



## **Perceptions of cleanliness, hygiene and hygiene issues – a survey of UK and US media coverage 1989 to 2017**

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### **Summary**

The review covers 3 decades of media coverage about hygiene and cleanliness in home and everyday life, and the surrounding issues. In all 54 media articles published between 1999 and 2017 were analyzed together with consumer feedback, where available. The review illustrates the considerable amount of inaccurate or misleading reporting of this issue and suggests it is a significant cause of public misunderstanding and mistrust about infection risks and the importance of hygiene. It also shows how inconsistent or misleading terminology is likely to have contributed to the confusion. Of concern is the fact that many of the inaccurate statements were included as “expert quotes”. In the UK it is estimated that 84% of the adult population read a newspaper (either print or online).<sup>i</sup>

#### **Microbes in homes and everyday life and infection risks**

Most of the 18 articles on this issue (12/18) emphasized the large numbers of microbes typically found in the home. Numbers quoted ranged from 100s to 1000s to millions per sample area – but most did not say that finding large numbers is quite normal.

Terms used for microbes were mostly germs (10/18 articles) or bacteria (11/18). For many people germs means harmful microbes. Only 4 articles mentioned that the germs/microbes identified were not usually harmful to health. Some articles claimed the microbes/bacteria were actively growing on surfaces

More than half (10/18) used sinister terms implying that the microbes are undesirable and should be eliminated, including terms such as disgusting, hidden, dangerous, deadly, etc. A few articles were explicitly scaremongering e.g: “My dishwasher is trying to kill me! ‘Deadly bacteria found”, “The kitchen sponge is 200,000 times dirtier than a toilet seat - and could even lead to paralysis”,

#### **The importance exposure to microbes and the immune system**

Analysis of 36 articles illustrated the misleading nature of the media coverage – in particular its failure to reflect the significant advances in scientific understanding of this issue, and their implications for hygiene.

Most articles (75% of 36) talked about exposure to “dirt and germs” (dirt 21, germs 18) as good/ necessary for building a “healthy” immune system. In recent articles, benefits of exposure to dirt, soil or through gardening has become a key theme. Apart from 2 articles, journalists again talked about ‘germs’ without explaining whether this meant ‘harmful microbes’ or ‘any type of microbe’, although data in Table 1 shows the extent to which media articles imply that ‘germs’ are ‘dangerous’. This is critical because it is the fundamental difference between the hygiene hypothesis which is no longer supported (that too much hygiene and cleanliness has reduced exposure to infectious microbes), and the, now widely accepted Old Friends Mechanism (that lifestyle changes have reduced exposure to the diverse range of mostly non harmful microbes in our animal and natural environment). Since many people see germs as “harmful microbes” and 50% of articles made reference to the “hygiene” hypothesis, it seems likely that journalists are still convinced of the former interpretation - the importance of infection exposure.

Overall, 30/36 articles (83%) mentioned home cleanliness or personal cleanliness as the, underlying cause of reduced vital microbe exposures. This is despite the fact that, from about 2005 onwards, as featured in 15 (42%) of articles, data were showing that lifestyle factors such as less outdoor activity/farm living, increasing C-section births, reduced breastfeeding, altered diet, overuse of antibiotics etc are the most probable causes. However, even then, 13 of these 15 articles also included references implying that “home cleanliness or hygiene” as an important underlying “lifestyle change.” In 77% of the 36 articles, the idea of a link to household cleanliness was reinforced by inclusion of the terms dirty, clean or hygienic in the headline.

The concept of home cleanliness as an underlying factor was further reinforced by the fact that 23/36 (64%) articles made reference to use of antibacterials, hand sanitizers etc as a contributory factor to reduced microbial exposure. The fact that this is still being quoted, despite lack of evidence, is a concern but may relate to the finding that, in 14 out of 23 articles, this was quoted as the opinion of an expert.

### **Impact on consumer understanding**

The extent of the misunderstanding and misconceptions about cleanliness, hygiene and antibacterial/disinfectant products in the mind of the public is illustrated by their responses to the media articles.

Public responses to ongoing articles about the “dangers” of the large numbers of ‘germs’ in their homes illustrate the scepticism which the content aroused. Many responders did not believe what they were being told, otherwise “how come we are not constantly sick”. A number concluded the scaremongering is “just to get us to buy unnecessary antibacterial products”.

Analysis of **responses** to articles about reduced microbe exposure and allergies etc suggest that the public (and journalists) still believe that the problem lies in lack or exposure to harmful microbes/germs and that, since germs are largely associated with dirt, then too much household cleanliness is the underlying cause. The report sets out the possible reasoning for this misinterpretation based on public understanding of the principles of vaccination, namely that challenge from harmful microbes/germs is needed to make the immune system strong enough to fight not only germs – but also harmless agents like pollen etc. The public do not grasp that, unlike infectious microbes, the immune system

requires programming (through exposure to Old Friends microbes) to ensure that it does NOT attack allergens. If germs are mainly associated with dirt, then the mistaken idea that too much home cleanliness and antibacterial use is the problem is a logical conclusion.

Growing understanding of the importance of the microbiome to our health has fundamental consequences for hygiene because it poses the question “how can we develop lifestyles which sustain exposure to the right sort of microbes, whilst at the same time protecting against those that cause disease?” When journalists asked experts what advice they would give people to increase their exposure to ‘good’ microbes, recommendations included more outdoor activity, getting outdoors and getting dirty, fondling pets and avoiding antibiotics where possible. Worryingly, in some cases, it included advice expected to increase the risk of infection – including not washing hands.

**Conclusions** - Across the world, health agencies recognise the need for greater emphasis on infection prevention as a central pillar in the fight against infection, including infection prevention through hygiene in home and everyday life. One of the current drivers for promoting hygiene, is the fundamental part it now plays in global strategy to tackle antibiotic resistance. This report illustrates the common misconceptions about hygiene which have developed, which threaten to undermine efforts to promote higher standards of public hygiene. The extent to which this has occurred suggests that hygiene behaviour change is unlikely to happen unless we also work to change public hygiene perceptions.

Although the responses recorded here do not necessarily represent a true cross section of consumer opinion, it highlights the need to do further studies to elucidate what consumers understand about how infections are spread and the role of hygiene. Also to find out where consumers get their knowledge, and to what extent media reporting contributes.

There is need to develop consistent and more accurate public messaging to ensure firstly that people better understand the issues, and secondly that advice about sustaining exposure to vital microbes through appropriate lifestyle does not conflict with vital hygiene messages such as those about handwashing<sup>1</sup>

## Methodology

The media coverage covers the years 1999 to 2017, For each media article, relevant points were extracted and analyzed and are summarized in Appendix 1, 2, and 3 which contain the following:

1. Ongoing coverage related to microbes and infection risks in home and everyday life
2. Ongoing coverage related to the so-called hygiene hypothesis
3. More recent coverage on the importance of the human microbiome to health

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<sup>1</sup> These issues are addressed in more detail in a 2017 white paper sponsored by the International Scientific Forum on Home Hygiene: Containing the burden of infectious diseases is everyone’s responsibility. A call for an integrated strategy for development and promotion of hygiene behaviour change in home and everyday life

In some cases, examples of consumer opinion feedback have also been extracted.

The articles were analyzed and results tabulated in Tables 1, 2 and 3. Table 4 and 5 summarize of some of the responses to the articles set out in Appendix 1, 2 and 3.

## Results

### Section 1 Microbes and infection risks in home and everyday life

Extracts of media articles about microbes found in the home and possible infection risks in home and everyday life are set out in Appendix 1. Findings are summarised in Table 1

<b>Table 1 Analysis of 18 media articles about microbes in the home and the potential health risks covering 1998-2017</b>	
<b>Of the 18 articles:</b>	<b>Number in parentheses represents numbering of article in appendix 1 e.g 1.1, 1.2 ---</b>
Most (12/18) emphasized numbers typically found on surfaces Numbers ranged from	huge (14), whopping (18). staggering (9,12), shocking (14)  100s to 1000s to millions up to 4 billion.
All but 4 did not say that finding large numbers is quite normal.	These 4 articles said: “microbes were “usually harmless” (9) “did not mean they were harmful to health” (2,5,6) “implied only some were pathogens” (11)
More than half (10/18) used sinister terms to refer to what was found	where germs lurk (1,5), harboured (2,9,12,16), disgusting germs (16), hidden bugs (8) dangerous place/germs (4,5), nasties(9), deadly bacteria (3), potential killer bugs (4), potentially fatal (9) wage warfare (1.15), yuck (9), full of germs (17), secretly harbouring a world of filth (15), bugs waiting to get us (1).
Some (8/18) claimed microbes were actively growing	“a breeding ground” (3,4,5,10, 12,14,17), “Reservoir” (9)
Many (10) rated risk on surfaces in relation to the toilet seat	Articles (2,5,6,7,8,12,15,16,17,18) rated there were more bugs/germs/bacteria on the surface than on a toilet seat. Figures ranged for 40x more up to 200,000x.
A variety of terms were used generically to refer to microbes	microorganisms (2), bugs (1,10,11), germs (1,2,6,7,9,11,12, 14, 16,17), bacteria (2,3,4, 5,6,7,8,9,11,14,16). 8 articles used terms germs and bacteria interchangeably within the same article (2,5,7,9,11,13,14,17). Viruses (9), mould (4.5) fungi (9,12) and yeasts (12) also used.
Some named potentially harmful organisms which might be, or were found in the home e.g Salmonella (4,8,10,11,12,14), Campylobacter (8), Listeria (4), E. coli (9), staphylococcus (2). Some used the terms like “may be” “could be”, “are potentially harmful” and gave advice on how to deal with risks - but some exaggerated the risk. e.g:	
<ul style="list-style-type: none"> <li>• My dishwasher is trying to kill me! Deadly bacteria found. Dishwashers are a breeding ground for potentially killer bugs <b>(3)</b>.</li> <li>• Most dangerous place in the fridge? - 8,000 bacteria every sq cm. Potentially killer bugs such as E.coli, salmonella and Listeria are among those found. (4).</li> <li>• Kitchen sponge is 200,000x dirtier than a toilet seat - and could even lead to PARALYSIS <b>(6)</b>.</li> <li>• From bathroom floor to sink drain and even the light switch, your bathroom is secretly harbouring a world of filth you know nothing about. A new infographic has created a</li> </ul>	

- map to help identify where germs love to lurk and help you to banish the bugs (15).
- THE GERMINATOR This is the surprising household item harbouring 200 TIMES more dangerous bacteria than a loo seat (18)

Most articles (12/18) emphasized the large numbers typically found, by using the terms huge, whopping, staggering, shocking. Numbers of microbes quoted ranged from 100s to 1000s to millions up to 4 billion per sample area. Only 4 articles mentioned that the microbes are not usually harmful to health. None mentioned that some microbes may be beneficial.

Terms most often used to refer generically for microbes were germs (10/18) and bacteria (11/18). In 8/18 articles the terms germs and bacteria were used interchangeably within the article. Other terms used were microorganisms (2), bugs (3), viruses (1), mould (2) fungi (2) and yeasts (1). Some articles claimed the microbes/bacteria were actively growing on surfaces – i.e. described them as a breeding ground. This is despite the fact that microbes cannot grow on dry surfaces

More than half (10/18) used sinister terms to imply – either directly or by subtle implication - that the microbes are undesirable by using terms such as - where germs lurk, disgusting germs, hidden bugs, dangerous place/germs, nasties, deadly bacteria, potential killer bugs, potentially fatal, secretly harbouring a world of filth, waiting to get us etc..

Terms most often used to refer generically for microbes were germs (10/18) and bacteria (11)/18. In 8/18 articles the terms germs and bacteria were used interchangeably within the article. Other terms used were microorganisms (2), bugs (3), viruses (1), mould (2) fungi (2) and yeasts (1). Some articles claimed the microbes/bacteria were actively growing on surfaces – i.e. described them as a breeding ground. This is despite the fact that microbes cannot grow on dry surfaces

Half of the articles rated surfaces on the basis that there were 100s-1000s more bugs/germs/bacteria present than on a toilet seat. Why journalists are so obsessed with this is unclear. But it was possibly intended to arouse feelings of disgust and anxiety, because toilet seats would be seen as the most disgusting/dirty surface in the home. Seven articles used the term “dirty” to indicate microbes were present and “clean” to mean that were not. Only 4 used the term “hygiene” to talk about preventing spread of microbes

In some articles, potentially harmful species which might be, or were found in the home, were named e.g Salmonella (6/18), Campylobacter (1/18), Listeria (1/18), E. coli (1/18), Staphylococcus (1/18). Some used the terms “may be”, “could be”, “are” potentially harmful, and gave advice on how to deal with risks - but some exaggerated the risk. e.g: “My dishwasher is trying to kill me! Deadly bacteria found. **Or** The kitchen sponge is 200,000 times dirtier than a toilet seat - and could even lead to paralysis **Or** “your bathroom is secretly harbouring a world of filth you know nothing about”.

## **Section 2. Media coverage of the so-called hygiene hypothesis and Old Friends Mechanism**

The hygiene hypothesis, first published 1989, suggested that rising levels of allergies in children was due to lack of exposure to childhood infections, partly due to decreasing family size – but also “improved household amenities and higher standards of personal cleanliness” However, from 1989 onwards, immunologists were realising that the necessary microbial exposure was not “infection” – but exposure to the diverse range of

mostly non harmful species which inhabit our animal and natural environment and that underlying cause was not “hygiene” but a range of lifestyle changes. This revised concept was named the Old Friends Mechanism.<sup>ii</sup>

Extracts of media articles related to this issue are summarised in Appendix 2. Findings are summarised in Table 2.

<b>Table 2. Analysis of 25 articles covering 1998 to 2017 related to the so-called hygiene hypothesis (numbers in parentheses indicate numbering of the article in the appendix 2 e.g 2.1, 2.2 ---)</b>
Of 25 articles, 20/25 consistently used the word dirty (4), clean (14) or hygienic (3) in the headline indicating that this was the key finding
14/25 articles made reference to the “hygiene hypothesis” as the underlying explanation for the rise in allergies etc. Referring to the type of microbial exposure which was lacking these were given as: <ul style="list-style-type: none"> <li>• Infection 7 (2,4,7,11,13, 22, 24)</li> <li>• Dirt and germs 19 (1,3,4, 5,6,8,10,12,13,15,16,18,19,20,21,22,24,25)</li> <li>• Beneficial microbes 2 (15,23)</li> <li>• 1 article (5) initially referred to need for infection exposure and then later made reference to need for beneficial non harmful microbes</li> </ul>
Looking at probable causes of loss of exposure to essential microbes, 34 statements within the 25 articles suggested or implied that home and personal cleanliness were key underlying causes - these included <ul style="list-style-type: none"> <li>• Too clean home environment 15 (3,4,5,6,7,8,9,10,12,13,14,15,19,20,21,22,24)</li> <li>• Too hygienic home environment 5 (1,2,6,7,13)</li> <li>• Sanitized, oversanitized home environment 3 (9,23,25)</li> <li>• Sterile home environment 6 (3,5,6,10,14)</li> <li>• Personal cleanliness (handwashing/bathing 5 (2,3,5,6,17)</li> </ul>
6 articles dating from 2012 onwards talked about the importance of lifestyle factors as underlying causes – specifically mentioned were : <ul style="list-style-type: none"> <li>• Clean or hygienic lifestyle 3 (15,16,21)</li> <li>• Clean world/sanitation and water etc 3 (11,22,23)</li> <li>• Antibiotic overuse 3 (21,22,23), farm living 3 (20,22,23), indoor living 1 (21), C-section 1 (21)</li> </ul>
Of 7 articles that mentioned lifestyle factors such as farm living, antibiotic overuse etc, 5 still implied that a fundamental cause was home cleanliness (15,16,20,21, 23),
Use of household cleaning and disinfectant products: 17/25 articles made reference to household products as an underlying cause of the loss of exposure to essential microbes – this included references to antibacterials 12 (1,3,6,9,12,13,15,18,19,20, 23, 24); disinfectants 1 (3); hand sanitizers 4 (17,19, 21, 25); household cleaners 2 (5,10)

Of 25 articles, 14 referred to the “hygiene hypothesis” as the explanation for the rise in allergies etc. Referring to the type of microbial exposure which was lacking, 7/25 talked about infection and 19/25 made reference to “dirt and/or germs” (13/25 dirt, 13/25 germs).

Despite that fact that the “hygiene” hypothesis concept has been replaced by Old Friends Mechanism, articles continued to imply that lack of exposure to infection/harmful microbes

were the underlying cause continued e.g references to infection as important (7/25), references to dirt and germs as important (19/25). Only 2 articles (15, 23) explained that key exposures were non harmful microbes

Talking about probable causes of loss of exposures, 34 statements within the 25 articles suggested that home and personal cleanliness were key underlying causes - these made reference to “too clean home environment (15/25), “too hygienic home environment” (5/25), “Sanitized, oversanitized home environment” (3/25), sterile home environment (6/25). personal cleanliness (handwashing/bathing (5/25).

From article 2.5 onwards, articles began to refer to lifestyle factors as likely underlying causes including clean or hygienic lifestyle (3), clean world/sanitation and water etc (3), antibiotic overuse (4); farm living (3); indoor living (21) C-section 1 (21). Of these 6 articles, 5 still tended to imply that the fundamental cause was home cleanliness (15,16,20,21,23) Overall 21/25 used the word dirty (4), clean (14) or hygienic (3) in the headline.

17 of the 25 articles referred to household products as an underlying cause of the loss of exposure to essential microbes – this included antibacterials (12) disinfectants (1); hand sanitizers (4) household cleaners (2). In 15 of the 25 articles which stated that use of antibacterials/disinfectants/hand sanitizers were an underlying cause, the opinion was reportedly given by an expert interviewed by the journalist

### Section 3 Media coverage on the importance of the human microbiome to health

Since 2000 we have seen the development of microbiome science which proposes that the human microbiome has a vital role in mediating interaction between Old Friends microbes and the immune system, and that sustaining a diverse microbiome is thus also important. This was accompanied by data showing that lifestyle factors are the probable underlying causes of the loss of microbial diversity of the microbiome. Extracts of media articles on this issue are set out in Appendix 3. Findings are summarised in Table 3.

**Table 3 Analysis of 11 articles covering 2014 to 2017 related to more recent media coverage prompted by research on the importance of the human microbiome to health (numbers in parentheses indicate the numbering of the article in the appdx 3)**

All 11 articles centred around the microbes inhabiting our bodies which are vital to health, referring to them variously as the microbiome 4 (3,4,9,10) populations of microbes 1 (2), naturally occurring bacteria 1 (1), friendly bacteria 2 (7,8) gut bacteria 2 (4,8) your own microbes 1 (4)

Three articles (5,6,11) made no actual reference to the microbiome although the source of the article was another article (5,6) or a book (11) about the microbiome

- Only 6 talked about the importance of diversity of the microbiome 1,2,4,7,8,9
- Five articles referred to the necessary exposures as germs 3,5,6,10,11

Diseases cited as being associated with depletion of the gut microbiome were: obesity 2 (1,2), diabetes 2 (4,6), immunity 3 ( 6,10 ,11), Allergies 4 (5,7,8,9), food intolerance 1 (7), “health” 2 (3,4)

Referring to possible causes of reduced biodiversity of gut microbiome, all 11 articles made reference to lifestyle factors as being underlying causes including:

- overuse of antibiotics 6 (1,2,3,4,8,9)

- C-section 5 (1,3,4,7,8)
- diet – “clean” food, insufficient fibre 3 (4,7,8)
- breastfeeding 2 (8,9)
- lack of exposure to animals 4 (4,7,8,11)
- lack of outdoor play 1 (9)
- small families, less exchange of microbes 1 (8)
- Eight articles referred to the importance of dirt, soil etc including filthy 1 (4), dirty 7 (4,5,6,8,9,10,11), soil 2 (7,9), gardening 3 (4,7,8), - although only articles 2 7,9 explained why i.e. that soil was a source of diverse good bacteria

All except 2 articles (7,8) made reference to overcleanliness of the home, use of antibacterial products and too much handwashing as probable contributory factors including

- modern germophobia 1 (3)
- too clean home environment 6 (1,4,5,6,10,11)
  - antibacterial usage 6 (1,3,4,5,6,9)
  - Hand sanitizer usage 3 (1,2,11)
  - too much handwashing 3 (4,5,6)

When experts were asked what advice they would give to families to increase their exposure to microbes in order to build a diverse microbiome. They were quoted as recommending the following:

- more outdoor activity 1 (9)
- getting outdoors and getting dirty 5 (4,7,8,9,11)
- fondling pets 3 (7,9,11) – including letting pets lick your face 1 (11)
- sucking a babies pacifier to clean it 1(1)
- Avoid antibiotics 3 (5,6,8)
- Not washing hands 4 (5,6,7,8)
- Clean less often 1 (8)

- 3 articles (3,5,10) made reference to the importance of building a diverse microbiome as supporting the hygiene hypothesis

All articles featured “new knowledge” about the importance of the human microbiome to our health, particularly its role in reducing risks of developing allergies and other immune disorders...

In talking about microbes inhabiting our bodies which are vital to health, articles referred to them variously as the microbiome (4) 3,4,9,10, populations of microbes (1) 2, naturally occurring bacteria (1) 1, friendly bacteria (2) 7,8 gut bacteria 2 (4,8) your own microbes (1) 4. Three articles (5,6,11) made no actual reference to the microbiome despite being sourced from another article (5,6) or a book (11) about the microbiome. Only 6 articles talked about the importance of diversity of the microbiome. Five articles referred to the necessary exposures as “germs”, the 2 articles by Dr Miriam Stoppard saying “We actually need 99.9% of household germs to prime our fledgling immune system”.

Referring to possible causes of reduced biodiversity of the gut microbiome, all 11 articles discussed lifestyle factors as being underlying causes including overuse of antibiotics (6), C-section (5), diet, “clean” food, insufficient fibre (3), not breastfeeding (2), lack of exposure to animals (4), lack of outdoor play (1), small families, less exchange of microbes (1). Eight articles, in addition to the factors mentioned above variously mentioned “good “ lifestyle



factors, particularly for young children, were getting dirty (7), filthy (1), contact with soil (2), gardening (3).

All except 2/11 articles (7,8) referred to overcleanliness of the home (6/11), use of antibacterial products (6/11), use of hand sanitizers (3/11) and too much handwashing (3/11) as probable contributory factors. In all but 2 of the 9 articles (3,4) the opinion that cleanliness or use of antibacterials etc was an important underlying cause was reportedly given by an expert interviewed by the journalist.

When experts were asked what advice they would give to families to increase their exposure to microbes in order to build a diverse microbiome, they were quoted as recommending the following:

- more outdoor activity (1) 9
- getting outdoors and getting dirty (5) 4, 7,8,9,11
- fondling pets (3) 7,9,11 – including letting pets lick your face (1) 11
- sucking a babies pacifier to clean it (1) 11
- Avoid antibiotics (3) 5,6,8
- Not washing hands (4) (4) 5,6,7,8

#### **Section 4 Public responses to media articles**

The following represents a digest of some of the comments posted by the public in response to media articles summarized in Appendices 1, 2, and 3. In general these follow a number of themes:

**Table 4 Scepticism about articles which talked about microbes in our homes**

Although media articles in section 1 set out to inform the public about microbes in the home – and many contained “tips” on good hygiene, there was strong emphasis on provoking a shock reaction i.e. they emphasized the large numbers typically found (1000s to millions up to 4 billion) and using sinister terms to imply – either directly or by subtle implication - that the microbes are undesirable and dangerous. The following illustrate that many readers were sceptical, believing that risks were being exaggerated:

- Calm Down!! : Virtually any moist surface will harbour germs and most bugs are found in environmental sites including washing machines, dishwashers, damp dishcloths etc. Although these sites harbour bacteria that does not inevitably mean they all present a serious risk of infection
- Since I have had the washing machine for about 15 years and the dishwasher around 5 years, they are certainly taking their time in trying to kill me
- As I am neither dean nor ill, I shall assume that this terrifying amount of bacteria is in fact nothing to worry about & will carry on as I have been up till now.
- Our homes teeming with all these evil bacteria and yet the vast majority of the population isn't crippled with food poisoning.
- Isn't it odd that entire households aren't dropping dead every day? All those deadly tea towels and chopping boards, not to mention the dish cloths.
- The point is this - there may be bacteria, but we rarely get sick from them, so these reports just distress the germ phones.
- It is ridiculous to get obsessive about our own bathrooms. Our skin has more bacteria on it, and we handle money - the filthiest stuff of all - without even thinking about it, and yet

we never seem to get sick from doing so. The only way to build resistance to bacteria is to be exposed to them.

- most 'germs', or more correctly, bacteria, are NOT harmful to us FACT - some are in fact very helpful, indeed essential for our life FACT - You would be dead if your body contained no bacteria - in fact your body, right now, has 10x as many bacteria as human cells - If you were never exposed to harmful bacteria, you would also be dead, as your immune system would never develop
- We must all be dead already. Pathetic whimpering and fear mongering.
- I very often wonder how the hell any of us survived before all this hysteria about sanitizing everything in sight set in!!

A common theme was – “if there are so many dangerous microbe around, how come I have lived so long/ never got sick” and “ The reason I did not get sick was because these microbes built up my resistance

- Most "working class " plebs like me who have reached our 70;s find these hygiene stories a joke. All these cleaning products only make matters worse by preventing people from building up a resistance to bugs. I wonder how many bacteria were on my mums pinafore that was used to wipe my face. I am amazed that people of my age and older have managed to reach this age without all the sprays wipes and dispensers.
- I've been on this planet over half a century, probably ate dirt as a kid, had my fair share of cheese and jam with green mould scraped off. I have never suffered food poisoning. Now I'm wondering if what I ate as a kid actually gave the body protection, I use chopping boards, give 'em a quick clean and still have had no adverse affects. Do gooders are making people susceptible to illnesses, rather than protecting them!
- OMG: I've been using the same filthy, uncleaned dishcloth for years; ditto my tea towel. Not to mention: eaten a reheated, pre-cooked sausage roll, left out overnight, and reheated, pre-cooked chicken, stored for two weeks in the fridge. And when I've dropped a crisp on the floor, I've simply taken the additional step of blowing the dust and hairs off. Never had food poisoning except as a child, staying at a small hotel.
- Cannot understand how we have managed to survive so far what with all the nasty things we can contract from everything we eat . Have they ever researched soap and water?

A number of people commented on the consistent need by the journalist of comparing contamination levels to those on a toilet seat:

- Why do these stories always compare to a toilet seat? It's been shown time and time again on TV programmes that the toilet seat is one of the cleanest places in the house.
- Well if we are doing a comparison in respect to where the largest number of “bugs” might be found should we not also include other human beings?
- How many bugs are in the air you breath all day every day!! Quick, everyone stop breathing!!! Why do these muppets keep comparing things to toilet seats

But one reader protested that readers were being totally insensitive to others less fortunate;

- Some of you might take the mick, but I have cystic fibrosis and already have one type of fungus growing on my lungs that cannot be eradicated. So whilst it might be ok for you, it's dangerous for others! Some tips in the article on how to get it rid of it could be useful!

### **Trying to scare us into buying antibacterial products**

A number of people pointed out that the articles were deliberate scaremongering, aimed at getting us to purchase unnecessary antibacterial products

- Shameless advert for entirely unnecessary cleaning products. The joke in our family is the one which claims to "kill 99.9% of germs dead". Being killed is not good enough, they have to be killed dead! The real joke is numbers. If there are 1,000,000,000 food poisoning bacteria on a chopping board - an entirely feasible if low number - and 99.9% are killed then 999,000,000 are left alive. This is more than enough to cause food poisoning. Bacteria are everywhere, get used to it. Most will not harm you because you should be immune. Good kitchen cleanliness, hot water and detergent is enough to prevent the more dangerous from harming
- All we need is soap and water. Stop writing articles that are ads. I know they're a money-spinner but most of us wash our hands well and don't need this overpriced muck. Stop scaremongering! How did our parents and grandparents cope, but they did.
- Is this scaremongering article sponsored by Reckitt Benckiser who manufacture Dettol?
- 'infographic' looks like an ad for dettol cleansing wipes- they're bound to 'big things up' if that's the case
- This will continue as long as the Mega-Companies that produce domestic cleaning materials are allowed to broadcast adverts implying that small children will be at risk if impressionable women who are usually totally clueless about science and mathematics do not use their products on a regular basis.

#### **Table 5 Too clean for our own good**

Articles promoting most comments were those in sections 2 and 3 which talked about the link between childhood exposure to microbes and risks of developing allergies. Many/most said that exposure to "dirt and germs" is important for building a strong immune system – otherwise children would grow up weak, weedy, sickly, prone to every ailment, neurotic, picking up germs more easily. Despite the articles being about allergies, only 2 articles also said "prone to allergies". People appeared to believe it was all about building a strong immune system enabling children to fight both infections and allergies i.e. they failed to understand the key message - that allergic reactions occur when the immune system "fights" rather than "tolerates" allergens':

- What a namby, pamby country we have become. No wonder kids are prone to every ailment going, they are not immune to anything.
- Articles such as these are the reason why there are so many children with allergies! They serve no purpose other than fuel and reinforce the germ paranoia many have developed.
- Dirty kids are healthy kids. Clean kids are weak and neurotic - like their mothers. To me it seems pretty obvious that if you bring a baby into your home then keep it germ free and keep the baby constantly wiped and clean its immune system will be so low it will pick up germs more easily. I think that children today do seem to pick up all kinds of bugs and colds much quicker than we ever did when we are growing up. I don't ever remember seeing my mum with wipes or sprays! My mum wiped down the counters and tables with the dishcloth from the sink, I almost never get sick! My mum never santized the shopping trolley or the table in the restaurant.
- It's fundamental - that's how basic immunization works, inject a small amount of the nasty, the bodies defence`s learn to deal with it. Check out her undersink cupboards before you select her to breed your children, guys, - if they`re full of product, run a mile or you`ll end up with a brood of poor sickly weak and whiney innocent little children!

- It's only by coming in contact with dirt, germs and viruses that our body can build up our immune system. I remember many years ago watching a TV programme about children who are brought up on farms with animals. These children had the highest immunity against almost everything because they were exposed from an early age.
- When I was a nipper and up to my neck in mud in the garden, my Nan used to tell my mother not to worry and "He'll eat a peck of dirt before he dies"..she knew the wisdom of not being over worried about cleanliness and that was without all the scientific clap trap.
- I shudder every time I see an advert in which an obsessively clean mother wipes down every possible surface with disinfectant to avoid her infant from eating anything which might just have come into contact with a speck of dust or a single microbe! Of course, human beings evolved alongside all these microbes and germs and mostly we achieve a natural immunity to all but the most virulent organisms.
- All this obsession with cleanliness is why people today have such weak immune systems. Particularly children. Weak and weedy, asthmatic and allergic to everything. Get dirty, build up the bugs, strengthen your immune system, Keep away from the antibiotics.
- Stop this clean mania! We as children are growing up in a house full with animals. We were all in a robust health without allergies and whatever. Many things today are much better than the past but on this case we have to look back and learn.

But one person said:

- My daughter is the only one in her class who washes her hands before school lunch - and often the only one not to catch stomach bugs and colds that regularly blight her friends' lives. But many in her class have allergies - so poor hygiene evidently doesn't guard against allergies.

Whilst another said:

- Well, I grew up near farms. And had lot of infections growing up. But I have some eczema, and autoimmune disease. One of my sisters has hay fever and many allergies.

### **Antibacterials reducing immunity and causing allergies**

These comments illustrate that some people believe that the main cause of "weakened immunity" is overuse of antibacterial products, although only one person actually mentioned this in the context of the rise in allergic diseases

- US food supply is way too sterile, and that is not good. To avoid a few illnesses and occasional deaths from food poisoning by sterilizing everything, we are probably killing thousands of people every year due to mutated bad bacteria (antibacterial soaps and overuse of antibiotics, especially in meat/chicken, and weak immune systems.
- Personally, I've always felt that the overuse of antibacterial wipes, soaps, etc. leads to a reduced immunity system. Theoretically, they'd work if we used them regularly on everything in the world. But to use them, and then constantly touch things filled with germs (money, stair rails, keyboards, etc.), seems at BEST a waste of time, and at WORST a way to ensure that we get the very diseases we are trying to avoid. I'm probably going to be one of those mom's that doesn't expect you to douse yourself in hand sanitizer before you hold my baby. But, no one did that before holding me when I was infant, and I'm still around to tell the tale.
- Antibacterials are way overused, and probably causing us harm, whether it's making allergies more common or leading to antibiotic-resistant bacteria. On the other hand, try not to generalize TOO much. my mom was way ahead of the curve on antibacterial things being at best a waste of time and at worst bad for you.

- The folks that sell all this anti-bacterial stuff are to blame. They have convinced us that germs are bad. I grew up in 70's. We left food out for hours, ran around barefoot, got cuts and scrapes and put nothing on them. I'm still alive and kicking. The only time I advocate extreme cleanliness is in food service, hospitals and shared work areas.
- Too much hygiene and not enough antibodies. How many people did you hear of with food poisoning 50 years ago ? ! !
- Anti-bacterial sprays should be banned; if we were a little LESS clean our immune systems would be stronger. They didn't exist when I was a child, and at 66 I rarely succumb to any illness. It is not essential to live in a clinically clean house.
- If it wasn't for all the antibacterial products in recent years then more people would build up their own immunity. I guess I'm lucky to be of a generation that was allowed to play out and get dirty when I was young.

## Discussion and conclusions

This review covers 3 decades of media coverage about hygiene and cleanliness in home and everyday life, and surrounding issues. In all 54 media articles published between 1999 and 2017 were analyzed. Analysis shows the considerable amount of inaccuracy in the reporting, which has failed to reflect advances in scientific understanding over this period. It also shows how inconsistent and misleading terminology has contributed to the confusion. Of concern is the fact that many of the inaccurate statements were included as “quotes from experts”. Public misunderstanding and scepticism about ‘germ risks’ and hygiene is illustrated by consumer’s feedback

### Microbes and infection risks in home and everyday life

Although articles summarized in Table 1 were intended to inform the public – and some included “tips” on good hygiene practice, most articles (12/18) emphasized the large numbers of microbes typically found, by using the terms huge, whopping, staggering, shocking. Numbers quoted ranged from 100s to 1000s to millions up to 4 billion per sample area – but what most did not say is that finding large numbers is quite normal.

Terms used for microbes were mostly germs (10/18 articles) and bacteria (11/18), and in many cases, the terms were used interchangeably. For many people germs means harmful microbes, but only 4 articles mentioned that the germs/microbes identified were not usually harmful to health. Some articles claimed the microbes/bacteria were actively growing on surfaces – i.e. described the surfaces as a breeding ground. This is despite the fact that microbes cannot grow on dry surfaces

More than half (10/18) used sinister terms to imply that the microbes are undesirable and should be eliminated, using terms such as disgusting, hidden, dangerous, deadly, etc. A few articles were explicitly scaremongering e.g: “My dishwasher is trying to kill me! Deadly bacteria found”, “The kitchen sponge is 200,000 times dirtier than a toilet seat - and could even lead to paralysis”,

### The importance exposure to microbes and the immune system

The hygiene hypothesis (first proposed in 1989) proposes a link between rising rates of allergy in children and reduced exposure of their developing immune system to “childhood infections”. From 2003 this simple concept was gradually replaced by a more plausible modification – the Old Friends Mechanism – namely that the necessary exposures (now seen as vital in preventing a wide range of immune-related diseases) were not infectious microbes, but the diverse range of mostly non-harmful species inhabiting our human, animal and natural environment.<sup>ii</sup> A key feature of this concept is that this diverse exposure is required to “programme” the immune system to “ignore” harmless agents like pollen etc, because attacking them causes allergies etc. A further finding in the 2000s is the vital role of the human microbiome in mediating interaction between Old Friends and the immune system, and that sustaining a diverse human microbiome is thus also important.

From the outset in 1989, because, it was proposed that “*improved household amenities and higher standards of personal cleanliness*” might be an underlying cause of the reduced infection exposure, the idea that we had become “too clean or too hygienic for our own good” became a constant theme in media coverage. The problem which this analysis shows, is that this simple idea of a link between cleanliness and allergies etc persists, and is still being repeated by the media. This may reflect the complexity of the subtle changes in the underlying science, but also the confused terminology used. It also reflects quotes from experts which are based on their opinions rather than scientific findings. Tables 2 and 3 summarize the content of 36 articles. A number of themes emerge which emphasize the misleading nature of the media coverage.

A strong theme throughout is the concept that exposure to “dirt and germs” is good/ necessary for building a “healthy” immune system, which, by association implies that the converse - cleanliness - must be “bad”. In all 75% of the 36 articles talked about exposure to “dirt and germs” (dirt 21, germs 18) as good/ necessary for building a “healthy” immune system. In the most recent microbiome articles (Table 3) benefits of exposure to dirt, soil or through gardening was a key theme - although only 3 explained why i.e. soil is a source of diverse good bacteria. That journalists used the term “dirty” to indicate microbes were present and “clean” is indicative of the close association which people see between dirt and germs. What was not mentioned is that e.g living plant and tree matter are also important sources of Old Friends exposure, and that much of the exposure whilst outdoors is from outdoor air which carries a diversity of bacteria, viruses, fungi, spores, pollen, leaf fragments and dust. This means gut exposure is partly mediated via the airways, from where it is transferred to the gut, or by touching plants or trees which would be considered as “clean”.<sup>ii</sup>

Again, persistent and widespread use of the word “germs”, is confusing, journalists using ‘germs’ throughout as a general term for the necessary microbe exposures, without any explanation as to whether they meant ‘harmful microbes’ or ‘any type of microbe’, although data in Table 1 shows the extent to which media articles imply that ‘germs’ are ‘dangerous’. This lack of clarity is fundamental because it is the key difference between the original hygiene hypothesis (that too much hygiene and cleanliness has reduced exposure to infectious microbes) and the now accepted Old Friends Mechanism (that lifestyle changes have reduced exposure to the diverse range of mostly non harmful microbes in our animal and natural environment). Only 2 articles explained that key exposures were non-harmful microbes. Since it is likely that many readers would interpret germs as “harmful microbes”

and the fact that 18/36 (50%) of articles make reference to the “hygiene” hypothesis as the underlying explanation, it seems likely that many people, including journalists are still convinced of the former interpretation - the need for infection exposure.

Another strong theme is the journalists’s conviction that a, or the, underlying cause of reduced vital microbe exposure is home and personal cleanliness. In all 27/36 articles (75%) mentioned home cleanliness or personal cleanliness referring, to the home environment as being too clean (15/25), hygienic (5/25), sanitized, oversanitized or sterile (4/25). Many of these references were quotes from so-called experts. This is despite the fact that, from about 2005 onwards, epidemiological data were showing that lifestyle factors such as less outdoor activity/farm living, increasing C-section births, reduced breastfeeding, altered diet, overuse of antibiotics etc were the most probable causes. In all, 47% of articles (including all 11 microbiome articles) made reference to lifestyle factors as underlying causes. However, even then, 13 of these 15 articles also included “home cleanliness” (including use of antibacterial products) as an underlying “lifestyle change.” In 77% of 36 articles, the idea of a link to household cleanliness was reinforced by inclusion of the terms ‘dirty, clean or hygienic’ in the headline. The recent articles illustrate that, despite growing evidence that the most likely underlying causes are “lifestyle changes”, journalists are still tending to reinforce the view that home cleanliness is the key issue.

A further strong theme is that, despite the ongoing lack of evidence, journalists still feel justified in listing use of disinfectants and antibacterials as a contributory factor, in some cases implying that it is a given fact. In all 23/36 (64%) made reference to the use of antibacterials, hand sanitizers etc as an underlying cause of reduced exposure/loss of microbial diversity, thus reinforcing the idea that home cleanliness is important. One article (2.23) stated “adults who clean their home with antibacterial sprays have higher asthma rates, and people who are more often exposed to triclosan (the agent used in antibacterial soap) have higher rates of allergies and hay fever. These are all correlations — not causations”. In reality the possibility of a link to antibacterial overuse has never been investigated and there is no supporting evidence.

In reality, of all the trends that might explain declining Old Friends (OF) exposure, the weakest is “being too clean in our own homes”. If it contributes, its role is likely to be small relative to lifestyle factors. Data, using RNA sequencing techniques on samples from US homes, suggest that modern homes “teem with microbes”. It shows that bacterial communities found in the home mostly relate to the people and domestic animals living there and the food they eat, together with input from the local outdoor environment.<sup>iii,iv</sup> Microbiological data indicate routine cleaning habits (even involving use of antibacterial cleaners) has no sustained effect on levels of microbes in homes Creating “sterile” homes through excessive cleanliness is implausible. As fast as microbes are removed, they are replaced, via dust and air from the outdoor environment, and commensal microbes shed from the human body and our pets, and contaminated food.<sup>v,vi,vii</sup>

Although data suggest less-cleaned surfaces (TV screen, door trims, floors) have more diverse microbial communities than regularly cleaned surfaces (cutting board, kitchen surface, toilet seat)<sup>Error! Bookmark not defined.,iv</sup> to date, there is no evidence of a link between home cleanliness and increased risk of allergic disease. A key point may be that the microbial content of modern urban homes has altered relative to earlier generations, not because of home and personal cleanliness, but because, we live in predominantly urban

surroundings with less microbial diversity in our environment, and also in our homes where the family members we interact with, and the food we eat. carry reduced diversity of microbes. This means we now interact with an altogether different and less diverse mix of microbes in our daily lives.

In 2002 (featured in articles 2.5 and 2.6) a questionnaire analysis of a large cohort of children born in 1991/2 found association between parent-reported frequency of hand and face washing, showering and bathing at 15 months and wheezing and atopic eczema at 30-42 months, but this association was not reported in other studies.<sup>viii,ix</sup> Since this time, the media have shown little interest in the possibility of a link between personal cleanliness (frequent showering and bathing) and immune disorders, despite evidence that skin microbiota are OF microbes.<sup>x</sup> More recently (2015) a data analysis of 399 families in Germany has indicated that neither personal cleanliness (e.g. hand washing and showering) nor home cleanliness activities were associated with allergy outcomes.<sup>xi</sup>

### **Impact on consumer understanding**

The extent of the misunderstanding and misconceptions about cleanliness, hygiene and disinfectant products in the mind of the public is illustrated by the responses documented in Table 4. Analysis of their responses gives clues as to how these may have arisen.

Public responses to articles about “danger” associated with large numbers of so-called germs found in their home illustrate the scepticism which they have aroused. Many responders simply did not believe what they were being told, otherwise “how come we are not constantly sick”. A number concluded the scaremongering is “just to get us to buy unnecessary antibacterial products”.

Alongside this, **responses to articles about** reduced microbe exposure and allergies suggested they had failed to grasp the key concept. The responses suggest that they were using their long time knowledge of the principles of immunization to understand this issue i.e. by challenging the immune system with small quantities of inactivated pathogenic microbes it is possible to induce immunity, i.e. make the immune system strong enough to fight infection. By analogy it is then concluded that the new findings show that challenging the immune system by exposure to germs also makes the system strong enough to “fight” (rather than tolerate) allergens. They fail to understand that attacking rather than tolerating allergens is the cause of allergies. By extension, based on the idea that “germs” are mostly associated with dirt, it seems reasonable to conclude that the underlying cause of loss of exposure to germs is home “cleanliness” and that this cleanliness is being exacerbated by overuse of antibacterial products. It is likely that this view is also held by the journalists, who, when interviewing experts for their article about the so-called hygiene hypothesis, typically start with the question “Does exposure to dirt and germs strengthen our immunity? (Bloomfield, pers comm.). The association may also have been triggered by the coincidence that early media coverage of the hygiene hypothesis in 1990s, coincided with the marketing of consumer antibacterial cleaners and antibacterial-impregnated products and the backlash in the media against these products.<sup>xii</sup> The fact that it is still being quoted despite the lack of evidence is a concern, although the fact that in 15 out of 25 articles this was being quoted as the opinion of an expert who was being interviewed about the latest findings and was invited to give his personal view about whether antibacterial products are a contributory factor.



Growing understanding of the importance of the microbiome to our health fundamental consequences for hygiene because it poses the question “how can we develop lifestyles which sustain exposure to the right sort of microbes, whilst at the same time protecting against those that cause disease?”. When interviewing experts, journalists asked them what advice they would give to families to increase their exposure to microbes in order to build a diverse microbiome. Recommendations included more outdoor activity, getting outdoors and getting dirty, fondling pets and avoiding antibiotics where possible. Worryingly, in some cases, it included advice expected to increase the risk of infection – including letting pets lick your face, sucking a babies pacifier to clean it, washing dishes by hand instead of using a dishwasher, and not washing hands.

## **Conclusions**

Overall this review illustrates the considerable amount of inaccurate reporting of this issue and suggests that this is a significant cause of current misunderstanding and mistrust amongst consumers about infection risks and the importance of hygiene. Most particularly it shows that inconsistent and misleading terminology used in these articles is likely to have contributed to the confusion.

Although the consumer responses recorded here, do not represent a true cross section of consumer opinion, it highlights the need to do further studies to elucidate what consumers understand about how infections are spread and the role of hygiene in infection prevention. Also to find out where consumers obtain their knowledge, and to what extent media reporting contributes.

Across the world, government and non-government agencies recognise the profound impact of infectious disease on global health and prosperity, and the need for greater emphasis on infection prevention as a central pillar in the fight against infection. One of the current drivers for promoting hygiene, is the fundamental part it now plays in the global strategy to tackle antibiotic resistance - but it also reflects factors such as the growing number of people at greater risk of infection being cared for, or caring for themselves in the community.

This report illustrates the common misconceptions about hygiene which have developed, which threaten to undermine efforts to promote higher standards of public hygiene. The extent to which this has occurred suggests that change is unlikely to happen unless we also work to change hygiene perceptions. There is need to develop consistent and more accurate public messaging to ensure firstly that people better understand the issues, and secondly that advice about sustaining exposure to vital microbes through appropriate lifestyle does not conflict with vital hygiene messages such as those about handwashing<sup>2</sup>

## **Appendix 1 Microbes and infection risks in home and everyday life**

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<sup>2</sup> These issues are addressed in more detail in a 2017 white paper sponsored by the International Scientific Forum on Home Hygiene: Containing the burden of infectious diseases is everyone's responsibility. A call for an integrated strategy for development and promotion of hygiene behaviour change in home and everyday life

This includes extracts of 25 media articles about microbes found in the home and possible infection risks in home and everyday life. Findings are summarised in Table 1

### **1.1 Germ warfare**

#### **The Mirror Nov 4<sup>th</sup> 1999**

They're here, they're everywhere. There seem to be bugs in every surface and corner waiting to get us. But where in the kitchen and bathroom do they really like to lurk

### **1.2 Lift buttons are 40 times dirtier than toilet seats'**

Mail online, September 2010

<http://www.dailymail.co.uk/health/article-1314717/Lift-buttons-40-times-dirtier-toilet-seats.html>

Next time you use the lift, you might want to wash your hands. A typical elevator button harbours nearly 40 times as many germs as a public toilet seat, scientists have found. A study carried out in hotels, restaurants, banks, offices and airports found 313 'colony forming units' of bacteria on every square centimetre of lift button. The equivalent surface area of toilet seat had only eight units. The bacteria on the lift buttons could include stomach bugs such as E.coli, the researchers say. The expert who carried out the research said 'In a busy building, a lift button can be touched by dozens of people who will have come into contact with all kinds of bacteria every hour. 'Even if the buttons are cleaned regularly, the potential for the build up of bacteria is high.' Previous studies have shown that a typical office desk harbours 400 times more bacteria than a toilet seat and computer keyboards have four times more germs than toilets. But Professor Hugh Pennington, one of Britain's leading microbiologists, said: 'Just because there are bacteria on a lift button it doesn't mean they are harmful to your health.

#### **Comments:**

- Why do these stories always compare to a toilet seat? It's been shown time and time again on various TV programmes that the toilet seat is one of the cleanest places in the house.
- Well if we are doing a comparison in respect to where the largest number of "bugs" might be found should we not also include other human beings?
- 
- most 'germs', or more correctly, bacteria, are NOT harmful to us FACT - some are in fact very helpful, indeed essential for our life FACT - You would be dead if your body contained no bacteria - in fact your body, right now, has 10x as many bacteria as human cells - If you were never exposed to harmful bacteria, you would also be dead, as your immune system would never develop
- How many bugs are in the air you breath all day every day!! Quick, everyone stop breathing!!! Why do these muppets keep comparing things to toilet seats
- so is the floor, but you have to stand on it, if you are so fussed, wear gloves. What a namby, pamby country we have become. no wonder kids are prone to every ailment going, they are not immune to anything.

### **1.3 My dishwasher is trying to kill me! Deadly bacteria found in household appliances**

Daily Mail June 2011

<http://www.dailymail.co.uk/health/article-2006329/Dishwasher-fungi-Dr-Polona-Zalar-finds-deadly-bacteria-household-appliances.html>

Dishwashers are a breeding ground for potentially killer bugs, say scientists. The moist and hot environment serves as a perfect habitat for two types of dangerous fungi which can also be found in other kitchen appliances such as washing machines and coffee machines.

Researchers found 62% of dishwashers contained the fungi *Exophiala dermatitidis* on the rubber band in the door. Both of the black yeasts are known to be dangerous to human health. *E. dermatitidis* is frequently encountered as an agent of human disease and is also known to colonise in the lungs of patients with cystic fibrosis. On rare occasions it has caused fatal infections in healthy humans. The researchers, say the invasion of black yeasts into our homes is a potential health risk. They said "The discovery of this widespread presence of extremophilic fungi in some of our common household appliances suggests these organisms have embarked on an extraordinary evolutionary process that could pose a significant risk to human health in the future.' Deadly: *Exophiala dermatitidis* is an agent of human disease and has been found in dishwashers and washing machines. The researchers studied dishwashers taken from private homes from 101 cities across the world - '62% were positive for fungi, and 56% accommodated *Exophiala*.

#### COMMENTS

- Calm Down!! This from the CF Trust: Virtually any moist surface will harbour germs and most bugs including *Pseudomonas aeruginosa* are found in environmental sites including washing machines, dishwashers, damp dishcloths etc. However although these sites harbour bacteria that does not inevitably mean they all present a serious risk of infection
- Some of you might take the mick, but I have cystic fibrosis and already have one type of fungus growing on my lungs that cannot be eradicated.. so whilst it might be ok for you, it's dangerous for others! Some tips in the article on how to get it rid of it could be useful!
- When my dishwasher or washing machine starts growling at me and muttering threats, then I will start taking some notice. Since I have had the washing machine for about 15 years and the dishwasher around 5 years, they are certainly taking their time in trying to kill me

#### **1.4 Most dangerous place in the fridge? With 8,000 bacteria every square centimetre... it's the salad drawer**

Daily Mail October 2011

<http://www.dailymail.co.uk/health/article-2050643/Most-dangerous-place-fridge-With-8-000-bacteria-square-centimetre-salad-drawer.html>

Fridge salad drawers can contain 750 times the level of bacteria considered safe, researchers warn. Potentially killer bugs such as *E.coli*, salmonella and *Listeria* are among those found, they say. Tests on salad drawers of 30 home fridges showed they had an average of 7,850 bacteria colony-forming units/sq centimetre. Some swabs taken had as many as 129,000 cfu/cm<sup>2</sup>. The standard EC recommendation for 'clean' food preparation and storage surfaces is for 0-10 cfu/cm<sup>2</sup>. The expert said: 'The whole purpose of a fridge is to keep food safe and minimise chances of bacteria and mould so it is worrying that in some there is clearly a substantial problem, as the research indicates.

#### **1.5 The hidden bugs in your everyday life**

Express Oct 2011

<http://www.express.co.uk/expressyourself/279690/The-hidden-bugs-in-your-everyday-life>

The film "Contagion" might be going to extremes but you only have to witness our plethora of toilet, kitchen and bathroom cleaners, growing numbers of devices, such as automatic toilet flushers and soap dispensers, as well as some people's propensity to "hover" over a public toilet seat rather than sit on it, to know that germ-phobia is sweeping our nation.

But according to an expert, there is an evolutionary reason why we are disgusted by the thought of germs. "If you look at hygiene on a global level, with a historical perspective infectious diseases have always been the biggest killers of humans and still are in developing countries," "They're still incredibly important."

“There are germs everywhere and only a tiny fraction of those are ones that make us sick so what we want to be practising is ‘targeted hygiene’. We need to avoid the dangerous germs, those in your faeces and those you find, for example, on raw meat. You should also be careful around those who are sick or who have infectious diseases. “So the most important things to do are to wash your hands thoroughly after going to the toilet and after cleaning up your child or after handling anything potentially infective. And wash your dirty dish cloths – salmonella can breed there.” So where do germs lurk and how many are there?

**PUBLIC TRANSPORT** A single sneeze produces more than 40,000 droplets of moisture and millions of germs, propelled over a distance of 32ft. Also 29% of people admit to sneezing without covering nose or mouth. People who have recently hopped on a bus or tram are 6 times more likely than those who don’t use public transport to develop an acute respiratory infection. And more than 1 in 4 commuters have faecal matter on their hands.

**OUT AND ABOUT** Handbags carry up to 10,000 bacteria/sq inch. One in 6 mobile phones in Britain is contaminated with faecal matter. Cash machines are as dirty and have the same levels of germs – those that can cause sickness and diarrhoea – as public toilets.

Public telephones have been labelled “a real hot spot for germs and grime” with one expert, reasoning: “Not only are they handled by different people each day but the handsets are then held close to a person’s nose and mouth. All it takes is for one person to have a cold or bug and this would get passed to everyone else who uses the phone.”

**IN THE HOME** The salad drawer of your fridge may contain more than 750 times the level of bacteria deemed safe. The average kitchen chopping board has 200% more faecal bacteria on it than the average toilet seat. About 30% of people have admitted to not washing their hands before cooking and 10 per cent to not washing their hands after handling raw meat while eight per cent say they have coughed into their hands and not washed them before preparing food. Flushing the toilet without putting the lid down can send germs as far away as 6ft and 43% of mothers don’t wash their hands after changing their baby’s nappy, while 88% of the seals around your bath and sink contain “unsatisfactory” levels of mould or, worse, are “heavily contaminated” with it.

**IN THE WORKPLACE** According to an expert, the average workplace has 21,000 bacteria per square inch, which means your workplace may have 400x more bacteria than your office toilet. “People don’t usually start cleaning the desktop until they’re sticking to it,” Desks, phones, door handles and other common surfaces were a veritable Petri dish of germs. In some areas, such as on desktops, he found hundreds of thousands of germs while in others, such as on a lift button, there were millions.

## **1.6 The kitchen sponge is 200,000 times dirtier than a toilet seat - and could even lead to PARALYSIS**

**Daily Mail Nov 2012**

<http://www.dailymail.co.uk/health/article-2235650/The-kitchen-sponge-200-000-times-dirtier-toilet-seat--lead-PARALYSIS.html>

It may come as a surprise to the houseproud and 'clean freaks' among us but the kitchen sponge is one of the dirtiest places in the home - 200,000 times dirtier than a toilet seat. And it is not just harmless bacteria lurking on your cleaning cloths and utensils.

Experts have linked germs found on sponges, cloths and chopping boards with a bacteria which can cause paralysis. A new study has found there are around 10million bacteria/ sq inch of kitchen sponge and a million/sq inch on a dish cloth. Bacteria found on them can cause Guillain-Barre syndrome, which can lead to loss of movement. You would be better off chopping your vegetables on a toilet seat than on a chopping board when it comes to

germs, scientists have claimed. An expert told the BBC the toilet seat is one of the cleanest things you'll run across in terms of micro-organisms. But he said we should be more worried about other household items e.g sponges, dish cloths, and reusable shopping bags.

### **1.7 Is the toilet seat really the dirtiest place in the home?**

**BBC News, November 2012**

<http://www.bbc.co.uk/news/magazine-20324304>

Charles Gerba (university of Arizona) studies have found that on the average toilet seat there are 50 bacteria/sq inch. It's one of the cleanest things you'll run across in terms of micro-organisms," he says. "It's our gold standard - there are not many things cleaner than a toilet seat when it comes to germs." We should be more worried about other household items, it seems. "Usually there are about 200 times more faecal bacteria on the average cutting board than on a toilet seat," In the kitchen it doesn't necessarily get there through actual contact with faeces. It comes via raw meat products or the viscera from inside of the animal, where a lot of the faecal bacteria originate. The toilet seat is one of the cleanest things you'll run across in terms of micro-organisms," "It's our gold standard - there are not many things cleaner than a toilet seat when it comes to germs." According to Gerba, there are about 10 million bacteria/sq inch on a sponge, and a million on a dishcloth. In other words, a kitchen sponge is 200,000 times dirtier than a toilet seat, and a dishcloth is 20,000 times dirtier.

### **1.8 The hidden dangers lurking in your kitchen: Chopping boards harbour 200% more faecal bacteria than toilet seats and potatoes and leeks can give you food poisoning**

**Daily Mail, Dec 2014**

<http://www.dailymail.co.uk/health/article-2876048/The-hidden-dangers-lurking-kitchen-Chopping-boards-harbour-200-faecal-bacteria-toilet-seats-potatoes-leeks-food-poisoning.html>

- New survey reveals 40% of all food poisoning cases caused by poor home hygiene
- E.coli, salmonella and Campylobacter bacteria can spread via chopping boards that haven't been cleaned properly
- Expert warned all raw meat, poultry and vegetables should be seen as a risk

There seems to be regular stories about domestic chopping boards and infection, but in fact it is fairly rare to develop gastro-enteritis from food prepared in the home. Mostly it occurs after a restaurant meal or a takeaway.

### **Comments**

- Most "working class " plebs like me who have reached our 70;s find these hygiene stories a joke. All these cleaning products only make matters worse by preventing people from building up a resistance to bugs. I wonder how many bacteria were on my mums pinafore that was used to wipe my face along with the "cat licks" from her hankie. I am amazed that people of my age and older have managed to reach this age without all the sprays wipes and dispensers.
- I've been on this planet over half a century, probably ate dirt as a kid, had my fair share of cheese and jam with green mould scraped off, I remember my nan taking the ants out of the condensed milk before giving to us kids and have never suffered food poisoning. now I'm wondering if what I ate as a kid actually gave the body protection as I grew, cos I use chopping boards, give em a quick clean and still have had no adverse affects. do gooders are making people susceptible to illnesses, rather than protecting them!

- As I am neither dean nor ill I shall assume that this terrifying amount of bacteria is in fact nothing to worry about & will carry on as I have been up till now.
- Shameless advert for entirely unnecessary cleaning products. The big joke in our family is the one which claims to "kill 99.9% of germs dead". Being killed is not good enough, they have to be killed dead! But the real joke is numbers. If there are 1,000,000,000 food poisoning bacteria on a chopping board - an entirely feasible if low number - and if 99.9% are killed then 999,000,000 are left alive. This is more than enough to cause food poisoning. These products, then, by virtue of their own evidence are absolutely useless! Bacteria are everywhere, get used to it. Most will not harm you because should be immune. Good kitchen cleanliness, hot water and detergent is enough to prevent the more dangerous from harming
- OMG: I've been using the same filthy, uncleaned dishcloth for years; ditto my tea towel. Not to mention: eaten a reheated, pre-cooked sausage roll, left out overnight, and reheated, pre-cooked chicken, stored for two weeks in the fridge. And when I've dropped a crisp on the floor, I've simply taken the additional step of blowing the dust and hairs off. Never had food poisoning except as a child, staying at a small hotel.
- Cannot understand how we have managed to survive so far what with all the nasty things we can contract from everything we eat . Have they ever researched soap and water?
- I'm a microbiologist and washing utensils in hot soapy water will kill bacteria. What did they do years ago when there was no disinfectants? My granny used to boil the tea towels and dish cloth every night in an old pot. This article is an advertisement for dettol.
- Too much hygiene and not enough antibodies. How many people did you hear of with food poisoning 50 years ago ? ! !
- All we need to clean is soap and hot water. Stop writing articles that are adds. I know they're a money-spinner but most of us wash our hands well and don't need this overpriced muck. Stop scaremongering! How the heck did our parents and grandparents cope, but they did.
- Is this scaremongering article sponsored by Reckitt Benckiser who manufacture Dettol?
- I was watching QI the other day when David Mitchell pointed out his observation of this old chestnut "if there are more germs on your chopping board than on your toilet seat then clearly it doesn't matter."
- The Hygiene Council" is a marketing team within Reckitt Benckiser Group plc - who own the Dettol brand (and most of the other products in your cleaning cupboard!). I appreciate that the DM must advertise to keep this service subscription-free. However, paid adverts, and product placement, should have the word "Promotion" included in the headline It is truly in the DM's best interest to distinguish between news articles and paid promotions.
- Our homes teeming with all these evil bacteria and yet the vast majority of the population isn't crippled with food poisoning.
- Anti-bacterial sprays should be banned; if we were a little LESS clean our immune systems would be stronger. They didn't exist when I was a child, and at 66 I rarely succumb to any illness. It is not essential to live in a clinically clean house.
- We must all be dead already. Pathetic whimpering and fear mongering.
- 'infographic' looks like an ad for dettol cleansing wipes- they're bound to 'big things up' if that's the case
- If it wasn't for all the antibacterial products in recent years then more people would build up their own immunity to these "hazards" I guess I'm lucky to be of a generation that was allowed to play out and get dirty when I was young.

- Isn't it odd that entire households aren't dropping dead every day? All those deadly tea towels and chopping boards, not to mention the dish cloths.

### 1.9 How often should we change our pyjamas, towels, bedsheets and toothbrushes to avoid illness?

THE MIRROR JAN 2016

[HTTP://WWW.MIRROR.CO.UK/NEWS/UK-NEWS/HOW-OFTEN-SHOULD-CHANGE-PYJAMAS-7245665](http://www.mirror.co.uk/news/uk-news/how-often-should-change-pyjamas-7245665)

All these life staples can harbour some real nasties... but when and how should we be washing them?

- **Yuck!** More than a quarter of men and 7% of women wear briefs for 2 days before washing them. Used pants contains microbes that can cause urinary tract infections, pneumonia and blood infections, as well as E-coli and **thrush** .
- **Yuck!** The average 18 to 30-year-old man wears the same pyjamas for 13 nights and young women 17 nights before washing them. "Pyjamas are worn right next to the skin – and we shed skin cells, filled with micro-organisms, at a vast rate,". "These organisms are usually harmless but if they get into the wrong place they can cause problems." For example, E-coli bacteria transferring from the bowel to the urinary tract can cause cystitis.
- **Yuck!** Nine out of 10 UK dishcloths were heavily contaminated with bacteria. More than half harboured E.coli while a quarter featured an organism called Pseudomonas spp. which can cause minor skin and eye infections and potentially life-threatening illness. The average used dishcloth harbours four billion living germs, contains 6x as much bacteria as toilet handles and is hailed as the "bug superhighway of the kitchen".
- **Yuck!** Cloths are one of the leading causes of cross contamination. "Cloth towels could quickly and easily become contaminated at significant levels, including microorganisms that can lead to food-borne illnesses," "Other researchers found that salmonella grows on cloths – even after they were washed."
- **Yuck!** Bath towels absorb dead skin cells and natural bacteria from our bodies and warm, damp conditions mean this bacteria thrives. Sharing towels can spread bacteria and viruses such as Staph. aureus (which can cause skin **infections**), **cold sores** and Athlete's Foot.
- **Yuck!** A recent poll says more than a third of us only wash our bedsheets once a fortnight. "Beds can become reservoirs of human cells, bacteria and bodily excretions. Humans shed half an ounce of skin each week – and a lot of that will be in the bed,".
- **Yuck!** A staggering 45% of us have never washed their pillows and duvets – despite the fact a third of the weight of a two year old pillow is made up of dead skin and dust mite faeces. "Duvets can harbour live and dead dust mites, skin scales and fungus, which can lead to allergies such as rhinitis and infections such as conjunctivitis."
- **Yuck!** "The average toothbrush contains around 10 million germs – from bacteria to the flu virus," "Even potentially fatal viruses, such as Hepatitis C, have been found on the humble brush, so sharing brushes is a big no no."

### 1.10 Is your LAUNDRY making you ill? 30°C cycles breed bacteria and transfer germs from your underwear to tea towels

Daily Mail August 2013

<http://www.dailymail.co.uk/health/article-2398775/30-c-laundry-cycles-breed-bacteria-transfer-germs-underwear-tea-towels.html>

- Low temperature cycles not strong enough to kill disease-causing bugs
- Research found 0.1g of faecal matter remains on 'clean' knickers
- Mixing underwear with tea towels in load creates a 'bacterial soup'
- Scientists found one million bacteria in two tablespoons of wash water
- Potentially contagious germs include Salmonella, E.coli and norovirus

Your washing might smell fresh but don't be lulled into a false sense of cleanliness. The move away from the high-temperature washes and harsh detergents of our grandmothers' era may be kinder to fabrics, the environment and sensitive skin but it could be costing us our health. Research has shown that potentially harmful bacteria in our laundry is not being killed off in low-temperature washes, turning the average spin cycle into a breeding ground for germs.

### **1.11 How clean is your laundry? Scientists say today's gentle washing methods create a 'bacteria soup' for clothes to swish around in and spread contagious bugs such as E.coli and Salmonella**

Levels of bacteria found in our washing machines and on supposedly 'clean' laundered clothes has led a hygiene expert to call for an increased awareness. The expert said: 'Consumers believe that normal laundering produces 'clean' clothes but this does not necessarily translate to 'hygienically' clean. The trend towards reducing washing temperatures and water volumes and using gentler detergents has affected the efficacy of the laundering process for reducing bacteria on contaminated clothing. It's time to re-evaluate the hygiene of our laundry.' The infection risks associated with laundry found an estimated average of 0.1g grams (10,000 organisms) of faecal matter on every pair of 'clean' knickers. Items that are most likely to be contaminated with pathogens are those which come into direct contact with the body - underwear, towels, facecloths, bedlinen and nappies. Bacteria lurking inside washing machines can also be responsible for cross-contamination: 'Studies have shown that a build-up of bacteria in the interior of the washing machine transfers to the wash water of subsequent cycles – with as many as one million bacteria found in just two tablespoons of wash water. 'Low-temperature washing provides optimal conditions for germs to breed and multiply in favourite hideaways such as the detergent drawer and door seals,' The expert warns 'Bacteria on wet clothes are more likely to contaminate hands. Transfer of germs from hands to objects in the home and ultimately our mouths is therefore a risk.

### **1.12 This is what happens to your body when you don't wash your sheets every week (and it will put you off ever wanting to skip laundry again)**

<http://www.dailymail.co.uk/femail/article-4023992/this-happens-body-don-t-wash-sheets-week-wanting-skip-laundry-again.html>

Daily Mail 12 December 2016

- Sheets should be washed weekly and a shower should be had before bed
- Athlete's foot, colds, yeast infections and other viruses can be spread otherwise

It may be the cosy sanctuary where we spend the most time every day - 49 hours per week if you sleep for seven hours per night - but how hygienic is your bed? If you don't wash your sheets weekly, you could be putting yourself at risk of serious viruses and infections.

'Depending upon what your bed is used for, and also how clean you are when you get in it, your bed can get pretty filthy and may actually be causing your body harm.'

The ways your dirty bed could be wrecking havoc with your health - and it will put you off ever wanting to skip laundry again.

**Germs – bacteria, yeasts, fungi and viruses** We have all sorts of bacteria and fungi on our bodies and most are perfectly fine, but the bed is a great place for them to breed, if you think about all the moisture that builds up as we sleep, saliva, fluids, skin cells etc. One such bacteria is Staphylococcus aureus – which is commonly found on human skin or in the nose of a healthy person, and on cuts and boils of those suffering from these conditions. Illnesses such as skin and wound infections, urinary tract infections, pneumonia and bacteraemia (blood stream infection) may develop if these bacteria enter the body.



**Athlete's foot (Tinea pedis)** If you or your partner has athlete's foot then it is highly contagious and will lurk in the bed amongst other places. Another fungal infection is *Candida albicans* (also called thrush) which can get into your bed from the body and would be removed through thorough, regular laundering of bedding.

**Yeast infections** You can get yeast infections on the skin, and they can cause problems in folds of skin where there may be moisture, and in your nether regions. Your bed may be a perfect breeding ground for such yeasts.

**Viruses** If you have a cold or flu then you need to crank up the washing regime and change the bedding more frequently to protect your partner. The virus spreads as much from being sneezed on as hand to mouth contact, so dirty tissues in the bed are a no-no – have a bin next to the bed and try to contain the viruses to your side of the bed.

### 1.13 The Disgusting Way Your Bed Sheets Are Making You Sick

Woman's day Dec 2016

<http://www.womansday.com/health-fitness/wellness/a50486/the-disgusting-truth-about-what-your-bed-sheets-are-doing-to-your-health/>

If you think of your bed as a big, fluffy slice of heaven on earth, then stop and picture this: a small pool full of millions of tiny dust mites and dead, castaway skin cells. That's what your bed really is, according to a home hygiene expert. As if that weren't gross enough, the dust mites increase a person's risk of getting a cold or suffering from allergies. But that's not all; our bed sheets can also harbour bacteria that causes the flu or food poisoning. **"If people have a cold, it can survive on the bed linen and it can survive a wash. Someone with food poisoning could be excreting salmonella into the bed," she says, adding that sleeping naked only increases the risk of spreading these germs.**

### 1.14 11 THINGS DIRTIER THAN YOUR TOILET SEAT

Good Housekeeping Jan 2016

<http://www.goodhousekeeping.co.uk/news/11-things-dirtier-than-your-toilet-seat>

Are you the type of person who would never dream of sitting on a public loo seat for fear of germs? Then prepare to be shocked – because the amount of everyday items that are covered in *even more* bacteria than the humble toilet seat is alarming. Find out what they are, and how to clean them, below. Did you know we shed dead skin cells at a rate of 1.5 million an hour? And they're the perfect food for bacteria, who thrive in carpets, which are also full of food particles, pollen and pet hairs. A staggering 200,000 bacteria live in each square inch of carpet (that's 700 times more than on a toilet seat) so make sure you invest in a super-efficient vacuum cleaner.

Experts who took swabs from chip and pin machines in England found that they were as dirty as public lavatories, with samples found to contain bacteria responsible for sickness and diarrhoea. When researchers tested 1,000 sponges and dishcloths from kitchens, they found 10 per cent contained salmonella. Even more shockingly, each square inch contained 134,630 bacteria – that's 456 times the amount on a toilet seat! In research conducted in 2013, both phones and tablets were found to have significantly more units of staphylococcus, a bug that can cause severe stomach sickness, than a toilet seat.

It may be your pride and joy, but your handbag could be a serious carrier of germs. When researchers studied 25 bags, they found that the average was three times dirtier than the office toilet seat. Handbags used regularly were 10 times dirtier – and let's be honest, who doesn't use their bag regularly? Cash machines could be giving you more than just money. Researchers have discovered that each button you touch has an average of 1,200 germs, including cold and flu viruses and *E. coli*.

When you throw your underwear into the laundry, at least 100 million E. coli bacteria enter the washing machine with them. With front-loading machines, the water also tends to settle at the bottom, creating a breeding ground for germs (toilet seats, on the other hand, are too dry to support a lot of bacteria). Researchers swabbed 33 keyboards in a London office and found they had up to five times as many germs as a toilet seat. The University of Toronto discovered that elevator buttons have more bacteria than toilets, while research in Saudi Arabia found 97 per cent of lift buttons are contaminated. Even worse, one in 10 had germs that could cause food poisoning or sinus infections. A 2013 study found that the average grill has 1.7 million microbes per sq inch. That's more than twice the germs on your average toilet – shocking given that it comes into direct contact with our food.

**1.15 Think your bathroom is clean? As many as 3.2 million bacteria/square inch may be lurking on your toilet bowl, but there's at least 200,000 more on your toothbrush!**  
**Daily Mail – 10<sup>th</sup> April 2017**

**<http://www.dailymail.co.uk/health/article-4379182/Millions-bacteria-lurking-bathroom.html#comments>**

- A new infographic reveals just how much bacteria is lurking in our bathrooms
  - Toothbrushes contain 200,000 more bacteria per square inch than a toilet seat
  - And a toilet bowl alone may have a massive 3.2 million bacteria per square inch
  - Even the bathroom light switch is infested, with 217 bacteria per square inch
- Your bathroom is a haven for a plethora of bacteria, breeding in places you would never believe weren't sparkling clean. From your bathroom floor to the sink drain and even the light switch, your bathroom is secretly harbouring a world of filth you know nothing about. A new infographic has created a bacteria heat map to help identify where germs love to lurk and help you to banish the bugs.

Toilet flush handles should be cleaned regularly to help combat the 83 bacteria that reside/sq inch. Closing the lid when flushing can help to prevent particles becoming airborne. It may not seem an obvious bacteria breeding ground, but you touch the light switch every time you go in and out of the bathroom, giving it a huge 217 bacteria per square inch. An unappetising thought while you brush your teeth twice a day, but your toothbrush may contain at least 200,000 more bacteria per square inch than your toilet seat. Perhaps the least surprising, your toilet bowl has a massive 3.2 million bacteria per square inch. A reason to put your make up away, your bathroom counter may contain 452 bacteria per square inch, which could combine with airborne toilet water if you flush with the lid open

#### **COMMENTS**

- Articles such as these are the reason why there are so many children with allergies! They serve no purpose other than fuel and reinforce the germ paranoia many have developed.
- The point is this - there may be bacteria, but we rarely get sick from them, so these report just distress the germ phobes.
- It is ridiculous to get obsessive about our own bathrooms unless we are pigs. Our skin has more bacteria on it, and we handle money - the filthiest stuff of all - without even thinking about it, and yet we never seem to get sick from doing so. The only way to build resistance to bacteria is to be exposed to them.
- stop this clean mania! we as children are growing up in a house full with animals. chicken where in the kitchen cats all around the toilet was outside in a wooden hutch and we were all in a robust health without allergies and whatever. many things today are much better than the past but on this case we have to look back and learn.
- All this obsession with cleanliness is why people today have such weak immune systems. Particularly children. Weak and weedy, all asthmatic and allergic to everything under the sun. Get dirty, build up the bugs, strengthen your immune system, keep away

from the antibiotics.

### **1.16 Your kitchen cloth could be making YOU ill: FIVE disgusting germ hotspots revealed**

**Express Jan 2017**

<http://www.express.co.uk/life-style/health/730093/cold-flu-symptoms-virus-bacteria-germ-bacteria-health-illness-dettol>

The innocent looking boards used to chop meat and vegetables harbour around 200 per cent more faecal bacteria than a toilet seat, according to numerous studies. Chopping boards are not the only household item harbouring a high number of disgusting germs. The cleaning sponge is also full of bacteria - on average there are more than ten million germs per square inch on a used sponge. The tea towel doesn't fare much better – a study found that 89 per cent of dishtowels are contaminated with E. coli, a leading cause of gastric illness. Pillows should be changed every 18 months as the average pillow contains up to 350,000 live bacteria.

#### **COMMENTS**

- Wow thanks for this impartial advice. I am off to buy all sorts of dettol products to keep my home safe and germ-free
- Yes that was more like an advertisement for Dettol

### **1.17 Pillows, spices and more - the 10 everyday items you never knew you had to throw away**

**Mirror Jan 2017**

<http://www.mirror.co.uk/money/pillows-spices-tupperware-more-10-9631557>

Did you know that some of the things you use every day have an expiry date? In fact, sponges and dishcloths should be thrown away every single week

- Whilst wooden chopping boards may be more hygienic, studies show that chopping boards harbour 200% more faecal bacteria than toilet seats.
- make matters worse, the average pillow contains up to 350,000 live bacteria.
- A study found that 89% of dishtowels are contaminated with E. coli, something which can cause gastric diseases.
- On average, there is more than 10 million germs/sq inch on a used sponge. If you have been scrubbing the toilet, throw the sponge away immediately after use.
- Toilet brushes are far from the most pleasant item in your bathroom, continuous scrubbing creates moisture on the bristles allowing bacteria to thrive and spread viciously.

### **1.18 THE GERMINATOR This is the surprising household item harbouring 200 TIMES more dangerous bacteria than a loo seat (even AFTER you've washed it)**

**The Sun July 2017**

<https://www.thesun.co.uk/living/4000207/this-is-the-surprising-household-item-harboured-200-times-more-dangerous-bacteria-than-a-loo-seat-even-after-youve-washed-it/>

Dirty chopping boards can harbour bacterial food poisoning germs like E. coli and salmonella. The essential item is up to 200x [dirtier than a toilet seat](#) with a whopping average bacteria count of 61, 597/sq inch, new research has found.

#### **Appendix 2 Media coverage of the so-called hygiene hypothesis and Old Friends Mechanism**

This includes extracts of media articles related to this issue. Findings are summarised in Table 2.

## **2.1 Let them eat dirt, New Scientist 1998**

<https://www.newscientist.com/article/mg15921435.100-let-them-eat-dirt/?full=true>

Take Howard Hughes, by the summer of 1958 his germ phobia had driven him into seclusion in a room at the Beverly Hills Hotel. At one point, he issued aides a three-page memo on the most hygienic way to open a tin of fruit. Such behaviour is irrational by anybody's standards, but don't we all have a little Howard Hughes inside us? After all, we can now wipe our antibacterial cutting board with an antibacterial sponge, shower with antibacterial soap, and sleep beneath an antibacterial quilt on an antibacterial pillow. In Japan, you can bank with an antibacterial deposit book, and soon, according to reports, drive to work in a car fitted with an antibacterial steering wheel. And given the reputation that flesh-eating, fever-causing, pustule-forming germs have acquired, is there any possible reason not to take every precaution possible? The short answer is yes, according to a growing number of scientists who are warming to the paradoxical notion that our growing separation from dirt and germs is behind the rapid rise in asthma in the US, Western Europe, Japan and Australia, and may be triggering other allergic diseases, too.

## **2.2 Clean children run higher risk of asthma Sunday Times 1998**

New research has shown that children who wash too much are more likely to develop allergies. Scientists from Bristol University ALSPAC study have found that children who bathe every day and wash their hands more than 5 times are 25% more likely to have asthma than their dirtier peers. We found that the more hygienic a child was, the more likely he/she was to suffer asthma. Bathing twice a day also had an effect. The findings fit the hypothesis that the current increase in asthma could be attributed to improved standards of hygiene which mean that children suffer fewer infections and that could leave them more vulnerable and sensitive to allergies.

## **2.3 How playing dirty can help keep our children healthy The Express 1998, written by a London GP**

You see them every day, small scrupulously clean faces peering unhappily through the glass of cars that ferry the children of the middle classes around our towns to super clean classrooms sealed off from dirt and germs. Their bodies have been subjected to a series of D Day landings by the latest disinfectants and antibacterial soil have left their hands as clean as a surgeons.. The toilets they sit on are subjected to twice daily bleach. This week's new scientists thinks the unthinkable in an article called Let them eat dirt. It asks "Is too little dirt causing the allergy epidemic? "Is there something about our super clean, sterilised nurseries that can undermine a child's health. The article then goes on to talk about the rise in allergies and the theory that under stimulation of the immune system may be to blame. It is a seductive idea but does not explain everything and there may be other factors e.g few gardens in inner cities. The importance of hygiene in the developing world is also discussed

## **2.4 Less asthma risk for 'sickly' children BBC News Feb 2001**

<http://news.bbc.co.uk/1/hi/health/1172085.stm>

Babies who suffer from runny noses and repeated viral infections are at less risk of asthma, say scientists. Researchers in Germany found that the infections boosted the child's immune system, making them less susceptible. The study will add to the debate over whether modern hygienic lifestyles and an over-reliance on antibiotics and vaccinations are contributing to the rising asthma rates. An expert said "previous research had shown that children from large families, those who grew up on farms or surrounded by animals and those exposed to viruses, were less likely to develop asthma. Knowing exactly which 'dirt'

provides the best education for the immune system and how to mimic its effects in a cleaner environment seems to be the key to reversing the rise in atopic diseases."

## **2.5 Clean children link to asthma**

**BBC News June 2002**

<http://news.bbc.co.uk/1/hi/health/2068211.stm>

A baby washed every day may be at higher risk of developing asthma or eczema, according to a research study. The finding, from University of Bristol, supports the theory that the developing immune system may actually benefit from some contact with dirt. Other studies have suggested that asthma is less likely if the child mixes with others at day nursery, owns a pet or lives on a farm. The researchers examined questionnaires from thousands of parents on the washing habits of their 15-month-old children, in particular how often their hands were washed before meals, and how often they were bathed. Parents scoring more highly for hygiene were slightly more likely to have a child who developed wheeze - or an eczema-like rash. The effect could not be entirely linked to heavy use of household cleaners. The researchers said: "The importance of hygiene in public health should not be dismissed. "However, the creation of a sterile environment through excessive cleanliness may potentially be harmful to the immune system."

## **2.6 Why children can be too clean for their own good**

**The Times June 2002**

Obsessive cleanliness in the home can increase the risk of asthma and eczema in young children a study has found. The findings lend support to the fashionable hygiene hypothesis which holds that parents who provide a sterile environment spare their children the challenge that their immune system needs to develop properly – more dirt is required. The study showed that the more often children have their faces and hands washed, or are bathed/the more hygienic they were the more likely they are to develop eczema and wheezing. Researchers said, there could be a number of explanations. One possibility is that we have found support for the hygiene hypothesis. When children are exposed to harmless bacteria it may simulate their immune system. There is concern that lack of contact. Perhaps due to the children spend more time indoors and parents use more antibacterial products around the home may lead to allergies.

## ***Diseases 'do not stop allergies'***

**BBC News April 2004**

<http://news.bbc.co.uk/1/hi/health/3671277.stm>

*Contracting infectious diseases as a young child does not protect against developing eczema, researchers say. It had been thought that being exposed to infections helped prevent a child from developing allergic conditions such as eczema, asthma and hay fever. A study of 24,000 Danish families found this untrue. But the paper did back previous findings that having pets and siblings, and going to day care, did reduce allergy incidence. Living on a farm was also confirmed as having a protective effect. It had been thought that these factors were explained by the 'hygiene hypothesis'. This suggests reduced exposure to infection in early infancy may increase the risk of developing conditions such as asthma and eczema. But this study suggests while there is a benefit, it is not due to exposure to infections and there must be a different reason for why children benefit from farms, siblings and day care. The researchers, led by Christine Stabell Benn, concluded: "Infectious disease in the first six months are associated with an increased risk of atopic dermatitis, while the opposite is true for several environmental factors indicative of microbial exposure."*

## **2.7 Hygiene blamed for NHS's soaring allergy bill**

**The Telegraph 19 Jun 2005**

<http://www.telegraph.co.uk/news/uknews/1492333/Hygiene-blamed-for-NHSs-soaring-allergy-bill.html>

The number of people in Britain who have allergies is set to rise because houses are too 'clean' for children's immune systems to develop properly, according to a health care expert. The professor of primary care research and development blamed the rise on what he called the "hygiene hypothesis". He said: "While the reasons for the very dramatic increases remain far from clear, evidence is converging on the possible link between improved living standards - which bring a reduced chance of infection - and the increasing risk of developing allergic conditions."

## **2.8 Dusty homes 'can prevent asthma in children'**

**Daily Mail, April 2006**

**<http://www.dailymail.co.uk/health/article-383858/Dusty-homes-prevent-asthma-children.html>**

It will come as a relief to those mothers too busy to keep their homes spick-and-span. Researchers have found that young children brought up in a spotlessly clean environment are more likely to develop asthma. A Netherlands study showed that babies least likely to suffer the condition - or to suffer wheezing - by the age of four are those who are exposed to the highest levels of dust in the home. Common microbes in dust, including fungal agents, may help these children build resistance to breathing disorders. Experts are unclear about the causes of the surge in cases, but believe environmental factors could be a trigger in genetically vulnerable people. Some say previous generations were exposed to more dirt - and its micro-organisms - which helped reinforce their immune systems. They claim early exposure to bugs spread by dirt and contaminated food could protect children from asthma. Overly clean lifestyles, however, fail to wake up the immune system. The lead researcher, said: "our findings provide evidence that noninfectious microbial exposure at a very young age might protect against asthma. The underlying mechanisms are not clear."

## **2.9 Is our cleanliness zeal making us ill?**

**The Times May 2008**

It is hard to know if the headlines about allergy epidemics is real or hype. Over the past weeks, anyone reading a variety of quality newspapers would have found themselves thoroughly perplexed. On The Times letter page, a group of allergists and scientists claimed that we are "in the midst of an allergy epidemic, with about 20 million children and adult allergy sufferers in the UK". So what is the truth? There is an idea called the "Hygiene Hypothesis", which considers whether modern life has become too clean; that in our increasingly sanitised, antibacterial and deodorised age, children's immune systems are not exposed to enough germs to develop normally. According to Mintel, Britons spent £612 million on bathing products in 2005; in 2011, the estimated figure will be £709 million.

*But recently there has been a backlash against the hygiene hypothesis. An expert said "the persistence of the unproven "hygiene" hypothesis is counterproductive. When we have unacceptable levels of norovirus, and other gastrointestinal diseases – and SARS and a potential flu pandemic – the idea that hygiene is unnatural is frightening. We need to support cleanliness and hygiene, I still found people who think it's proven that we are too clean. How has the error come about. The expert says "while exposure to microbes seemed pivotal in prevention of allergies, the hygiene hypothesis suggested that it was disease-causing microbes that offered protection – the hypotheses made the link between disease-causing microbes and protection from allergy – but it could be benign rather than disease-causing ones that are protective. As we've improved water and food, we've knocked out the good bacteria along with the pathogens*

## **2.10 How DIRT can protect you against cancer**

**Daily Mail 21 January 2008**

<http://www.dailymail.co.uk/health/article-509603/How-DIRT-protect-cancer.html>

The idea that we're too clean for our own good will be familiar. Scientists call it the hygiene hypothesis, and the theory is that far from benefiting our health, our obsession with cleanliness and hygiene is actually bad for us. It's said that exposure to dirt and germs early in life 'primes' the immune system so it is prepared for any future threat - and that our constant wiping and sterilising of everything from kitchen work tops to children's toys may be undermining this important mechanism. Last year, UK consumers spent £610 million on household cleaning products, up 16 per cent over a five-year period, according to market research experts. And the result of all this cleaning, according to proponents of the hygiene hypothesis, is an exponential growth in allergies.

## **2.11 Cleanliness linked to rise in diabetes, say scientists**

**Daily Mail September 2008**

Being too clean could increase the risk of diabetes, scientists said yesterday.

They say a lack of exposure to bacteria and viruses during childhood may explain why the number of under-fives with type one diabetes has soared in recent years. The University of Bristol study, which is published online in the journal Nature, also found that so-called 'friendly' bacteria in the gut can prevent the onset of this form of diabetes. The findings support a 'hygiene hypothesis' theory that a lack of exposure to bacteria and viruses may actually lead to an increased risk of diseases like allergies, asthma, and other disorders of the immune system. Exposure to some forms of bacteria might help to prevent the onset of type 1 diabetes, which often develops in childhood, where the immune system launches an attack on cells that produce insulin. 'We have known for some time about the association between early infection and the development of type 1 diabetes,' he said. 'The results presented here also suggest that some infections may help to protect against the development of type 1 diabetes.'

## **2.12 Parental obsessions with cleanliness can lead to diabetes in children**

**Daily Telegraph Sept 2008**

Children who are brought up in extremely clean houses could be at greater risk of developing diabetes later in life, scientists have warned. A University of Bristol Study found that children living in sterile environments, where anti-bacterial soaps and sprays were frequently used, did not absorb "friendly" gut bacteria that can help to stop the development of type 1 diabetes. Children from "normal" households had healthier immune systems. The study used genetically modified mice that lacked the part of the immune system that responded to bacteria. They found that 80 per cent of the mice raised in a completely germ-free environment, and therefore lacking "friendly" gut bacteria, developed severe diabetes. But when they gave mice a cocktail of the usual bacteria found in the gut, the incidence of diabetes fell dramatically.

## **2.13 Everyday Germs in Childhood May Prevent Diseases in Adulthood**

**Science Daily Dec. 2009**

A Northwestern University study suggests that parents should ease up on antibacterial soap and perhaps allow their little ones a romp or two in the mud --- or at least a much better acquaintance with everyday germs. The study looks at how microbial exposures early in life affect inflammatory processes related to diseases associated with aging in adulthood. Most provocatively, it suggests that exposure to infectious microbes early in life

may actually protect individuals from cardiovascular diseases in adults. "Contrary to assumptions related to earlier studies, our research suggests that ultra-clean, ultra-hygienic environments early in life may contribute to higher levels of inflammation as an adult" Relatively speaking, humans only recently have lived in such hyper-hygienic environments. Inflammatory networks may need the same type of microbial exposures early in life that have been part of the human environment for all of our evolutionary history to function optimally in adulthood,"

## **2.14 Excessive cleanliness to blame for allergy rise**

Telegraph 15 Apr 2010

<http://www.telegraph.co.uk/news/health/news/7589193/Excessive-cleanliness-to-blame-for-allergy-rise.html>

Excessive cleanliness in modern homes has led to a steep rise in allergies, a new report indicated. These conditions have become increasingly widespread in developed countries with hay fever, eczema, hives and asthma are on the rise. The study linked the trend to the sterile environment created by the cleaning habits of today. The expert commented "There is an inverse relationship between the level of hygiene and the incidence of allergies and autoimmune diseases," "The more sterile the environment a child lives in, the higher the risk he or she will develop allergies or an immune problem in their lifetime." Although hygiene does reduce our exposure to harmful bacteria it also limits our exposure to beneficial microorganisms. As a result, the bacterial flora of our digestive system isn't as rich and diversified as it used to be.

## **2.15 Eating off the floor : How clean living is bad for you**

Rob Dunn , Scientific American, Guest Blog Jan 2012

<http://blogs.scientificamerican.com/guest-blog/2012/01/29/eating-off-the-floor-how-clean-living-is-bad-for-you/>

You are part bacteria, if you got rid of the life on your skin or in your gut, you would almost certainly die. The hygiene hypothesis, goes something like this... Humans moved from rural lifestyles outdoors to hyper-clean lifestyles indoors in city apartments with central air, sealed windows and surfaces scrubbed clean, at every opportunity, with antimicrobial wipes. That transition led us to spend less time getting "dirty" outside. It also "cleaned up" many of the species we need around us indoors that would allow us to get dirty. This combination prevented many of our immune systems from developing normally<sup>2</sup>. As a consequence, our they revolt against us in the form of asthma, allergies, Crohn's disease, inflammatory bowel disease etc *In other words, clean living of one sort or another may be at the root of the majority of modern, chronic, diseases.* The hygiene hypothesis is simultaneously elegant, but vague, and poorly tested. Little is known about how a change in the bacteria you are exposed to might negatively affect your immune system. Even less is known about how microbes vary with human lifestyles.

Some things have been tested. Taking worms away from someone with worms can make them more likely to suffer from autoimmune diseases. Conversely, adding them back can make them less likely to suffer. That said, we lost our worms because we started using indoor plumbing and walking around in shoes. When people talk about getting back to nature and being less hyperclean they seldom mean pooping near other people's feet and hands. If the hygiene hypothesis were right, we might expect the composition of bacteria and other microscopic species on individuals or in houses to vary as a function of our lifestyles and our health should vary, in turn, as a function of the composition of those microbes. The hygiene hypothesis doesn't really specify whether it is the diversity (how many kinds), composition (which kinds) or abundance (how many in total) that matters. My guess is that whatever the result is, it is likely to be dependent on other factors e.g urban living



A hospital study showed that clean living is bad for diversity. The outdoor air was most diverse, followed by rooms with an open window and then, finally, rooms that were mechanically ventilated. This is what the hygiene hypothesis would predict, that the conditions in which we try to envelope ourselves, warm rooms with the windows closed and the central air turned on, lead to the lowest diversity of microorganisms in our surroundings.

## **2.16 How keeping kids too clean can wreck their immune systems**

**Daily Mail March 2012**

<http://www.dailymail.co.uk/health/article-2118871/How-keeping-children-clean-wreck-immune-systems.html>

Today's children may be too clean for their own good, research suggests. Evidence is growing that dirt and germs can protect against disease - and that our indoor-based, ultra-clean lifestyles are bad for our health. The latest evidence comes from American researchers who studied germ-free mice, bred in a bubble and kept in sterile cages and fed sterile food. The lungs and bowels of the germ-free mice contained extra-large numbers of a type of immune cell blamed for asthma and bowel problems.

Graham Rook, emeritus professor of microbiology at University College London, said: 'The way forward is to work out how these bugs are doing it, so we can exploit them through new vaccines and drugs.' However, he urged parents not to deliberately let hygiene standards slip in a bid to make their children healthier. This is because skimping on cleanliness could let other, dangerous bugs take hold. Professor Rook said: 'It would be terribly dangerous to say to people, "Let's relax hygiene and we'll have less of these diseases".'

### **COMMENTS**

Dirty kids are healthy kids. Clean kids are weak and neurotic - like their mothers. It doesn't take a 'scientist' to come up with that gem. To me it seems pretty obvious that if you bring a baby into your home then keep it germ free and keep the baby constantly wiped and clean its immune system will be so low it will pick up germs more easily. I think that children today do seem to pick up all kinds of bugs and colds much quicker than we ever did when we are growing up. I don't ever remember seeing my mum with wipes or sprays! My mum wiped down the counters and tables with the dishcloth from the sink, I almost never get sick! My mum never sanitized the shopping trolley or the table in the restaurant.

Isn't this painfully obvious? You start fighting against nature and she will fight back: hospital superbugs and the gradual erosion of the effectiveness of antibiotics. Dirty kids are healthy kids. Clean kids are weak and neurotic - like their mothers.

It's fundamental - that's how basic immunization works, inject a small amount of the nasty, the body's defence learns to deal with it. Check out her undersink cupboards before you select her to breed your children, guys, - if they're full of product, run a mile or you'll end up with a brood of poor sickly weak and whiney innocent little children!

This will continue as long as the Mega-Companies that produce domestic cleaning materials are allowed to broadcast adverts implying that small children will be at risk if impressionable women who are usually totally clueless about science and mathematics do not use their products on a regular basis.

I very often wonder how the hell any of us survived before all this hysteria about sanitizing everything in sight set in!!

I shudder every time I see an advert in which an obsessively clean mother wipes down every possible surface with disinfectant to avoid her infant from eating anything which might just have come into contact with a speck of dust or a single microbe! Of course, human beings evolved alongside all these microbes and germs and mostly we achieve a natural immunity to all but the most virulent organisms.

### **2.17 Your Microbes and You - The Good, Bad and Ugly**

**NIH news in Health Oct 2012**

So what can you do to protect against microbes that cause infection but take care of the ones that help you? We know that washing our hands is important for removing harmful microbes—for example, before eating or after using the bathroom. Many researchers worry that some people are trying to get too clean. Blaser thinks that people are using sanitizers and antibiotic products too often these days. “there are many bad germs, but we’ve gone overboard - trying to get rid of the bad guys has had a collateral effect on the good guys.”

### **2.18 Early exposure to germs has lasting benefits**

**Nature 22 March 2012**

**<http://www.nature.com/news/early-exposure-to-germs-has-lasting-benefits-1.10294>**

Exposure to germs in childhood is thought to help strengthen the immune system and protect children from developing allergies and asthma, but the pathways by which this occurs have been unclear. Now, researchers have identified a mechanism in mice that may explain the role of exposure to microbes in the development of asthma and ulcerative colitis. The study supports the 'hygiene hypothesis', which contends that such autoimmune diseases are more common in the developed world where the prevalence of antibiotics and antibacterials reduce children's exposure to microbes.

### **2.19 Is it possible to be too clean? Researchers say yes**

**NBC News Oct 2012**

**<https://www.nbcnews.com/news/other/it-possible-be-too-clean-researchers-say-yes-f1C6345427>**

If you've been feeling guilty because you can't keep your house spotless, stop. - allowing the odd germ to flourish here or there just might be saving your kid from a lifetime of allergies, Dr. Nancy Snyderman explained on "NBC Nightly News with Brian Williams" Monday. It seems counterintuitive, but that's exactly what the so-called "hygiene hypothesis" suggests. You can actually be too clean for your own good. Scientists came up with the hypothesis as a way to explain the explosion of allergies and asthma in America's youth. And what they discovered was: kids who grow up in less tidy environments end up with a lower risk of developing sensitivities to benign substances, like pollen and dog dander.

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A study released in June added to the growing of evidence that the too-clean-for-health hypothesis might be on track. That study, found that Amish children who were raised on farms were less likely to develop allergies and asthma than their peers.

An expert says: If you keep your environment too clean – by using too many bacterial soaps and hand sanitizers, for example – then your immune system becomes more sensitized to any irritant that comes its way. Does that mean we can all throw out our mop buckets and soap? No, experts say. We still need to keep things clean, just not Bubble Boy antiseptic. My advice is that some hygiene is good, too much is bad,” “In many cases you have to use common sense. You’re in a situation where you’re likely to be exposed to germs that could cause disease – it’s a better idea to use sanitizers to remove them. “But indiscriminate use - overusing hand sanitizers, anti-microbial soaps and so forth - is also going to be doing harm. So you have to balance the two.”

## **2.20 Hypercleanliness may be making us sick**

**Washington Post March 2013**

[https://www.washingtonpost.com/national/health-science/hypercleanliness-may-be-making-us-sick/2013/03/25/9e6d4764-84e9-11e2-999e-5f8e0410cb9d\\_story.html?utm\\_term=.377e734e6dcf](https://www.washingtonpost.com/national/health-science/hypercleanliness-may-be-making-us-sick/2013/03/25/9e6d4764-84e9-11e2-999e-5f8e0410cb9d_story.html?utm_term=.377e734e6dcf)

A growing body of evidence suggests that all the antibacterial-wiping, germ-killing cleanliness of the developed world may actually be making us more prone to getting sick — and that a little more dirt might help us stay healthier in the long run. The idea, is known as the hygiene hypothesis Researchers know: Our immune systems need bugs. They rely on early encounters with germs to learn how to protect our bodies. “Bacteria, fungi, lots of these things we think of as bad — they’re all part of our environment, and we evolved to live with them,” Through exposure to these microbes early in life, your immune system learns what’s harmful and what isn’t and that readies the immune responses you’ll have for the rest of your life.

But researchers can’t say which particular interactions with the environment help prevent disease later on. The articles goes on to consider – farm living, antibiotics, diet etc. Parasites and disease-causing microbes have also shown a protective effect, but again it’s not clear which microbes are doing the protecting. So Should we ditch spring cleaning and adopt a dairy cow — or a parasite — to keep allergies at bay?

Probably not, hygiene saves lives and prevents the spread of disease, and no researcher would advocate abandoning it entirely. But we may want to rethink our relationship with germs, she says. The important thing is moderation: “It’s not that you should expose yourself to things that are going to kill you. We’re just talking about living in a more microbially rich environment. That means you don’t need to use antibacterial soaps or wipes, or clean everything with bleach, or even wash your clothes every day. Getting dirty isn’t so bad. . . . Just use your common sense.”

### **COMMENTS**

Well, I grew up near farms. And has lot of infections growing up. But I have some eczema, and autoimmune disease. One of my sisters has hay fever and many allergies. The overuse of these wipes is serious, but for different reasons. Many of them rely on antibiotics. This leads to germ developing resistance to antibiotics.

Antibacterials are way overused, and probably causing us harm, whether it's making allergies more common or leading to antibiotic-resistant bacteria. On the other hand, try not to generalize TOO much. my mom was way ahead of the curve on antibacterial things being at best a waste of time and at worst bad for you.

Those wipes and so-called anti-bacterial soaps are just marketing. They work; they push the population of bacteria toward more resistance to antibiotics. That's the problem with them. They make the 'enemy' stronger and the 'local population' less friendly.

The folks that sell all this anti-bacterial stuff are to blame. They have convinced us that germs are bad. I grew up in 70's. We left food out for hours, ran around barefoot, got cuts

and scrapes and put nothing on them. I'm still alive and kicking. The only time I advocate extreme cleanliness is in food service, hospitals and shared work areas.

The piece doesn't mention the fact that easily-killed bacterial strains out-breed the superbug variety in a normal dirty environment, leaving the superbugs as an infinitesimally small group, thus unable to infect people. But when we fanatically clean up with bleach and so on, only the superbugs remain (they can't metabolise or drink properly, so avoid the toxins we use), so they eventually breed up and become the dominant group.

### **2.21 Coming Clean About "Good" Germs, "Bad" Germs, and Childhood Allergies Quality Health May 2013**

<https://www.qualityhealth.com/allergies-articles/coming-clean-about-good-germs-bad-germs-childhood-allergies>

Revising the Hygiene Theory and Childhood Allergies Gupta points out her recent research efforts on children and allergies have discovered that 1 in 13 young people (or 8 percent) suffer from food allergies-her findings were published in *Pediatrics* (2011), the official journal of the American Academy of Pediatrics. While experts don't know what exactly is causing the rise in allergies, our increasingly hygienic lifestyles may play a role. According to Gupta, some of the factors research points to include: more C-sections, which eliminate the newborn's exposure to germs in the birthing process; over-treating infants with antibiotics for viral infections; children spending more time indoors than in the past, and the over-use of antibacterial hand sanitizers.

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### **2.22 Good hygiene may be to blame for soaring Alzheimer's Telegraph, Sep 2013**

<http://www.telegraph.co.uk/news/health/news/10286654/Good-hygiene-may-be-to-blame-for-soaring-Alzheimers.html>

Modern cities and improved hygiene could be behind rising rates of Alzheimer's in Britain and the rest of the developed world, scientists say. Countries such as the UK and France, where this is universal, had a 9 per cent higher incidence of Alzheimer's than countries such as Kenya and Cambodia where less than half the population can access clean water. A similar pattern emerged from comparisons between countries with low and high rates of infectious disease. Researchers have linked the "hygiene hypothesis" - the idea that lack of exposure to germs, viruses and parasites harms the immune system - to rising rates of dementia in richer nations."The 'hygiene hypothesis', which suggests a relationship between cleaner environments and a higher risk of certain allergies and autoimmune diseases, is well established. Access to clean drinking water was one area said to have a high impact on Alzheimer's rates. The hygiene hypothesis is based on the assumption that lack of contact with "dirt" in the form of bacteria and other infectious agents upsets the development of white blood cells, key elements of the immune system. The researchers wrote: "Exposure to micro-organisms is critical for the regulation of the immune system." Since the turn of the 19th century, such exposure had increasingly diminished in wealthier nations due to lack of contact with "animals, faeces and soil".

### **2.23 The hygiene hypothesis: How being too clean might be making us sick Vox, Jan 28, 2015, 11:07am EST**

<https://www.vox.com/2014/6/25/5837892/is-being-too-clean-making-us-sick>

Over the past few decades, doctors have arrived at a counterintuitive hypothesis about our modern, ultra-sanitized world. Too much cleanliness may be causing us to develop allergies, asthma, inflammatory bowel diseases, and other autoimmune disorders. The hygiene hypothesis suggests that early life exposure to microbes helps in the education of

an infant's developing immune system." Without this education, your immune system may be more prone to attacking the wrong target — in the case of autoimmune diseases, yourself. But researchers have found that a few specific autoimmune diseases — asthma, **hay fever**, inflammatory bowel diseases, and various allergies — have become much more common as we've become more sanitary, and are much more prevalent in the wealthy world than the developing one. Even within a developing country like Ghana, wealthy urban children **have higher rates of these autoimmune diseases** than poorer or rural children.

In the wealthy world, adults who **clean their houses with antibacterial sprays** have higher asthma rates, and people **who are more often exposed to triclosan** (the active ingredient in antibacterial soap) have higher rates of allergies and hay fever. Kids who grow up on farms or have pets, meanwhile, **have lower rates of allergies and asthma**. These are all correlations — not causations — but they suggest that something about the relatively clean, modern urban environment makes these autoimmune diseases more likely to develop.

So what does this mean for you?



But there's still some disagreement among scientists



None of this means that you should stop cleaning your house or washing yourself, or begin drinking potentially sewage-contaminated water. For one, most of these findings involve bacteria exposure during *childhood* — not for adults. Most of the reduction in bacteria exposure in modern society comes from broader trends (like **antibiotic overuse** and sewage treatment plants) rather than personal choices. So, at the moment, the practical applications of this research on a personal level are relatively limited. It might make you think twice before having your kid use antibiotic soap (which **you really shouldn't be using anyway**). More importantly, it provides some evidence that **vaginal births and breastfeeding are important** for the development of a healthy microbiome in infants.

## 2.24 We're too clean for our own good

Sydney Morning herald, June 2016

<http://www.smh.com.au/comment/were-too-clean-for-our-own-good-20160622-gpoye1.html>

I spent the first four years of my life with a bagel in hand. It often slipped from my fingers, at which point my mum would call over her shoulder, "Five second rule." That was my cue to pick it up off the floor and stick it back in my mouth. First-time parents would look at my mother in disgust. You're really going to let her eat that? But think of all the germs!

A 2015 study found that children whose families washed their dishes by hand were significantly less likely to suffer from eczema than were children whose families used a dishwasher. These findings suggest that those who wash their dishes by hand are likely exposed to more pathogens, which actually protect them from the development of eczema. This represents the latest data in support of the hygiene hypothesis.

Most experts in the field agree that germs are necessary for healthy immune function. An expert said "The typical human probably harbours 90 trillion microbes ... The very fact you have so many microbes of so many different kinds is what keeps you healthy most of the time." She denounced the current societal obsession with antibacterial products and suggests that plain soap and water are all that is needed for washing. With this knowledge, it's clearly time to re-evaluate our perspective on germs. Rather than allowing phobia to rule what we buy and how we wash, we must come to accept germs as a reality of human existence, a requirement, in fact, for healthy living. How to we begin to change our relationship with germs? Maybe we begin by drinking from the tap, washing in moderation and employing the five-second rule.

## **2.25 UBC microbiologist says parents should ease up on war against bacteria** **The globe and Mail August 2016**

[https://beta.theglobeandmail.com/news/british-columbia/ubc-microbiologist-says-parents-should-ease-up-on-war-against-bacteria/article31569957/?ref=http://www.theglobeandmail.com&utm\\_source=twitter.com&utm\\_medium=Referrer:+Social+Network+Media&utm\\_campaign=Shared+Web+Article+Links](https://beta.theglobeandmail.com/news/british-columbia/ubc-microbiologist-says-parents-should-ease-up-on-war-against-bacteria/article31569957/?ref=http://www.theglobeandmail.com&utm_source=twitter.com&utm_medium=Referrer:+Social+Network+Media&utm_campaign=Shared+Web+Article+Links)

The co-author of the new book *Let Them Eat Dirt: Saving Your Child from an Oversanitized World* is quick to point out that he's not suggesting parents let their kids chow down on, well, dirt, but is making the case for parents to ease up on their war against bacteria because early exposure can kick-start young immune systems to begin the war on disease.

That means holding off on hand washing and hand sanitizer, letting kids play more with their pets, feeding babies breast milk instead of formula, among other measures, to let kids get a mix of good and bad bacteria. "We're not saying, 'Feed them dirt,' but let them be kids," Dr. Finlay said in an interview on Thursday. "You don't have to wash them off every time they're dirty, and wash them off before dinner. They don't have to be scrubbed clean." The authors research has shown children who are introduced early on to some microbes can ward off asthma when they're older. Infections were once a major cause of human illness, leading to a necessary tide of vaccines, clean water and antibiotics, said Dr. Finlay. All good, but things may have gone too far. "What we're now realizing in our quest to get so clean is we're depriving ourselves of harmless microbes we have actually co-evolved with, that we would normally exp

## **Appendix 3 Media coverage on the importance of the human microbiome to health**

Extracts of media articles on this issue are set out in Appendix 3. Findings are summarised in Table 3.

### **3.1 Why antibiotics are making us all ill** **Guardian June 2014**

<https://www.theguardian.com/society/2014/jun/01/why-antibiotics-making-us-ill-bacteria-martin-blaser>

Martin Blaser argues that we are suffering from a new wave of 'modern plagues' such as obesity and asthma because we have destroyed the naturally occurring bacteria in our bodies. The most popular explanation for the rise in childhood morbidity is the so-called hygiene hypothesis. The idea is that modern plagues are happening because we have made our world too clean. A lot of parents these days try to ramp up their kids' immune systems by exposing them to pets, farm animals, barnyards. I beg to differ. The hygiene hypothesis has been misinterpreted. Each of us hosts a similarly diverse ecology of microbes that, over eons, co-evolved with our species. Together, they play a critical role in your immunity and ability to combat disease. In short, your microbiome keeps you healthy. And parts of it are disappearing. The reasons are all around us, including overuse of

antibiotics in humans and animals, caesarean sections, and the widespread use of sanitizers and antiseptics, to name just a few.

### **3.2 Antibiotics and obesity**

**American Museum of Natural History; Oct 2014**

<https://www.amnh.org/explore/news-blogs/podcasts/scicafe-antibiotics-and-obesity-with-martin-blaser/>

Microbiology researchers recently proved that populations of microbes living in and on the human body affect their hosts' health. In this podcast, physician and microbiologist Martin Blaser discusses how changes in the human microbiome - for example, through the overuse of antibiotics and hand sanitizers - may be contributing to an increase in chronic conditions including obesity, allergic disorders, and diabetes.

### **3.3 Invite some germs to dinner**

**New York Times May 2015**

<https://www.nytimes.com/2015/05/10/sunday-review/invite-some-germs-to-dinner.html>

Industrial food sanitation practices — along with home cooks' antibacterial veggie washes, chlorine bleach kitchen cleaners and sterilization cycle [dishwashers](#) kill off so-called good bacteria naturally found in foods that bolster our health. Moreover, eliminating bad or pathogenic bacteria means we may not be exposed to the small doses that could inoculate us against intestinal crises. "No one is saying you need to eat a peck of dirt before you die to be healthy," said an expert "But there is a line somewhere when it comes to cleanliness. We just don't know where it is." The theory that there might be such a thing as "too clean" food stems from the [hygiene hypothesis](#), which has been gaining traction over the last decade. It holds that our modern germaphobic ways may be making us sick by harming our microbiome, which comprises all the microscopic beasts — bacteria, viruses, fungi, mites, etc. — that live in and on our bodies. Research so far has focused primarily on the detrimental effects of caesarean births and not breast-feeding, which may [inhibit the formation](#) of a robust microbiome, and the use of antibacterial soaps and antibiotics, which [diminish the microbiome](#) once it is established. Note: this is taken from an article which talks about antibiotic overuse – but there is no mention of antibacterial soaps A result is an immune system that essentially gets bored, spoiling for a fight and apt to react to harmless substances and even attack the body's own tissues.

### **3.4 Are you filthy enough: why we all need to stop washing hands**

**The Times Health Supplement Nov 13<sup>th</sup> 2015**

<http://www.thetimes.co.uk/tto/health/article4602687.ece>

A group of scientists believe that our gut bacteria are key to fighting disease - and they will go to extremes to stay healthy. A scientist whose daughter was diagnosed with diabetes is trying to understand why? Was it her caesarean section delivery, her modern disinfected upbringing, too many antibiotics or processed food – all of which have a damaging effect on gut bacteria. A nutritionist said "The idea that children should wash their hand before eating... I don't think we should be washing our hands before a meal now. If you think of the number of food poisoning incidents in the home, they're incredibly rare. "We're over-cleaning enough. The more microbial diversity you have, the better. I think we have to start striking a different balance because our sterility is causing problems. "What about washing your hands after using the lavatory? Many microbiologists (bacteriologists) don't do that. If you're in a public toilet, and you've been for a pee, you're probably better off with your own microbes. These experts believe that we need to take care of our gut bacteria by getting a bit more down and dirty

Why has the gut microbiome become depleted. There are 3 main contenders: Firstly over use of antibiotics The second is sterility of modern life and diet the need for a variety of

plant foods, yoghurts, growing up around animals, gardening and farming. The third is c-sections

### **3.5 Making your house too clean could be dangerous for your children**

**Miriam Stoppard The Mirror Dec 2015**

<http://www.mirror.co.uk/news/uk-news/making-your-house-clean-could-6964569>

I keep saying we're too clean. I've been saying it for 20 years and I'll keep repeating it. I'm a believer in my granny's saying, "you've got to eat a peck of dirt in your time". We actually need 99.9% of household germs to prime our fledgling immune system to mature and behave itself. Exposing a child to household germs helps free them from the dangers of developing allergies. On the other hand, raising children in environments that are too clean leads to a weak immune system that will fire off whenever it meets an unfamiliar invader; that's an allergic response. This is called a "hygiene hypothesis" of allergies. We're obsessed with cleanliness, and we believe the ads saying we must "kill 99.9% of all household germs". A nutritionist is articulate about the damage we do with too much cleanliness. "The idea that children should wash their hand before eating. I don't think we should be washing our hands before a meal now. If you think of the number of food poisoning incidents in the home, they're incredibly rare. "We're over-cleaning enough. The more microbial diversity you have, the better. I think we have to start striking a different balance because our sterility is causing problems. "What about washing your hands after using the lavatory? Many microbiologists (bacteriologists) don't do that.

### **3.6 Fighting the germ of our near obsessive cleanliness**

**Dec 9th 2015 Mumbai Mirror**

<http://www.mumbaimirror.com/others/health-lifestyle/Fighting-the-germ-of-our-near-obsessive-cleanliness/articleshow/50085504.cms?>

I keep saying we're too clean. I've been saying it for 20 years and I'll keep repeating it. I'm a believer in my granny's saying - "You've got to eat a peck of dirt in your time". And she didn't mean a pinch. She meant an imperial peck, equivalent to about 10 kilos! All that time ago, though she didn't know why, she was right. The difference is we now know why she was right. And the reason resides in the bacteria we're exposed to early in life and our immune system. We actually need 99.9 per cent of household germs to prime our fledgling immune system to mature and behave itself. Exposing a child to an array of household germs helps free them from the dangers of developing allergies, including asthma. On the other hand, raising children in environments that are too clean leads to a weak immune system that will make the fundamental error of firing off whenever it meets an unfamiliar invader; that's an allergic response.

This is called a "hygiene hypothesis" of allergies. Worse than that, this weakened immune system will run the risk of attacking your own body (autoimmune disease), possibly leading to MS, rheumatoid arthritis or even diabetes. We're obsessed with cleanliness, and we believe the ads saying we must "kill 99.9 per cent of all household germs".

A nutritionist is articulate about the damage we do with too much cleanliness. "The idea that children should wash their hand before eating ... I don't think we should be washing our hands before a meal now. If you think of the number of food poisoning incidents in the home, they're incredibly rare. So for the sake of your children, walk past the products in the supermarket aisle displaying all manner of antibacterial products to keep your home. Every surface, your laundry and now even the air in your home that your child breathes is germ free. It's wrong and it's dangerous. When you see a household product promising to kill 99.9 per cent of household germs, leave it on the shelf. For your children's sake

### **3.7 Dog walkers and gardeners should avoid washing hands to encourage friendly bacteria**

**Telegraph Jan 13th 2016**



<http://www.telegraph.co.uk/news/health/news/12097838/Dog-walkers-and-gardeners-should-avoid-washing-hands-to-encourage-friendly-bacteria.html>

Friendly bacteria are disappearing from the body and people should avoid washing excessively, Dog walkers and gardeners should resist the urge to wash their hands after touching pets or soil to **encourage friendly bacteria into the body** and reverse the damage of decades of poor diets, scientist have said. Many believe it is **disappearing microbes** which has fuelled the rise in allergies and food intolerances, as bacteria often secrete enzymes which dampen down the immune system. Simple tweaks in our cultural practices, for example, not washing our hands after gardening or petting our dogs could be a step in the right direction." Numerous factors including widespread antibiotic use, more-frequent caesarean sections and less-frequent breastfeeding have been proposed for why we see this depletion in industrialized populations," said the study's lead author "We asked ourselves whether the huge difference in dietary fibre intake between traditional and modern populations could, alone, account for it."

### **3.8 Don't wash your hands! A bit of dirt is good for you: Experts say cleaning less often would protect against allergies by allowing helpful bacteria into the body** Daily Mail Jan 13th 2016

<http://www.dailymail.co.uk/sciencetech/article-3398553/Don-t-wash-hands-bit-dirt-good-Experts-say-cleaning-protect-against-allergies-allowing-helpful-bacteria-body.html#ixzz3xDe>

Researchers said modern diets lacking in fibre may cause irreversible damage to vital gut bacteria. They said that fibre, which cannot be digested by the human gut, was the primary source of food for bacteria living in our gut. Humans are able to pick up bacteria from external sources. One of the most significant sources of bacteria is from our immediate families, especially during birth and infancy. Widespread antibiotic use, caesarean sections and less-frequent breastfeeding in industrialised nations could also account for the depletion of intestinal microbes. The researchers suggested that simple tweaks in our culture, such as not washing our hands after gardening or petting a dog and reducing our reliance on antibiotics, could be a step in the right direction.

#### **Comments**

It's only by coming in contact with dirt, germs and viruses that our body can build up our immune system. I remember many years ago watching a TV programme about children who are brought up on farms with animals. These children had the highest immunity against almost everything because they were exposed from an early age.

When I was a nipper and up to my neck in mud in the garden, my Nan used to tell my mother not to worry and "He'll eat a peck of dirt before he dies" ..she knew the wisdom of not being over worried about cleanliness and that was without all the scientific clap trap.

### **3.9 Let them eat dirt! Our obsession with hygiene is jeopardising our children's health**

The Telegraph June 2016

<http://www.telegraph.co.uk/good-news/2016/06/11/our-obsession-with-hygiene-is-jeopardising-our-childrens-health/>

Mothers are chastised with the endless list of chronic childhood illnesses, from autoimmune diseases like eczema or asthma to nut allergies, dairy intolerances, to ADHD. In her book Healthy Food, Healthy Gut, Happy Child, An expert advocates a lifestyle centred around contact with the microbes present in soil. "Parents are keeping their children away from the things critical to their health," "We are sanitising their lives with cleaning products, pesticides and antibiotics."Recent research from the journal Occupational Environmental shows that children exposed to bleach actually have more, not fewer infections - including 20% higher risk of coming down with the flu, she points out.

It's become clear that the gut microbiome plays a vital role in health and immunity, and the more diverse they are the better. In her book, she shows how the over-sanitisation of our lives is depriving our guts of the biodiversity that can be found in healthy soil, making us more susceptible to conditions like allergies. "Research shows that children who grow up on farms are less likely to have allergies and asthma, because the biodiversity of the bacteria in the soil they're exposed to is tremendous." "Encourage them to play in the dirt. "Spend hours a day in forests and parks, on mountains, and play sports on fields."

### 3.10 Too clean for our children's good

NY Times April 17th 2017

<https://www.nytimes.com/2017/04/17/well/family/too-clean-for-our-childrens-good.html?smid=tw-nytimeswell&smtyp=cur>

Many parents, quite reasonably, worry about germs and dirt finding their way into a child's mouth. But many have also heard in recent years of the "hygiene hypothesis," which holds that some exposure to germs and microorganisms in early childhood is actually good for us. Dr. Gilbert is a co-author, with Rob Knight of a new book called "[Dirt Is Good: The Advantage of Germs for Your Child's Developing Immune System](#)." - "When we talk about the hygiene hypothesis, the collection of theories that address the possible problems associated with growing up less exposed to germs and dirt, we are talking about growing up indoors". - "We're talking about living in a world of relatively clean and controlled surfaces, where even small children who are constantly picking things up and putting them in their mouths are not going to come into contact with a very wide variety of exposures". - "we've come to ask, whether children, too completely walled off from the microbial surroundings may grow up with some negative consequences of our ever-cleaner homes. - That separation actually starts even before a baby is brought into its clean home environment. "

Another expert said "Studies have shown that priming or seeding of the microbiome in the child is absolutely critical, "you don't want to create such a sterile environment that the immune system does not develop normally. We need to study health consequences of the built environment, even the more modern and more "hygienic" built environment"

### 3.11 Dirt is good – why kids need exposure to germs

Shots health News from NPR July 2017

<http://www.npr.org/sections/health-shots/2017/07/16/537075018/dirt-is-good-why-kids-need-exposure-to-germs>

This article is about new book called *Dirt is Good: The Advantage of Germs for Your Child's Developing Immune System*. Presented in a Q&A format, the book seeks to answer many of the questions from parents. What do parents get wrong? Some of the main things are over-sterilizing their environment, keeping their children from ever getting dirty. So going out into the backyard and playing in the mud, and then as soon as they're filthy, bringing them in and sterilizing their hands with antiseptic wipes, and then making sure that none of the dirt gets near their faces. Also, keeping them away from animals. It's fine to wash their hands if there's a cold or a flu virus around, but if a dog licks their face, that's not a bad thing. In fact that could be extremely beneficial. What about hand sanitizer? Good or bad? Usually bad. Hot, soapy water is fine. Even mildly warm, soapy water is fine, and it's probably less damaging to the child's overall health. It turned out that most of the exposures were actually beneficial," Gilbert says. "So that dirty pacifier that fell on the floor — if you just stick it in your mouth and lick it, and then pop it back in little Tommy's mouth, it's actually going to stimulate their immune system. Their immune system's going to become stronger because of it."

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