The Life Of Cheese

Barcoding Investigation of Fungal Growth on Popularly Consumed Cheeses

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Abstract

We investigated fungal growth on the cheese that we consume everyday. Our goal is to learn and become more aware of which cheeses are safest to consume . In addition, harmful bacteria, such as listeria, brucella, salmonella and E. coli, can grow along with mold. Mold generally can't penetrate far into hard and semisoft cheeses. I am helping my community by discovering which type of cheese grows more fungus. As well as making our peers more aware of which types of cheeses require more careful storage as to avoid fungal growth.

Introduction

Cheese making is a process that has been used since ancient times. It's a useful method in preserving the nutrients found in cow and goat milk. In class we created on experiments to investigate the effect of fungi growing in cheese, during this experiment we identified the different fungi present in the cheese bought at our local super markets. Fungi and molds that grow on food can release poison into the food and make it dangerous to consume. The type of fungus find in cheese, however is harmless for the most part. By doing this experiment we learned many ways fungus can be used in the creation of our cheese. We also discovered how fungus gives each cheese its different taste and texture.

Materials

Cheddar Cheese	Thermal Cycler
Muenster Cheese	10ul Tips
American Cheese	100ul Tips
Mozzarella Cheese	1000ul Tips
White Racks	Roll Of Tape
Water Bath	Gray/Yellow Micropipette
Styrofoam rack for water	Plastic Beakers
Thermometer	Sharpies
E-gel power kit	E-gel
UV Box	Microcentrifuge

Methods

To collect the samples for our experiment we bought our cheeses from a supermarket in the area. From there we collected 3 different cheeses from 3 different brands. By doing this we were able to keep the data as accurate as possible in regards to what fungi are present in what cheeses. Upon collecting the samples labeled the types of cheese we use put them in an airlock bag and place them in containers according to what brand they come from. Once sent to the genetics lab and analysed, we made data tables listing the fungi present in each cheese across different brands. Also to avoid contamination of the samples we wore wearing plastic gloves.

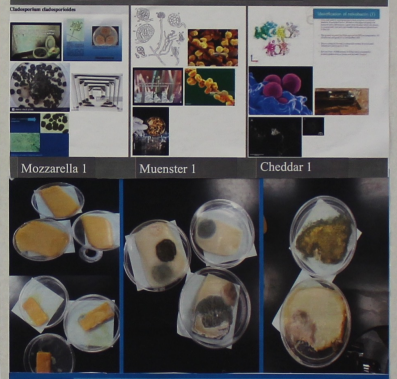
American Cheese

1(1).	gi|392570|emb|AJ004813	Penicillium commune - 5.8S ribosomal RNA region	591	1067	0.0
2(2).	gi|3925728|emb|AJ004814	Penicillium camemberti - 5.8S ribosomal RNA region	591	1067	0.0
3(3).	gi|18784378|gb|EU664481	Penicillium camemberti - 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence	591	1067	0.0
4(4).	gi|2590183381|gb|GQ458026	Penicillium commune - 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence	591	1067	0.0
5(5).	gi|169639291|gb|EU497946	Penicillium camemberti - 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence	591	1067	0.0
		Penicillium commune - 18S ribosomal RNA gene, partial sequence; internal transcribed			

Cheddar Cheese

1(1).	gi|18252598|gb|AF459728	Eurotium herbariorum - 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence	555	794	0.0
2(2).	gi|53034170|gb|KF367458	Eurotium sp. - ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence	555	794	0.0
3(3).	gi|33007829|gb|GU054228	Unscultured fungus - internal transcribed spacer 1, partial sequence; 5.8S ribosomal RNA gene, complete sequence; and internal transcribed spacer 2, partial sequence	555	794	0.0
4(4).	gi|33007830|gb|GU054228	Unscultured fungus - internal transcribed spacer 1, partial sequence; 5.8S ribosomal RNA gene, complete sequence; and internal transcribed spacer 2, partial sequence	555	794	0.0
5(5).	gi|357143099|gb|KF800105	Unscultured fungus - 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence	555	794	0.0
		Unscultured fungus - 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and			

Results



Tables and Figures

Mozzarella Cheese

1(1).	gi|353917|emb|AJ003035	Cladosporium cladosporioides - gene, partial; internal transcribed spacer 1 (ITS1), internal transcribed spacer 1 (ITS1), strain CBS 169.34	563	998	0.0
2(2).	gi|29668705|gb|GU559748	Cladosporium sphaerospermum - 18S ribosomal RNA gene, internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, and 28S ribosomal RNA gene, region	553	998	0.0
3(3).	gi|53034170|gb|KF367458	Cladosporium sp. - 18S ribosomal RNA gene, internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and large subunit ribosomal RNA gene, partial sequence	553	998	0.0
4(4).	gi|182415172|gb|EU167562	Cladosporium sp. - small subunit ribosomal RNA gene, internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and large subunit ribosomal RNA gene, partial sequence	553	998	0.0
5(5).	gi|3657691|gb|JN656298	Cladosporium cladosporioides - 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence	550	993	0.0
6(6).	gi|3547203|gb|LF299126	Unscultured fungus - 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene	553	993	0.0

Muenster Cheese

1(1).	gi|50784727|gb|KC692212	Aspergillus proliferans - 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence	540	904	0.0
2(2).	gi|37786146|gb|AY213649	Eurotium rubrum - 18S rRNA gene, partial sequence; internal transcribed spacer 1, 5.8S rRNA gene, and internal transcribed spacer 2, complete sequence; and 28S rRNA gene, partial sequence	511	902	0.0
3(3).	gi|220029606|gb|FJ471617	Aspergillus sp. - ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence	511	902	0.0
4(4).	gi|18252598|gb|AF459728	Eurotium rowlegiaeum - 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence	511	902	0.0
5(5).	gi|158533192|gb|EF652047	Eurotium herbariorum - 71 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA	511	902	0.0

Discussion

Our results served to answer our questions because we were looking to uncover which cheeses have preservatives in them, causing them to grow less fungus and mold, and which do in fact grow fungus and mold easily, indicating that it's healthier to eat.These finding ments that we have and can share more knowledge on what type of cheese is safer to eat.

Our results show that cheddar cheese and american cheese didn't grow any fungus, and are therefore more ridden with preservatives. The mozzarella cheese grew the most mold, indicating that it was freshest. This was also due to the moisture (liquid milk) present in this particular type of cheese. The muenster cheese grew the second most amount of fungus and mold, indicating that it too is a healthy cheese to eat. We do not recommend consumption of sliced american cheese (as found in our school cafeteria), or cheddar cheese, because these cheeses may contain unhealthy amounts of preservatives in them that prevent natural molding processes when left unrefrigerated.

References

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