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GASTROENTEROLOGY & HEPATOLOGY | RESEARCH ARTICLE

Does education influence the acceptability of faecal microbiota transplantation in colitis: A cross-sectional study

Bret S. Palmer1*, Chris Metcalfe1, Aileen Fraser2 and Tom Creed2

Abstract: Objectives: Dysbiosis can have a profound effect on the health of the individual and is considered to be a contributing factor to many health problems such as Inflammatory Bowel Disease and Clostridium difficile infection. Faecal Microbiota Transplantation (FMT) is potentially a safe method of renewing the ecology and correcting the dysbiosis, so alleviating the associated conditions. This study aims to identify any barriers to the acceptability of FMT in colitis patients and whether these barriers can be overcome through education. Methods: An unsolicited online survey distributed via Crohn’s and Colitis (CCUK) to approximately 900 members suffering from colitis. Results: 224 responses were received, a response rate of 25%. 36.2% (n = 81) of respondents were male. The age range of participants was 19–81 years (mean 45.1). After the demographic and medical status questions, participants were asked “Does FMT sound acceptable to you?” Out of the respondents that answered this question only 37.1% (n = 78, 43.2% of these being male) agreed with this statement, with the remainder answering no (n = 40) or unsure (n = 92). After various questions and explanations examining the process of FMT, individuals were asked this question again with 53.6% (n = 105, 59.7% of these being male) stating that this procedure was now acceptable (p < 0.001). Conclusion: The acceptability of FMT was found to be low but can be improved with the provision of information.

ABOUT THE AUTHORS

I have long been interested in the relationship and interplay between disease and microbes. My understanding of this relationship has changed from not just how pathogenic microbes cause disease but how we need a wide range of microbes to sustain good overall physical and mental health. While FMT is an unpleasant procedure it is one of the few methods of microbe replacement that has proven to be effective. If FMT remains the only effective method of microbe replacement, then understanding how to improve greater acceptability of this procedure will become key to limiting many non-communicable diseases, as well as reducing the burden of many diseases linked to a westernised life style.

PUBLIC INTEREST STATEMENT

For the past four billion years a war has been going on between bacteria and viruses. This war has pushed forward the evolution of all other life including mankind. The conflict between bacteria and viruses continues within our gut today. It is this ecosystem which we have evolved with that helps keep us healthy. When our gut’s ecosystem becomes unbalanced it can lead to various diseases. It is thought that by transplanting a healthy ecosystem into an unhealthy person some disease processes such as Inflammatory Bowel Disease, metabolic syndrome and obesity could be reversed. In our study we examine the influence of education in the acceptability of transplanting a healthy ecosystem by faecal (stool) transplant and show that by explaining the science behind this treatment its acceptability is increased. With more diseases being linked to an unhealthy ecosystem, a greater understanding of this procedure is needed in society.

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1. Introduction

The human bowel is home to 100 trillion bacteria and has an extensive, poorly understood, ecology (Lepage et al., 2013). It is now recognized that disruption within this ecology (dysbiosis) can have a profound effect on the health of the individual (Carding, Verbeke, Vipond, Corfe, & Owen, 2015). Dysbiosis is considered to be a contributing factor to many autoimmune diseases and is a common finding in many other wide ranging health problems such as obesity, asthma and metabolic syndrome (Carding et al., 2015).

Some autoimmune diseases have been known for centuries while others, such as Inflammatory Bowel Disease (IBD) and asthma have only been characterized in the last 100 years. The epidemiology of autoimmune disease in the 20th century shows a steady increase in prevalence with diseases such as IBD becoming more common in countries which have transitioned to a more westernised culture with improved hygiene practices (Smith, Bloomfield, & Rook, 2012). For example IBD was largely unnoticed at the beginning of the 20th century; Crohn’s disease being formally discovered by Burrill Bernard Crohn in 1932, despite IBD being described in 1913 by Thomas Kennedy Dalziel (1913). However ulcerative colitis was described earlier by Samuel Wilks in 1859 but not confirmed until 1931 by Sir Arthur Hurst (Hurst, 1931; Wilks, 1859). The current prevalence of IBD has now increased to 505 per 100,000 persons for ulcerative colitis and 322 per 100,000 persons for Crohn’s disease in Europe (Molodecky et al., 2012).

The annual cost of IBD for the NHS in England is approximately £1 billion, based on an average cost of £3,000 (US$4600, €4180) per patient per year (Bassi, Dodd, Williamson, & Bodger, 2004). This is likely to be an underestimate as it does not take into account the ever increasing drug costs due to the increased use of monoclonal antibodies, surgery and indirect costs to society, (UK Inflammatory Bowel Disease Audit 3rd Round, 2011) the burden of IBD in humans is increasing. As a result there has been renewed examination of fecal microbiota transplantation (FMT) as a possible method of treatment. FMT is the process of taking feces from a healthy individual and transferring the feces into an unhealthy individual via NJ tube, colonoscopy or enema. The aim is to transplant a healthy gut ecosystem from a well individual to replace the unhealthy ecosystem in an individual affected by a disease which is thought to be amenable to this modality of treatment. While the evidence for FMT in treating pseudomembranous colitis due to Clostridium difficile is now robust as a second line treatment, (NICE guidelines, 2014) the evidence for its use in IBD and ulcerative colitis (UC) in particular is at present patchy. One randomized trial investigating FMT in those with active UC, did induce remission in 24% of those who undertook FMT compared to 5% who took the placebo (Moayyedi et al., 2015). Another small scale trial has reported no statistical difference in patients with UC treated with FMT, (Ponsioen, 2012; Rossen, Fuentes et al., 2015) other trials are completing in 2016 (Li, 2013; Marcus & Focht, 2013; Paramsothy, 2013). One meta-analysis did review 25 studies into Faecal Microbiota Transplantation (FMT) which showed FMT having a promising effect for UC (Shi et al., 2016). Another meta-analysis examining IBD showed a pooled subgroup analysis demonstrating a pooled estimate of clinical remission of 22% for UC and 60.5% for Crohn’s disease (Colman & Rubin, 2014) both meta-analysis suggests that FMT is safe. There are also many systematic reviews on FMT most have similar conclusions to that of the latest review we have found (Rossen et al., 2015) that FMT is highly effective in Clostridium difficile Infection and holds promise in UC. Even if these trials show positive outcomes and demonstrate FMT as an effective treatment for UC, there still remains the concern of acceptability. Many gastroenterologists do not consider FMT in the treatment of C. difficile as it is commonly assumed that a patient would find such a treatment to be unacceptable, despite the weight of evidence on its effectiveness (Zipursky, Sidorsky, Freedman, Sidorsky, & Kirkland, 2014).
To the best of our knowledge only one other study has investigated the acceptability of FMT in ulcerative colitis patients, (Kahn et al., 2013) this study based in the United States of America had 95 participants with 46% of participants who were willing to undergo FMT.

This study reports a short descriptive analysis of the results from a survey taken by individuals with IBD who live in the South West of England, Great Britain, about their views on the acceptability of FMT, as a method of treatment for IBD. The aim of the study is to see if educating patients about the FMT procedure increases the acceptability of it.

2. Methods
A pilot questionnaire was constructed to ascertain the views of IBD sufferers on FMT as a treatment method. Questions were identified from validated IBD questionnaires. The pilot was trialed on 7 colitis patients at an IBD clinic at the Bristol Royal Infirmary. Patients were asked to answer the questions, how they felt about the nature of the questions, and their opinion of what else could have been asked or missed out. The results of the pilot were used to inform the final anonymous online questionnaire using Survey Monkey® (https://www.surveymonkey.com). The survey began with questions on basic demographic and medical data.

The survey then asked about respondents' views on FMT and whether they felt it was an acceptable method of treatment. A series of subsequent questions, structured around FMT, then gave respondents more detailed information explaining the current theories, science and the FMT procedure (see the attached survey in Appendix 1). Finally, respondents were asked, knowing what they now know, would they consider receiving FMT. Respondents could not backtrack on previous answers submitted.

2.1. Study participants and recruitment
The population of interest was IBD sufferers within travelling distance of the Bristol area, as we wanted to gain a measure of acceptability of FMT in any future trial or service. Crohn's and Colitis UK (CCUK) distributed the questionnaire, by prior agreement, to all of their members in Bristol and the surrounding areas, including South East Wales, UK. This totaled 900 Colitis members of the CCUK in December 2013. Participation was voluntary, and individuals could withdraw at any time during the questionnaire. Informed consent was obtained from each participant. Responses were treated anonymously and respondents were uncompensated for their time or expenses. An explanation of the survey was given to all participants with contact details if they had any remaining questions or concerns which they would like to be answered.

2.2. Ethical issues
This work was supported by the University of Bristol School of Social and Community Medicine and approved by the Faculty of Medicine and Dentistry Committee for Ethics, approval number: 4121 (131403).

2.3. Analysis
Responses were collected over a period of three months. Differences in response on categorical measures between independent groups were tested for statistical significance using the \( \chi^2 \) test. The null hypothesis of no change in acceptability of FMT following information provision was tested using McNemar's test, applied to the paired data from each participant's two responses to this question.
In order to obtain a binary result the responses for “No” and “unsure” were added together. For question 8, on medications, there were no pre-specified hypothesis and so the data is not presented here. For Question 18 blood relatives were combined into a single response category, and no one chose the “friend” response category. The analysis in Tables 1 and 2 is based on responses obtained for questions 14 and 20 respectively.

### Table 1. Responses obtained by the faecal microbiota transplantation questionnaire split by acceptability of FMT (Q14) before the provision of information

<table>
<thead>
<tr>
<th>Question (number of responses)</th>
<th>Does FMT sound acceptable to you?</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (n = 78)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No (n = 40)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unsure (n = 92)</td>
<td></td>
</tr>
<tr>
<td>Q3: What is your age? (n = 224)</td>
<td>Mean 46.6 (range 20–74)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>44.1 (range 19–73)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>44.3 (range 19–77)</td>
<td></td>
</tr>
<tr>
<td>Q4: What is your sex? (n = 210)</td>
<td>Male 32 (41.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 (40.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>26 (28.3%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female 46 (59.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24 (60.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>66 (71.7%)</td>
<td>Baseline</td>
</tr>
<tr>
<td>Q5: Diagnosis? (n = 208)</td>
<td>Crohn's disease 29 (37.2%)</td>
<td>0.177a</td>
</tr>
<tr>
<td></td>
<td>Ulcerative colitis 44 (56.4%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other 5 (6.4%)</td>
<td></td>
</tr>
<tr>
<td>Q6: Average time with the disease in years? (n = 209)</td>
<td>Mean 13.4 (range 1.2–44.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.1 (range 0.1–52.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11.0 (range 12–46.3)</td>
<td></td>
</tr>
<tr>
<td>Q7: Do you smoke? (n = 210)</td>
<td>Yes 2 (2.6%)</td>
<td>0.138a</td>
</tr>
<tr>
<td></td>
<td>2 (5.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9 (9.8%)</td>
<td></td>
</tr>
<tr>
<td>Q9: Are any of your medications taken rectally? (n = 207)</td>
<td>Yes 17 (21.8%)</td>
<td>0.916a</td>
</tr>
<tr>
<td></td>
<td>8 (20.5%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18 (20.0%)</td>
<td></td>
</tr>
<tr>
<td>Q10: Have you had surgery to the large bowel? (n = 208)</td>
<td>Yes 21 (27.3%)</td>
<td>0.679a</td>
</tr>
<tr>
<td></td>
<td>9 (23.1%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22 (23.9%)</td>
<td></td>
</tr>
<tr>
<td>Q11: Are you awaiting surgery? (n = 208)</td>
<td>Yes 0 (0.0%)</td>
<td>0.167a</td>
</tr>
<tr>
<td></td>
<td>0 (0.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 (2.2%)</td>
<td></td>
</tr>
<tr>
<td>Q12: Are you considering surgery due to your symptoms? (n = 207)</td>
<td>Yes 10 (12.8%)</td>
<td>0.545a</td>
</tr>
<tr>
<td></td>
<td>3 (7.9%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 (5.5%)</td>
<td></td>
</tr>
<tr>
<td>Q13: Do you feel your symptoms are well controlled? (n = 197)</td>
<td>Yes 40 (52.6%)</td>
<td>Baseline</td>
</tr>
<tr>
<td></td>
<td>24 (61.5%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45 (54.9%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No 15 (19.7%)</td>
<td>0.864a</td>
</tr>
<tr>
<td></td>
<td>8 (20.5%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11 (13.4%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unsure 21 (27.6%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7 (18.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>26 (31.7%)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: P values were obtained by using the chi (c) square. Cells were combined to base the test on a 2x2 table, except where a ‘baseline’ is indicated, in which case we compared the other categories in turn to that baseline category.

Where values are below five the Fisher’s exact test was used.

*Values based on Chi square unless any values are under five then Fisher’s exact test was used.

*Values on these columns are based on question 14.
Table 2. Responses obtained by the faecal microbiota transplantation questionnaire split by acceptability of FMT (Q20) after the provision of information

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes (n = 105)</th>
<th>No (n = 33)</th>
<th>Unsure (n = 58)</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q15: Would you consider participating in a trial? (n = 195)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>67 (64.4%)</td>
<td>1 (3.0%)</td>
<td>9 (15.5%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No</td>
<td>19 (18.3%)</td>
<td>30 (90.9%)</td>
<td>16 (27.6%)</td>
<td></td>
</tr>
<tr>
<td>Unsure</td>
<td>18 (17.3%)</td>
<td>2 (6.1%)</td>
<td>33 (56.9%)</td>
<td></td>
</tr>
<tr>
<td>Q16: If the trial was successful, everyone in the control group would be offered a faecal rectal enema at the end of the trial; would you then participate? (n = 195)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>83 (79.1%)</td>
<td>1 (3.1%)</td>
<td>18 (31.0%)</td>
<td>0.755</td>
</tr>
<tr>
<td>No</td>
<td>12 (11.4%)</td>
<td>26 (81.3%)</td>
<td>6 (10.3%)</td>
<td></td>
</tr>
<tr>
<td>Unsure</td>
<td>10 (9.5%)</td>
<td>5 (15.6%)</td>
<td>34 (58.6%)</td>
<td></td>
</tr>
<tr>
<td>Questions truncated, full questions in appendix (number of responses)</td>
<td>Me</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q17: How many enemas would be acceptable? (n = 191)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It will never be acceptable</td>
<td>3 (2.9%)</td>
<td>21 (65.6%)</td>
<td>6 (11.1%)</td>
<td>Baseline</td>
</tr>
<tr>
<td>Only one</td>
<td>8 (7.6%)</td>
<td>5 (15.6%)</td>
<td>6 (11.1%)</td>
<td>Test for trend</td>
</tr>
<tr>
<td>One a day for two days</td>
<td>6 (5.7%)</td>
<td>2 (6.3%)</td>
<td>5 (9.3%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>One a day for three days</td>
<td>4 (3.8%)</td>
<td>0 (0.0%)</td>
<td>6 (11.1%)</td>
<td></td>
</tr>
<tr>
<td>One a day for four days</td>
<td>1 (1.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td></td>
</tr>
<tr>
<td>One a day for five days</td>
<td>14 (13.3%)</td>
<td>0 (0.0%)</td>
<td>5 (9.3%)</td>
<td></td>
</tr>
<tr>
<td>One a day for ten days</td>
<td>4 (3.8%)</td>
<td>0 (0.0%)</td>
<td>3 (5.6%)</td>
<td></td>
</tr>
<tr>
<td>As many as is needed</td>
<td>65 (61.9%)</td>
<td>4 (12.5%)</td>
<td>23 (42.6%)</td>
<td></td>
</tr>
<tr>
<td>Q18: Which donor would be more acceptable to you? (n = 187)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partner</td>
<td>15 (14.6%)</td>
<td>8 (29.6%)</td>
<td>12 (21.1%)</td>
<td>Baseline</td>
</tr>
<tr>
<td>Blood relatives</td>
<td>2 (1.9%)</td>
<td>3 (11.1%)</td>
<td>2 (3.51%)</td>
<td>0.681*</td>
</tr>
<tr>
<td>Anonymous donor, anyone who has the largest variation in their bowel biology (largest number of different types of bacteria)</td>
<td>86 (83.5%)</td>
<td>16 (59.3%)</td>
<td>43 (75.4%)</td>
<td>0.09*</td>
</tr>
<tr>
<td>Q19: Would you be happy to receive five faecal rectal enemas, one a day for five days? (n = 196)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>80 (76.2%)</td>
<td>1 (3.0%)</td>
<td>8 (13.8%)</td>
<td>0.01</td>
</tr>
<tr>
<td>No</td>
<td>9 (8.6%)</td>
<td>28 (84.9%)</td>
<td>3 (5.2%)</td>
<td></td>
</tr>
<tr>
<td>Unsure</td>
<td>16 (15.2%)</td>
<td>4 (12.1%)</td>
<td>47 (81.0%)</td>
<td></td>
</tr>
</tbody>
</table>

*Values marked with an asterisk (*) are those based on Fisher's exact test, remaining p values are obtained using the Chi squared test. To construct 2x2 tables the "no" and "unsure" values were added together for both tests. For chi-square tests the values were compared to the baseline.

†Values on these columns are based on question 20.
3. Results

224 responses were received from members of the CCUK, Table 1, with a response rate of 25%. Of those who reported demographic information 36.2% (n = 81) of the respondents were male. The overall age range of individuals taking part was 19–77 years with a mean value of 45.1 years. This mean and age range was similar for men (47.7, range 21–77) and women (43.7, range 19–77). Of all the individuals who reported a diagnosis 51.9% (n = 108) were ulcerative colitis suffers, 44.7% (n = 93) were diagnosed with Crohn’s disease with the remainder reporting duel or mixed pathology.

Of the patient characteristics investigated, there was no evidence that taking medication rectally, having had surgery to the large bowel, and considering surgery due to symptoms were associated with the acceptability of FMT prior to the provision of information, Table 1. There was also no evidence of association between how people viewed their illness (Q21) and their acceptability of FMT. For simplicity these results have not been reported.

Regarding numbers of stool transplants and source of stool, Table 2, respondents stated they would prefer, as many enemas as needed is the preferred option (test for trend \( p = < 0.001 \)). An anonymous donor with the largest variation in their bowel biology was the most commonly chosen donor (77.5%, n = 145, \( p = 0.09 \)). 18.7% (n = 35) stated they would prefer their partner to be the donor, the preferred donor was not associated with subsequent response to Q20, the second time participants were asked about the acceptability of FMT.

On being asked for the first time does FMT sound acceptable 37.1% (n = 78, 41.0% of these being male) of respondents agreed with the statement that FMT sounded acceptable, with the remainder answering no (n = 40) or unsure (n = 92). The number of respondents answering “yes” to this question increased to 105 (McNemar’s test \( p\)-value = < 0.001, Table 3) after they had answered questions examining the process of FMT (53.6%, n = 105, 59.7% of these being male).

4. Discussion

4.1. Main findings

This is the largest study identified that has examined the thoughts and attitudes of colitis sufferers on the acceptability of FMT. The study has identified that a large proportion of IBD sufferers consider FMT an acceptable treatment and that this acceptance increases when detailed information on the nature and purpose of the procedure is given.

Many FMT studies only give transplants where the recipient is related to the donor. Whether it is assumed by these studies that this would be more acceptable to patients is unclear. Studies have demonstrated that an unrelated donor (such as a spouse) may have a greater success in FMT than a blood related donor, possibly due to greater variability in microbiota (Gough, Shaikh, & Manges, 2011). This study demonstrates that over 75% of the study population would prefer a donor who has

<table>
<thead>
<tr>
<th>Q 14: Does FMT sound acceptable to you? (n = 210)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>69</td>
</tr>
<tr>
<td>No</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
</tr>
</tbody>
</table>

Table 3. McNemar’s test comparing pre (Q14) and post (Q20) education

Q20: Knowing what you know now; does FMT (taking stool (poo) from a healthy individual, mixing a sample (about an egg cup full) with water and giving it to you as a rectal enema) sound acceptable to you? (n = 196)

<table>
<thead>
<tr>
<th>Q20: Total</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>69</td>
<td>7</td>
</tr>
<tr>
<td>No</td>
<td>36</td>
<td>84</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td>91</td>
</tr>
</tbody>
</table>

Notes: There is strong evidence against the null hypothesis of the changes in response being equally likely to fall in either direction using McNemar’s test (\( p < 0.001 \)).
the greatest microbiota variability and are not concerned with the donors’ relationship status to
them. Only 18% of respondents were found to prefer their partner as their ideal donor.

Since this study took place, an oral capsulized frozen form of FMT has been developed (Youngster
et al., 2014). This procedure may be more acceptable to colitis sufferers as it is commonly given in
double coated white capsules. This procedure may also become lower risk, easier to administer and
cheaper compared to the current nasal-jejunum, colonoscopy or enema routes as these currently
require much planning and liaison with microbiology laboratories for effective transplantation.

IBD is a debilitating disease which is increasing in prevalence and putting an increasing burden on
health care resources. FMT is acceptable to the majority of colitis sufferers once the purpose of the
procedure and the effect on the body has been explained. If the evidence from the awaited RCTs
agrees with the reported Canadian study (Moayyedi et al., 2015) in that FMT could be an effective
treatment for colitis sufferers, then adoption should be encouraged as it may provide a long-term
resolution of symptoms.

4.2. What is already known on this topic
Only two studies were identified whose purpose was to explore patient attitudes towards FMT in ulc-
erative colitis (Kahn et al., 2013) or C. difficile infection (Zipursky, Sidorsky, Freedman, Sidorsky, &
Kirkland, 2012). The findings from the present study are broadly in keeping with these studies in that
the majority of individuals would accept FMT as a treatment option, once it is explained to them.
However the present study found that acceptability of FMT rose sharply from 37.1% to 53.6% when
precise information about the procedure is given.

4.3. What this study adds
This study demonstrates that patient acceptability and consent to FMT can be significantly increased
provided a detailed explanation is given as to the reasons for using FMT and what it involves.

4.4. Limitations of this study
For ease the CCUK were approached to e-mail their members, but we recognise that the member-
ship of CCUK is not necessarily representative of all colitis sufferers. Individuals who were proactive
about finding more information about their disease are likely to be members of this charity. Such
individuals may be more likely to complete an unsolicited questionnaire from CCUK and may be
more open to novel forms of therapy.

While the respondents to this survey were people suffering from IBD in the South West of England
and South East Wales, it is believed that the results can be generalized to Northern European and
North American populations where acceptability studies have been performed (Kahn et al., 2013).

The response rate to this survey was low, unfortunately we have no information on the non-re-
sponders in terms of age, sex or area so we are unable to assess if there is any non-response bias.

While the survey had been based on the questions noted in other surveys for ulcerative colitis
patients and was piloted amongst a small group of individuals, the questionnaire was not fully vali-
dated. However, the resultant findings are consistent with similar studies.

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Competing Interests
The authors declare no competing interest.

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References
http://dx.doi.org/10.1016/j.jcch.2014.08.006
http://dx.doi.org/10.1093/cid/cir362
http://dx.doi.org/10.1136/bmj.1.3688.693
http://dx.doi.org/10.1097/MIB.0b013e31828f1250
http://dx.doi.org/10.1136/gutjnl-2011-301805
http://dx.doi.org/10.1053/j.gastro.2015.04.001
http://dx.doi.org/10.1053/j.gastro.2015.03.045
http://dx.doi.org/10.1371/journal.pone.0157259
http://dx.doi.org/10.1001/jama.2014.13875
http://dx.doi.org/10.1155/2014/403828
Appendix 1
Hard copy of the survey sent by The National Association for Colitis and Crohn’s Disease (NACC), Now called the Crohn’s and Colitis UK (CCUK).

<table>
<thead>
<tr>
<th>Participant Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following page provides more information on the proposed research study followed by questions relating to the acceptability of such a treatment.</td>
</tr>
</tbody>
</table>

Participant information

1. What is the purpose of the project?

This project aims to investigate the acceptability of faecal microbiota transplantation (FMT), which is also known as intestinal microbiota transplantation or Stool transplant for the use as a treatment in ulcerative colitis. This survey is the first step before we submit a grant for funding to enable a full research trial to take place to evaluate the effectiveness of FMT (stool transplantation).

2. Why have I been selected to take part in this survey?

You are aged 18 or over and have a medical diagnosis of Inflammatory Bowel Disease, either Crohn’s disease (with colon involvement) or Ulcerative Colitis and a member of The National Association for Colitis and Crohn’s Disease (NACC), whom have sent this out on our behalf.

3. What will I have to do?

You will complete an online survey which consists of various questions. The whole survey will take approximately 20 minutes (21 questions) to complete. You will firstly be asked to consent to completing the questionnaire. You will then be asked to provide information on your gender, age and diagnosis. You will then answer questions on feelings around present treatment, how effective it is and then questions around your feelings and thoughts around FMT (stool transplantation).

4. Will my participation involve any physical discomfort?

No.

5. Will my participation involve any psychological discomfort or embarrassment?

No psychological discomfort or embarrassment should be felt. However we do require that you disclose whether you have been diagnosed with ulcerative colitis, and to disclose symptoms you may have experienced, which may make some people feel uncomfortable. If you feel uncomfortable at any point then you do not need to answer that question. You can withdraw from the study by closing your internet browser.

6. Will I have to provide any bodily samples (i.e. blood, saliva)?

No.

7. How will confidentiality be assured?

No personal data such as names and contact details will be taken. Data will be anonymised and your individual answers will not be identifiable. Data will be used for a research project only. Your data will be stored on a password protected computer and will be kept for up to 7 years before being destroyed. There is a possibility that the results of this survey could be published in a scientific journal, or at a conference. Your data will always be kept anonymous.

8. Will I receive any financial rewards / travel expenses for taking part?

No.

9. How can I withdraw from the project?

You can withdraw from the study at any point by closing your internet browser. At the beginning of the online survey you will be given the option of providing a unique identifier. You may use this to withdraw from the study by emailing the researcher with this identifier and your data will then be removed without prejudice.

10. If I require further information who should I contact and how?
If you require further information on the project or would like advice whilst completing the survey then please contact the researcher Dr Bret Palmer on epbsp@bristol.ac.uk or the researcher’s supervisor Dr Chris Metcalfe on chris.metcalfe@bristol.ac.uk.

If you have any concerns or worries concerning this research or if you wish to register a complaint, please direct it to: Dr Chris Metcalfe, School of Social and Community Medicine, University of Bristol, Canynge Hall, 39 Whatley Road, Bristol BS8 2PS.
Informed Consent

please read and if you agree tick the ‘Yes’ box below to continue.

1. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and without my medical care or legal rights being affected.

☐ I agree to take part in the above study
☐ NO, I DO NOT AGREE (No need to continue).
Thank you for showing an interest in this study. It is investigating the acceptability of faecal microbiota transplantation (FMT), which is also known as stool (Poo) transplant for use as a treatment in ulcerative colitis.

2. Please provide a unique identifier containing either letters or numbers which you can quote to the researcher if you wish to withdraw your data (approx 4-8 units long).

3. What is your age?

   Age in years

4. Gender

   - Male
   - Female
17 questions remaining

5. Diagnosis
   - [ ] Crohn's disease (if you do not have involvement of the colon there is no need to continue)
   - [ ] Ulcerative colitis
   - [ ] Other (please specify)

6. Approximate month and year of diagnosis?

   [ ] DD / [ ] MM / [ ] YYYY

7. Do you smoke?
   - [ ] Yes
   - [ ] No

   If yes how many a day or a week
**Your Current Treatment**

14 questions remaining

8. What are you presently using in your current treatment? [Please tick all that apply].
   - [ ] 5-ASA (Sulfasalazine or Mesalazine)
   - [ ] Corticosteroids (Prednisone)
   - [ ] Azathioprine
   - [ ] Other medications e.g. (infliximab or adalimumab)
   - [ ] Other (please specify)

9. Are any of your medications taken rectally?
   - [ ] Yes
   - [ ] No
12 questions remaining

10. Have you had any Surgery to the large bowel?
   - Yes
   - No

If yes what operation was performed, i what did they do?

11. Are you awaiting surgery (On a waiting list)?
   - Yes
   - No

12. Are you considering surgery due to your symptoms?
   - Yes
   - No
13. Do you feel as if your ulcerative colitis is well controlled with your current medication?

- Yes
- No
- Unsure
Faecal Microbiota Transplantation (FMT)

In your bowels there are about 100 trillion bacteria. Every stool you produce consists of about 1/3 bacteria. There are many scientific studies that show that people with any form of Inflammatory Bowel Disease have a low variability in the types of bacteria in their bowel. This is akin to between a rain forest full of different types of life and a large field full of only a few types of life.

Faecal Microbiota Transplantation (FMT)

FMT is taking stool (poo) from a healthy individual, mixing a sample (about an egg cup full) with water and giving it to you as a rectal enema (this means a plastic bottle with a flexible tube. The tube is inserted into the rectum and the bottle squeezed, to push the fluid into the bowels).

14. Does this sound acceptable to you?
   - [ ] Yes
   - [ ] No
   - [ ] Unsure
Studies have been conducted and transplanting the biology from one bowel into another does work. Stool transplant appears successful in changing the recipient’s bowel bacteria for the long term.

In studies like the one we are proposing the donors as well as the recipients would be screened for various diseases. The donors would be screened with many more tests then the recipients for any known bacteria or virus that can cause disease.

Having read the above:

If you signed up to a scientific trial where you were placed into two groups. One group would receive the faecal rectal enema, the other only a salt water enema. You and your doctor would not know who got what until the results were announced 6 months later. Both groups would do the same screening and have a rectal camera test (Sigmoidoscopy) at the start and end of the trial.

15. Would you consider participating, knowing that there is a 50% chance of not getting the treatment?

☐ Yes
☐ No
☐ Unsure

Please tell us the reasons for your answer:

16. If the trial was successful, everyone in the control group (Salt water rectal enema group) would be offered a faecal rectal enema at the end of the trial; thereby guaranteeing you treatment if it was successful. Would you then participate?

☐ Yes
☐ No
☐ Unsure
Faecal transplant appears to be more successful the greater the number of faecal rectal enemas a colitis sufferer has.

17. How many enemas would be acceptable? An enema would consist of 100ml, 2 minutes to put into the rectum and the patient to hold the enema within them for as long as possible (30 minutes maximum).

- [ ] It will never be acceptable
- [ ] Only one
- [ ] One a day for two days
- [ ] One a day for three days
- [ ] One a day for Four days
- [ ] One a day for Five days
- [ ] One a day for Ten days
- [ ] As many as is needed
The science already reported shows that the greater the variation in the bowels biology the greater the chance of success. As family members may have a similar bowel biology, family members may not be the best donors.

18. Which donor would be more acceptable to you?

- Partner
- Parent
- Sibling
- Cousin
- Friend
- Anonymous donor, anyone who has the largest variation in their bowel biology (largest number of different types of bacteria)
3 questions remaining

19. Would you be happy to receive 5 faecal rectal enemas, one a day for FIVE days, each enema would contain one sample from one individual, but some of the samples would be from a different screened donors, all of the donors would be selected for their health and because they have the highest variability in their bowels. This would maximise the chances of increasing the variability of your bowel’s bacteria.

- Yes
- No
- Unsure

If you have answered No why is this unacceptable?

20. Knowing what you know now; does FMT (taking stool (poo) from a healthy individual, mixing a sample (about an egg cup full) with water and giving it to you as a rectal enema) sound acceptable to you?

- Yes
- No
- Unsure
Last question

21. We are interested in your own personal views of how you now see your current illness. Please indicate (tick) how much you agree or disagree with the following statements about your illness by ticking the appropriate box

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>My illness is likely to be permanent rather than temporary</td>
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<td>My illness will last for a long time</td>
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<td>I expect to have this illness for the rest of my life</td>
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<td>My illness is a serious condition</td>
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<td>My illness has major consequences on my life</td>
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<tr>
<td>My illness does not have much effect on my life</td>
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<td>My illness strongly affects the way others see me</td>
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<td>My illness has serious financial consequences</td>
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<td>My illness causes difficulties for those who are close to me</td>
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<td>There is a lot which I can do to control my symptoms</td>
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<td>The course of my illness depends on me</td>
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<td>The negative effects of my illness can be prevented (avoided) by my treatment</td>
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<td>My treatment can control my illness</td>
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<td>I have a clear picture or understanding of my condition</td>
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<tr>
<td>The symptoms of my illness change a great deal from day to day</td>
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<td>My illness is very unpredictable</td>
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<tr>
<td>I go through cycles in which my illness gets better and worse</td>
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