

The effect of toilet cleaning products on e-coli essay sample



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1. 1. 0 Experimental design

1. 1. 1 Focus question- Is the bacteria Escherichia coli (e coli) adversely affected (killed) by King white cleaning products.

1. 1. 2 Hypothesis – King White toilet cleaner will most adversely affect (kill) the bacteria Escherichia coli (e coli) to the highest degree when compared to a range of toilet cleaning products.

1. 1. 3 Theory- Escherichia coli (E coli) are bacteria which causes severe stomach cramps and diarrhoea. It is the leading cause of bloody stools and in older people/younger children certain strains of e coli can be fatal (Family doctor, pg 1, 2008). E coli are common bacteria in humans and some mammals. It is vital in the body as it produces vitamin K as a by-product and is generally a harmless pathogen providing that it remains within the large intestine. However its bi-product becomes negatory when e coli move into other diameters of the body such as the stomach.

The bacteria are most commonly transmitted by consuming tainted meat, contaminated water, and raw milk and between cattle workers. However the bacteria may also be transmitted by unhygienic bathroom practise (Pinkster E, pg 1, 2007). E coli is found in human waste which is passed through bathroom toilets, hence some of these e coli bacteria may contaminate bathroom surfaces. From a combination of contaminated surfaces and unsatisfactory hygienic practise the bacteria can be transferred from person to person. To minimize the transmittance of e coli from person to person in bathrooms many toilet cleaning agents have been developed. These come in many brands and varieties boasting characteristics such as fresh smells or

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longevity. But a common feature with all toilet cleaning products is that they remove harmful germs. Bacteria divide by the process of binary fission. In this process the bacterial DNA strand is replicated and then the cell is split, resulting in two identical cells. However this process of replication is highly susceptible to mutation (Daviddarling, pg 1, 2008).

The growth of bacterial cells can be inhibited by two processes. The first by cellular death (that the bacteria is literally killed by substance e. g. arsenic causes the cell membrane/wall to breakdown resulting in osmotic implosion). The second process is the inhibition of bacteria enzymes which result in an inability to reproduce, hence limiting growth. Both of these processes would result in a limited bacteria population (John. L, pg 1, 2008). Different toilet cleaning products ability to perform either of these growth inhibiting processes will be examined.

The effectiveness of these toilet cleaning products will be compared against two controls. One which is known to always inhibit e coli growth and one which is known not to effect e coli growth. In this case bleach and water respectively (Institute of infectious disease, pg 1, 2009). To test the effectiveness of these different agents the Kirby-Bauer test will be used. This test allows different substances to be tested on the same colony of bacteria to examine the effect of the different substances on the bacteria (Xing. Q, pg 3, 2004). By this process the effectiveness of a range of toilet cleaners can be compared against a known decontaminate and also against each other. Different diameters correspond to different levels bacterial susteptability. These are 10mm or less being resistant, 11mm-15mm being intermediate and 15mm+ being susceptible. (A Olsen, pg 1, 1995)

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Hence the effectiveness of toilet cleaning products at removing e coli bacteria can be examined; additionally the effectiveness of the individual brands can be examined. In the Bauer test diameters affected by the substance shall have a lighter complexion to its surroundings. The larger the affected diameter the more effective the substance. In short this experiment will examine whether toilet cleaners are effective for removing e coli, and if so which brands are most effective at the task. Consumers could use the data from this experiment to make informed decisions on their toilet cleaning purchases.

1. 2. 0 Controlling variables

1. 2. 1 Controlling variables (table 1)

Variable identified

Type of variable

Method for control

Toilet cleaning product used

Independent

The effect of different toilet cleaning products on the depended variables shall be examined. These products shall include...

-King white

-Toilet duck cleaner

-Home brand toilet cleaner

-Harpic toilet cleaner

With bleach and water as controls.

Effectiveness of cleaning product

Dependent variable

Whether the product has any effect or not shall be recorded. If the substance creates a zone of inhibition then the effect diameter shall be a lighter complexion than its surroundings.

Diameter of zone of inhibition

Depended variable

The larger the diameter of the zone of inhibition the more effective the cleaning product. The diameter of the zone of inhibition shall be recorded if the substance has any effect on the growth of e coli. The diameter shall be measured using a 30cm/300mm + 0.1cm/1.0mm

E coli strain

Uncontrolled variable

All of the e coli shall be sources for the same diameter, however due to the mutagenic properties of bacteria it cannot be insured that all the strains are static.

Bacteria growth Mechanism

Controlled variables

The bacteria will be grown in a nutrient agar plates. Agar plates shall be placed in a incubator.

Time allowed for bacteria growth/inhibition

Controlled variables

The bacteria will be allowed to grow for 24 hours. The growth (and the effect of the substances on this growth) will be examined after this time period.

Method for the preparation of e coli on agar plates

Controlled variable

E coli will be spread over the agar plate using a glass spreader.

Measuring apparatus

Controlled variable

The diameter of individual affected diameters shall be measured using the (mm) side of a 30cm ruler

Decontamination of apparatus

Controlled variable

To avoid the decontamination of the agar plate the glass spreader/tweezers will be heated using a Bunsen burner before each repeated use. The glass spreader will be coated in methylated spirits.

Replications

Controlled variables

Each different substance shall be tested using the same body of e coli five times. To be conservative each substance shall occur once on each agar plate. In short five agar plates shall be used.

Position of substance samples on agar plate

Controlled variable

The substances shall be placed in a circle shape between the centre and circumference. This will allow equal diameter for each sample.

Human contamination of samples.

Controlled variables

To avoid human contamination various controls will be employed. Gloves will be worn to prevent contact contamination, the lids of the agar plates shall be kept sealed whenever possible, additionally the experimenter should keep their face as far from the sample as possible to avoid oral contamination.

Atmosphere of growing conditions

Controlled variable

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Samples shall be placed into an incubator keeps temperature and humidity at a constant level.

Volume of cleaning product used

Controlled variable

(The volume of cleaning product used will be whatever is necessary to soak a paper disk.

1. 2. 2- Control experiment - A positive control which always inhibits e coli growth will be used (bleach), and a negative of control which never inhibits e coli growth will be used (water)