Germs in Your Car Driving You Crazy?

technical article

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The purpose of this project was to determine the relative numbers of bacteria and molds in automobiles. Several variables were considered including different areas of the vehicle, type of vehicle, whether there were children involved with the vehicle, geographic location, married or single drivers, and male or female drivers.

Methods

One hundred total vehicles were tested in Illinois, Arizona, Florida, California and Washington D.C. There were 11 sites tested inside each vehicle. Sites were sampled with sterile transport swabs (Becton Dickinson, Sparks, MD) and sent overnight packed in an ice chest to the University of Arizona and processed. Approximately four sq. inches was sampled at each location.

Sites sampled in each vehicle

1. Steering wheel
2. Radio knob
3. Dashboard
4. Door handle
5. Seat
6. Children's car seat
7. Change holder
8. Window opener
9. Cup holder
10. Seat belt
11. Food spill

Results and Discussion

Who has the germiest automobile? Who has the cleanest automobile? A married female living in Florida had the germiest automobile. The cleanest automobile was a single male living in Arizona. Married individuals and females have the germiest automobile, and of the cities tested, Tampa, Florida ranked highest in average bacterial numbers. Single individuals and males had the cleanest automobiles. Arizona had the lowest bacterial numbers. People living in Tampa had ten times more bacteria in their automobiles than people living in Tucson, Arizona.

The average number of bacteria according to the site were also sampled. The radio knob had the least amount of bacteria and food spills sampled had the highest number of bacteria. This suggests that bacteria grow in food spills in the car. Unexpectedly, since it is not often utilized, the dashboard consistently had the second highest number of bacteria. The high number of bacteria on the dash board may reflect the movement of air over the dashboard. Air is draw in from the dashboard and bacteria may be impacting the dashboard as the air is drawn in to the air circulation system. The other possibility is that this is the warmest spot in the automobile, i.e., the sun shines directly on the dashboard most of the day. Overall bacteria numbers ranged from <10 to 8.0 x 105 CFU/ 4 sq inch. The dashboard food spills had ten times more bacteria than the radio knob or the seat belt.

More bacteria were isolated in Vans and SUV's than cars, which may reflect the greater numbers of people in the larger vehicles or perhaps greater occurrence of children in the larger vehicles.

As might be expected the greater numbers of bacteria were found in automobiles that carried children as passengers.

S. aureus was isolated on the steering wheel more frequently than on any other site. This stands to reason since it is in contact with the hands more than any other site.

The percent of automobiles in which S. aureus and MRSA were found was also determined. MRSA was isolated from a car seat and steering wheel. MRSA was isolated in 2% of automobiles tested.

A list of the molds identified from automobiles and the number of times they were isolated was also compiled. Members of the genus Aspergillus were the most common molds identified.

Molds Identified in Automobiles

Genus of Mold Identified	Number of times Identified
Aspergillus	37
Ulocladium	5
Alternaria	5
Penicillium	4
Geotrichum	2
Chrysosporium	2
Trichoderma	1
Aureobasidium	1
Geomyces	1
Chrysonilia	1

The isolation of molds was highest in Chicago and the least in Florida. The occurrence of molds was almost 15 times greater in Chicago than in Tampa. The occurrence of molds in automobiles was found to be directly related to the mean temperature of the city in which the automobiles occurred. The lower the mean temperature of the city the greater the number of molds in the car.

The number of bacteria was found to be related to the mean average monthly rainfall for each city studied. This may be a reflection of the longer survival of bacteria in moist environments. Greater number of bacteria also appeared to be related to warmer temperatures since the greatest number of bacteria where isolated in automobiles from Florida which had the average annual warmest temperature of all the cities studied.

Conclusions

I. Married people have more bacteria in their cars than single people

II. Females have more bacteria in their cars than males

III. Automobiles with children have more bacteria than without children

IV. Cities with the most bacteria in automobiles from cleanest to dirtiest

1. Tucson
2. Oakland/Pleasanton
3. Chicago
4. Washington D.C.
5. Tampa

V. Individual sites in order of numbers of bacteria isolated

1. Radio knob
2. Seat belt
3. Window Opener
4. Steering wheel
5. Car seat
6. Change holder
7. Seat
8. Cup holder
9. Dash board
10. Food spill

VI. Vehicle type in order of number of bacteria isolated

1. Vans
2. SUV
3. Car

VII. Sites where S. aureus was found from the least amount to the most

1. Seat
2. Change holder
3. Door handle
4. Food spills
5. Radio knob

6. Car seat
7. Window opener
8. Dash board
9. Cup holder
10. Seat belt
11. Steering wheel

VIII. MRSA was isolated in 2% of the automobiles

IX. Sites with the most mold from least to most

1. Seat belt
2. Window opener
3. Door handle
4. Radio knob
5. Car seat
6. Seat
7. Steering wheel
8. Dash board
9. Change holder
10. Food spills
11. Cup holder

X. The greater the mean temperature of a city the greater the number of molds isolated in the automobiles.

Xl. Florida had the highest overall numbers of bacteria, while Arizona the lowest. Florida also had the highest annual rainfall and mean annual average temperature. Thus, bacterial numbers are probability related to a combination of high humidity and temperatures.

XlI. Aspergillus species were the most common fungi isolated in automobiles.

Technical Details

The numbers of heterotrophic bacteria (HPC) were determined on R2A media (Difco, sparks, MD) using the spread plate method. Samples were diluted using physiological saline for assay of 10-1 thru 10-3 dilutions. All dilutions were assayed in duplicate. The plates were then incubated at 30 degrees C for 5 days.

Molds were assayed on Sabouraud dextrose agar (Difco, Sparks, MD) containing 50 mg/L

chloramphenicol. Samples were incubated at 30 degrees C for up to 14 days and colonies counted. Molds were isolated and put onto MycoVue (Hardy Diagnostics, Mesa, AZ) slide culture system. Identification was obtained based on macroscopic morphology and microscopic examination of hyphae and spore morphology.

Staphylococcus aureus was assayed on Tryptic soy Agar amended with 5% sheep blood (TSA), 10 mg/L colistin, and 15 mg/L naladixic acid using the spread plate method (Chapin and Murray, 1999). The agar plates were incubated at 35 degrees C for 24-48 hours. b-hemolytic colonies were isolated and passed onto unamended TSA plates and incubated at 35 degrees C for 24-48 hours. Gram positive cocci, catalase positive, tube coagulase positive, slide coagulase positive and polymixin B resistant colonies were then placed onto MRSA CHROMagar (Becton Dickinson, Sparks, MD) to confirm as Methicillin resistant S. aureus (MRSA).