

Questions and Answers: Teagasc Research Insights webinar series
Macro to Micro: Food Structure, Digestion and the Microbiome (21 October 2020)

#	1
Question	Hello! I would like to know if you could send us the presentations recording again :-)
Answer(s)	Yes, it will be available on the Teagasc YouTube channel.

#	2
Question	Will we get copies of the presentations sent out?
Answer(s)	Yes, they will be available on the Teagasc website: https://www.teagasc.ie/about/research--innovation/teagasc-research-insights-webinars/

#	3
Question	When you want to bring a product on the market with eg. prebiotic properties. Would it be enough to show this effect only using in-vitro simulations? Or are the models not sufficient enough, needing in-vivo clinical trials?
Answer(s)	Answered live during the webinar Additional remarks by A. Brodkorb: To get around this, the most common practice is to label it: "contains compound XXX, which has been shown to ... reduce blood pressure etc."

#	4
Question	How closely does in-vitro match in vivo digestion and how do you check this?
Answer(s)	This is an excellent question. There are research questions that can be answered surprisingly accurate by in vitro digestion methods. The most established models are for drug delivery. I know that a number of years ago the TIM model replaced the animal (dog) trials in Astra Seneca. Food Digestion is somewhat behind but we have made great progress over the last few years e.g. the INFOGEST network. In vitro methods have been shown to simulate the digestion of protein particularly well. For toxicology (heavy metals) in vitro methods have been used and standardised by another EU group (BARGE). For more information and articles, please do not hesitate to contact me at: andre.brodkorb@teagasc.ie

#	5
Question	Hi Andre, can Infogest be used to develop low calory release food products that can be used for the management of overweight and ovesity status of consumers? Thanks
Answer(s)	The Infogest method can be used to evaluate the bioaccessibility of nutrients, so yes for an initial evaluation, it would be suitable as it takes the food structure into account.

#	6
Question	Hello Sir! Thank you very much for your sharing. What is the time to call a

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	protein slowly and fast digestible?
Answer(s)	This is a good question and not an easy one to answer. The glucose equivalent would be the glycemic index, which takes a glucose solution as the standard. Starch would be slower than glucose. No such standard exist for proteins and research is still in its infancy. However, if the protein stays in solution during the gastric phase, then it will be emptied fast. If it is in solid or gel form, then the delivery of the amino acids will be slower.

#	7
Question	Watching from Bridgetown College with my 6th year biology students. Really interesting. What type of course would most of your presenters have done in college, biology based or chemistry?
Answer(s)	Answered live during the webinar. Thank you for following us. We hope you found the information useful and your class enjoyed the webinar. Please let us know if you need any further information.

#	8
Question	Does boiling an egg negatively affect its food value and is there a different nutritive value in a lightly boiled egg compared to a hard boiled egg?
Answer(s)	Good questions! Standard cooking food rarely affects the macronutrients of food i.e. carbs, proteins and fats. In fact cooking makes the food safer from a microbiological point of view, and it can make some food edible e.g. raw grain vs. flour and baked bread. In other instances cooking can make some bioactive compounds more active and bioavailable e.g. lycopene (the red colour in tomatoes) is more bioavailable cooked than in raw form. Hence the notion that raw is always better than cooked food is incorrect. Saying that, many vitamins and heat-sensitive compounds degrade during cooking, hence a good mixture of raw food (fruit and veg.) is good. I could see a difference in soft-boiled and hard-boiled eggs, the latter being a hard gel and it will take slightly longer to digest in the stomach than soft-boiled eggs. However, the small intestine is a very effective machine and can digest food very efficiently, so at the end of the digestion, both will be identical in terms of protein delivery and absorption into the blood stream, e.g. identical nutritional value.

#	9
Question	Hi My question to Dr. Brodkorb, regarding the in-vitro digestive method published in Nature protocol, Are there any specifications about shaking force during oral, gastric, and intestine digestive steps? Could a shaker water bath be suitable for the in-v?
Answer(s)	This is a difficult question and we have debated this extensively during the writing of the manuscript. The overall consensus was that the food mixture needs to be "properly mixed" Brodkorb et al. Nature Protocols 2019, https://rdcu.be/brEMd :

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	<p>“...to use the most suitable reaction vessel (e.g., 50-mL tubes) to allow proper mixing during all digestion phases” “...Incubate the samples at 37 °C, mixing the digestive mixture sufficiently (e.g., rotating wheel, shaking incubator) for 2 h from the point at which pepsin was added. If there are large precipitates or clogs form, see the ‘Troubleshooting’ section.”</p> <p>A shaking water bath is probably not sufficient unless it is strong enough to sufficiently mix the digestion. We recommend a rotating wheel or overhead mixer such as seen in the videos: https://www.youtube.com/channel/UCdc-NPx9kTDGyH_kZCgpQWg</p>
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#	10
Question	If this is a question I can ask here. For the general public where in Ireland can one get their microbiome tested? or Europe?
Answer(s)	I know there are companies that do this but there is not much that can be answered from looking at your own microbiome composition at one time point and it is very expensive to get done. I would advise trying to keep a healthy microbiome through consumption of a diverse and healthy diet comprised mainly of whole foods.

#	11
Question	May I ask what was the last 3D microscopy?
Answer(s)	The last video shows a 3D reconstruction of a dairy powder particle. The images were obtained using a technique called computerized X-ray tomography which allows scanning different planes through the sample with a very high resolution. Then, using the appropriate software for image processing and analysis, we can put together all the planes and render a three-dimensional image.

#	12
Question	Healthy ageing is what?
Answer(s)	Good question! Very simply healthy ageing refers to aging without frailty and with continued health.

#	13
Question	What's the relationship between the gut microbiome and food digestion or nutrient adsorption?
Answer(s)	The gut microbiome assists in these roles in many ways. Within food digestion gut microbes can digest parts of the diet that we are unable to digest such as fibre. On the impact on absorption one example is alteration of bile acids by the microbiome which can change fat absorption. These are just some examples of these interactions but there are others.

#	14
Question	For both André and Ciara: People usually relate to the microbiota we have in our large intestine and study

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	that with different in vitro models, but we know today we also have microbiota in our small intestine. How can we simulate that in models?
Answer(s)	Answered during the webinar

#	15
Question	If any type of additive added milk is consumed then digestion profile will be changed or will be same??
Answer(s)	<p>Treatment or additional compounds to milk will later the digestive mechanism and timescale of the milk. However, the small intestine is a very effective machine and can digest food very efficiently, so at the end of the digestion, most milks will be identical in terms of protein delivery and absorption into the blood stream, e.g. identical nutritional value.</p> <p>A few years ago it was noted that cocoa changes the clotting of milk and prohibited the making of cheese from chocolate milk (yes people tried this). Similarly, the clotting of milk in the stomach will be affected by cocoa. However, the intestinal digestion will make up for it and the nutritional value will be identical</p>

#	16
Question	A question for Ciara, could she comment on influence of vegan diets on the gut microbiome?
Answer(s)	Answered during the webinar

#	17
Question	For checking the digestibility of two species milk, which type of invitro digestion we can follow?
Answer(s)	<p>For an initial indication of differences, the INFOGEST method (Brodkorb et al. Nature Protocols 2019, https://rdcu.be/brEMd) would be sufficient Please make sure to standardise the amounts of proteins and fat so you can properly compare results. However, the differences are expected to be very small and subtle, hence a more sophisticated methods would be required e.g. the consensus method</p> <p>Mulet-Cabero, A.-I., L. Egger, R. Portmann, O. Ménard, S. Marze, M. Minekus, S. Le Feunteun, A. Sarkar, M. M. L. Grundy, F. Carrière, M. Golding, D. Dupont, I. Recio, A. Brodkorb and A. Mackie (2020). "A standardised semi-dynamic in vitro digestion method suitable for food – an international consensus." Food & Function 11: 1702-1720.</p>

#	18
Question	Is there a name of a probiotic that survives the gastro track?
Answer(s)	<p>The majority of probiotics only survive the stomach in low numbers unless taken as a supplement in capsule form, encapsulated or taken with food. Lactobacillus acidophilus and related strains are more tolerant to acid.</p> <p>However, a most bacteria survive in low numbers and colonise the gut. Human</p>

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	intervention trials are necessary to show the efficacy of the probiotic bacteria. Yes probiotics will need to reach the gut to truly be a probiotic and those such as <i>Lactobacilli</i> and <i>Bifidobacteria</i> can survive transit but it does seem to vary a lot from one species or even strain to another.
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#	19
Question	Dr. Ciara: do continuous ingestion of probiotics lead to translocation?
Answer(s)	I am not sure it has been related to continuous ingestion but some evidence of this has been suggested in certain settings such as in ICU patients.

#	20
Question	Can we use atomic force microscopy to find out the internal structure of xerogel made out of flour?
Answer(s)	Answered during the webinar

#	21
Question	A question to Dr. O'Donovan, What is your opinion about the probiotic characterization to be useful microbes in human GIT? What are the crucial characteristics that a probiotic should possess to be called a probiotic?
Answer(s)	The conditions to be met to be called a probiotic are pretty strict. Most importantly the bacteria need to survive transit to the gut and confer a benefit.

#	22
Question	Is there a limit for ingestion ie not more than 10 ⁹ or like that
Answer(s)	For most probiotics they tend to contain 1-10 billion CFUs depending on the probiotic. There is no concrete evidence suggesting what dose is most effective.

#	23
Question	Does Teagasc do a food interventional study with different diseased patient?
Answer(s)	Yes, Teagasc perform human intervention trials as part of national or international consortia e.g. Alimentary Pharmabiotic Centre, as well as some selected trials on their own.

#	24
Question	Among all the proven probiotics which has highest chances for translation
Answer(s)	It really depends what the end goal is. The probiotic Alflorex for example has been used in the treatment of IBS with a lot of support for this benefit. Some individual species often seem very promising but moving from background research to beneficial health impacts in human trials can result in unexpected results.

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#	25
Question	Since kefir is a fermented food, to date, can it be considered a probiotic since its strains colonize the gut?
Answer(s)	I think some more research is needed into this about if it is the kefir or just specific potentially probiotic strains present. Kefirs can also vary from grain to grain so it might depend on the source.

#	26
Question	Do we know enough about the complexity of the MB to start changing it?. Are there dangers in this?. Too much probiotic?
Answer(s)	If we already have a healthy microbiome the support of this through eating a varied whole food diet can be very beneficial. The addition of probiotics to an already healthy microbiome and individual may be unnecessary however they can be very helpful in certain settings such as after a course of antibiotics. It doesn't seem like there is any downsides to those activities which are known to support a healthy microbiome.

#	27
Question	Ciara: are there any proven detriments to health from over consumption of fermented foods, (as in too many SCFAs producing bacteria?)
Answer(s)	Answered during the webinar

#	28
Question	Sulfate reducing bacteria have been found in inflammatory conditions. Which foods contribute to sulfite and H2S generation in the gut?
Answer(s)	Brassica vegetables such as broccoli and cabbage can promote the growth of these bacteria. However, it may just be down to the bacteria in the gut microbiome of the individual anyway. A high fibre diet as much as it can be tolerated may help promote the activity of other bacteria in these individuals

#	29
Question	Hi Ciara, thanks for sharing your insights. Is the on-going supplement of probiotics necessary to get a good gut health?
Answer(s)	No I don't think so. I think they can be very useful in certain individuals and settings for example just after a course of antibiotics. However, if you already have a healthy gut microbiome it is unlikely these will be of benefit. The consumption of prebiotics, fibre, or fermented foods would be a good option in promoting continual gut health in an already healthy individual.

#	30
Question	What is the microbial difference between Kefir and Yogurt? and is the microbes in these products that benefit the gut or is it the structure and composition of the food products they generate?

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Answer(s)	The base of these products are the same (milk) but the way they are produced and microbes used in their production differ. <i>Lactobacillus delbrueckii</i> subsp. <i>bulgaricus</i> and <i>Streptococcus thermophilus</i> are the microbes used in the production of yogurt while kefir contains a mix of bacteria and yeast and these vary slightly from grain to grain. As the microbes vary the end products and metabolites present in the products are different from each other.
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#	31
Question	For Laura: Can you use AFM to study how strong is a structure using different forces?
Answer(s)	Yes, that is one of the applications of AFM (atomic force microscopy). This technique uses a tiny scanning probe to map the topography of samples, similar to a record player, but much smaller. We can also apply different forces on the sample through this probe, and detect how the sample reacts to them.

#	32
Question	What is the effects of paleo diets? Mainly composed by proteins...
Answer(s)	Good question. The paleo diets is in many ways an extreme diet, and many claims have been made around this diet (and many other extreme diets), which are in stark contrast to a recognised healthy and mixed diet. It would be best to consult a trained nutritionist or follow a recognised healthy diet with plenty of vegetables.

#	33
Question	In florecent microscopy how you color specific compounds such as protein or fat?
Answer(s)	Answered during the webinar

#	34
Question	What are the effects of imbibing spirits of 40% A.B.V. on the gut biome?
Answer(s)	There have been studies on the effect of alcohol on the gut microbiota. However, most of the alcohol will be absorbed before the large intestine and any effect on the gut microbiota is most likely a knock-on effect of the alcohol in the upper gastro-intestinal tract. I am not sure if there has been a comparison based on alcohol % specifically so I don't know if I can speak to that directly. The heavy consumption of alcohol has been found to have a major impact on all body systems including the gut microbiome as heavy consumption is linked with inflammation of many organs including the gut. Most studies of alcohol and the gut microbiome mainly seem to look at heavy drinking vs. no drinking so I am not sure of the impacts of moderate drinking if any. Hope this answers the question!!

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#	35
Question	For Andre, he mentioned digestibility between plant and meat. That means that meat is better digested hence how this affects vegans?
Answer(s)	<p>Correct, over 90 and 95% of the meat proteins are absorbed in contrast to plant-based proteins which have an average digestibility of 50 to 80%. Cooking food and increasing the intake to adequate amounts of proteins will easily overcome this, with an added benefit of an increase intake of fibre.</p> <p>Saying that, for the average Western adults, protein intake is mostly sufficient. However, malnutrition is common among elderly adults and socially disadvantaged population groups.</p>

#	36
Question	Are the in vitro and ex vivo studies can be decalred in the same group of digestion approaches?
Answer(s)	<p>Good question! There are many ex vivo models and it is really case-by-case. Some in vitro models are validated as long as you are aware of the shortcomings, see</p> <p>Brodkorb, A. et al. (2019). "INFOGEST static in vitro simulation of gastrointestinal food digestion." <i>Nature Protocols</i> 14(4): 991-1014. https://rdcu.be/brEMd</p>

#	37
Question	Ciara/Andre : are faecal transplants, to enhance the microbiome set to become a thing!!?
Answer(s)	<p>I hope not!! They can be very beneficial in treating recurrent <i>C. diff.</i> infections but beyond in that setting their use has not been found to be beneficial. When they are done in the correct settings there are a lot of tests that are completed to ensure the matter being transferred is safe.</p>