



*Entire transporting cooling unit is kept, when meat is carried.

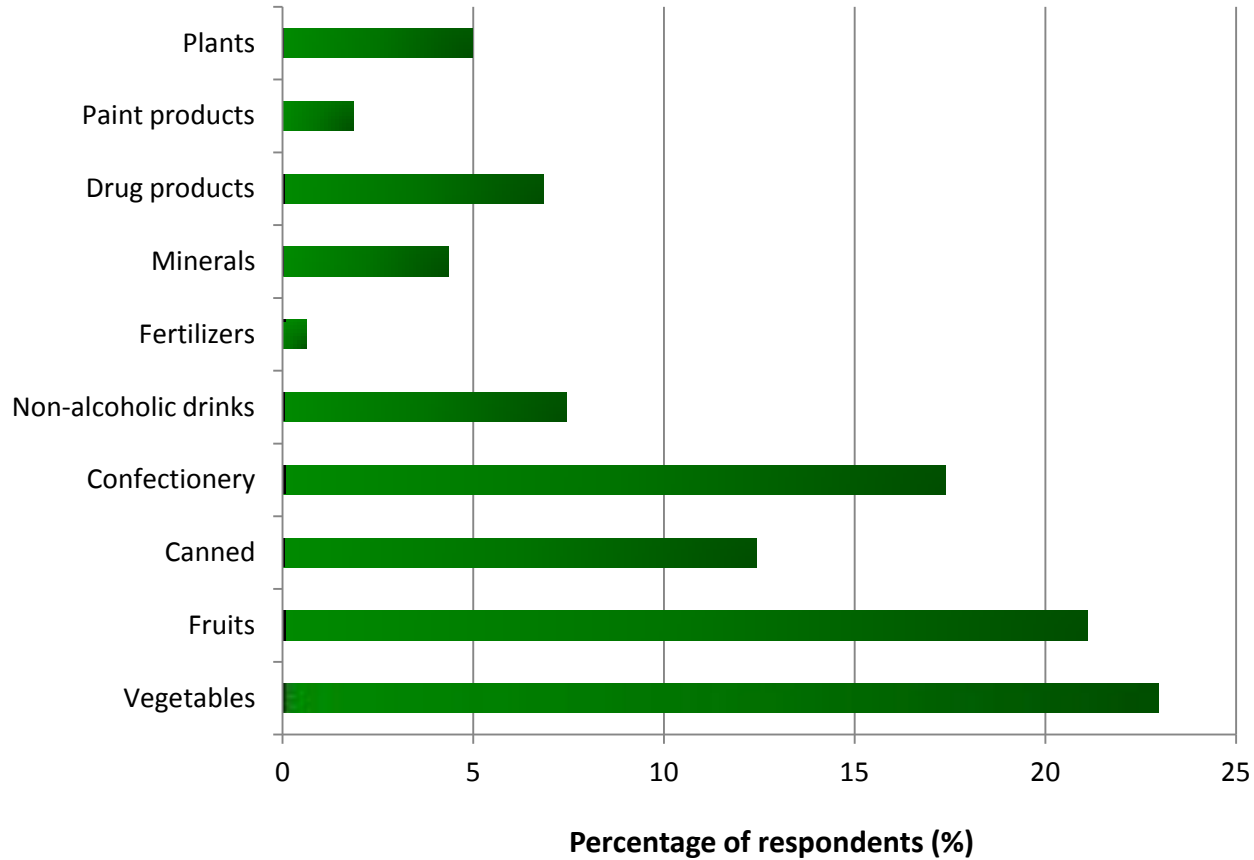


PERCENTAGE AND TYPE OF CHILLED AND FROZEN MEAT WEEKLY TRANSPORTED



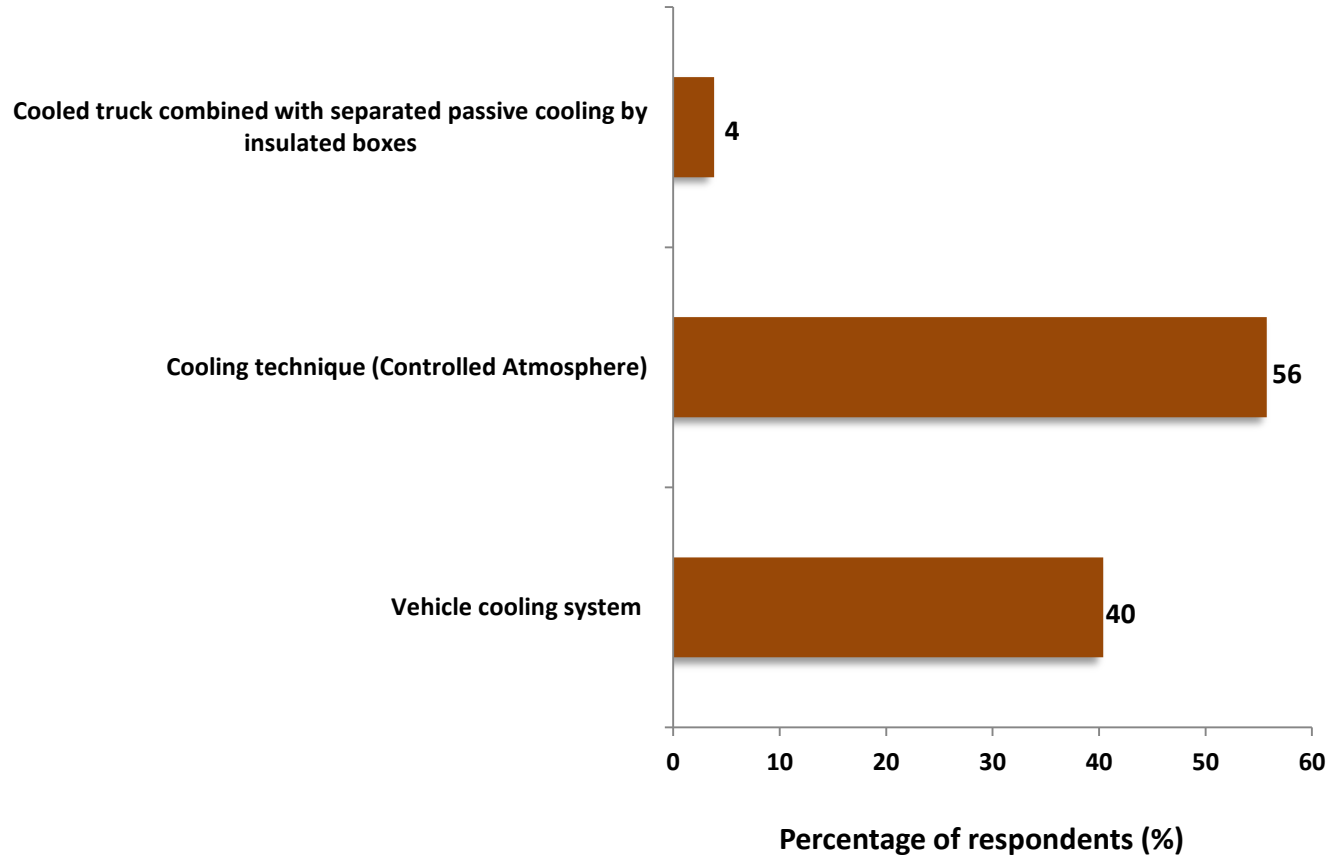


***NON-MEAT PRODUCTS* TRANSPORTED BY MEXICAN CARRIERS**



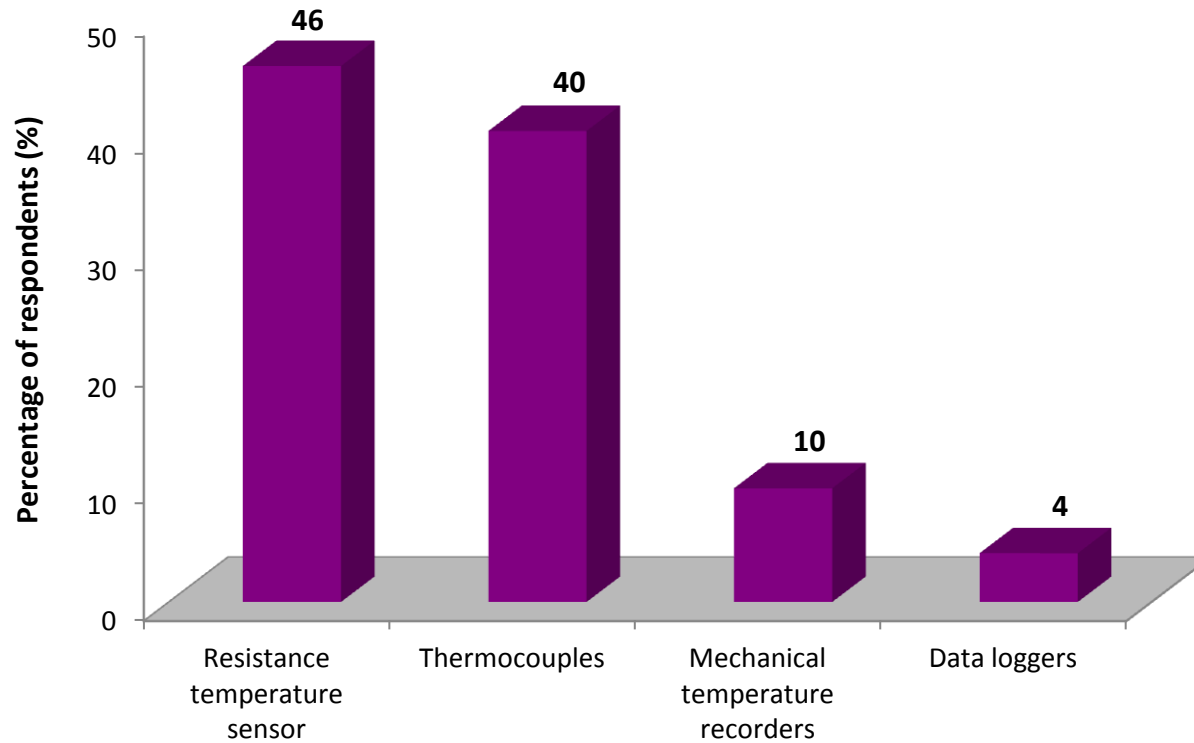


COOLING TECHNOLOGIES USED BY MEXICAN VEHICLES CARRYING MEAT





TEMPERATURE MEASUREMENT DEVICES USED IN MEXICAN VEHICLES CARRYING MEAT





TECHNOLOGY APPLIED TO MONITOR COLD CHAIN WITHIN VEHICLES CARRYING MEAT

| TECHNOLOGY | PROPORTION OF RESPONDENTS (%) |
|--|-------------------------------|
| Continuous control with electronically data logger | 53.4 |
| Continuous control with Wireless systems | 17.8 |
| Measurement of central temperature (random samples) | 11.0 |
| Measurement of surface temperature (random samples) | 8.2 |
| Tactile sensors for determination of door opening time | 4.1 |
| Time-temperature indicators | 4.1 |
| None | 1.4 |



CONCLUSIONS

- Transport of meat and meat products is done in large loads and over long distances
- Some carrying companies have own vehicles and cooling systems adequate for maintaining the cold chain
- Some improvements could be suggested in monitoring cold chain within vehicles
- Transportation of meat and meat products is not specialized as vehicles that carry meat also carry other goods



Thank you

Questions?



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