

Rangan Chatterjee-Presentation Vail 2016

I am a National Health Service GP, I'm a whole food advocate
and occasionally I appear on BBC television and talk about health matters.

And when I was invited to come and speak at a low-carb conference,
I thought, "Okay, that's great, I'm excited. That sounds like a lot of fun!"

But I thought, "What can I talk about?"

And I am very passionate about the microbiome
and I appreciate that this may be a tad controversial in areas,
because this is new science.

But I think we know enough to start applying some of the science that we know
and how can we incorporate that into low-carb diets?

I have been a practicing M.D. for nearly 15 years now
and I started off being a hospital specialist
and I did my certification exams in internal medicine and started off in nephrology.

But I was getting a little bit frustrated
with how super specialized that I thought medicine is becoming these days
and I felt that I wanted to take a step back and see the whole picture.

So I moved into general practice, certified in that,
and frankly it was the best decision I've ever made.

I love it, you get to see all kinds of problems, all kinds of people

and you get to build relationships, which is what I feel medicine is also about.

As well as getting people better.

And the more I practice, and it's nearly 15 years now, the more I realize that,

"Nutrition and Lifestyle should be the bedrock

upon which all medical treatment for chronic disease should be founded."

I know that not all my colleagues agree with me,

but my experience has taught me that that's the case.

And I really had the privilege this year, well last year actually,

of making a series of documentaries at BBC 1, which is a big channel.

It was a primetime show and the premise of the show is,

"What happens if you have more time with your doctor?"

Because the average primary-care consultation in the UK is 10 minutes.

And I got to spend four or five weeks with patients,

with the whole family in that house.

And these results are things that you guys have probably seen many times before.

This wasn't a low-carb show,

there were three families on three different episodes,

but two of them had diabetes.

And by virtue of that facts, they became low-carb shows.

Because in my eyes, the only way to treat type 2 diabetes,

or metabolic syndrome, or abdominal obesity

or at least the first port of call for treating them,

should be a diet low in refined and processed carbohydrates.

And what was great about it, this is a 4 million "what should eat" show in the UK.

And these are people who may not read the journals,
who may not read the newspapers, who may not read the news,
but sort of family go through this process... how difficult it was,
what they found easy, what they found hard and see profound changes.

So daughtie, 36 years old...

These guys were hooked on fast-food.

And she'd been to the doctor many times, but she hasn't been for nine months.

And on sort of my initial set of bloods we diagnosed diabetes.

Now I'm just giving you the headline news, basically.

There's a lot more to it, but her HbA1c was 7.3%,

we confirmed it with the fasting glucose.

She was 276 pounds and within four weeks, her HbA1c was down to 5.8%.

She'd lost 30 pounds by the time the show at...

She'd lost another 30.

And now I got a text from her a couple of weeks ago, she's almost lost 100 pounds
and we only finished filming six months ago.

So she's doing great, it is sustainable...

And this is the question that people ask - "Is it sustainable?"

Of course it's sustainable, if you empower people, if you educate them.

The other family was solely different.

This was an established diabetic, 49 year-old chap.

He'd had type 2 diabetes for 12 years.

He was on multiple medications, three diabetes medications -

Metformin, Glycoside and Sitagliptin.

As well as a Statin and Lisinopril for blood pressure.

Now again within four to five weeks there were few challenges

for a variety of reasons which came out on the show,

but weight circumference - 39 to 34.5 inches...

Weight down by 25 pounds, HPA1c....

Within the first week I took him off sulfonylurea,

the Glipizide and his DDP 4 inhibitors.

So he was just on metformin because I had planned to fast him.

I'm a big fan of Jason's work and that was really the strategy I used with him.

And again within a few weeks - significant improvement.

So this is the kind of stuff that got me into trouble

with the British Dietitians Association in the UK.

And they release a statement criticizing my unsafe strategies.

Didn't appear to be that interested in the results,

which I would have thought would be the primary objective.

But then we have another association called BANS,

the British Association of Nutritional Therapists

and they released a statement saying how pleased they were

with the advice I'd given on this show.

So, I guess this sort of stuff polarizes opinions.

First just a little introduction, I did immunology to get to University

and I love all the subjects coming out of microbiome

and how diets impact the microbiome and impact our immune system.

And I'm going to try and bring some of that into how I think we can apply that

within the realm of the low-carb diets.

So, I love this paper.

This is from 2011.

I don't know if everyone knows what the gut microbiome is.

I assume a lot of you do, but just so we clear why this starts.

"The gut microbiome is a term given to describe

"the vast collection of symbiotic microorganisms in the human GI system

"and their collective interactive genomes.

"Recent studies have suggested that the microbiome

"performs numerous important biochemical functions for the host

"and disorders of the microbiome are associated

with many and diverse human disease processes."

And we don't know everything yes.

It's still early science, but I think it's exciting.

Modern technology and systems biology recently

"have established the importance of the gut microbiome in the disease pathogenesis

for numerous system disease states, including obesity..."

And the same paper has a lovely graphic where they look at various parts of the body,

various diseases and whether there is an association

with imbalances and problems with your microbiome.

It doesn't mean we know how to fix it yet, but I think it's very, very fascinating.

Now many of you may be familiar that

that's a figure quoted that we have 10 times more microbial cells in human cells.

But actually if you look a little bit deeper, recent estimates suggest

that a human gut contains within 30 trillion and 400 trillion microorganisms.

Whereas human body has an estimate of 37 trillion cells,
with a considerable range.

And so based on these approximations,
we could have a 1:1 ratio with microbial cells
or they could outnumber our cells by a 100:1.

But the question is, "What is a healthy microbiome?"

It doesn't mean we necessarily know the answer to that yet,
but we are studying a lot of ancestral tribes to find out,
you know, what happens if your gut is untouched by modern living, modern food.

And it's pretty hard to do.

And I think a few years back we used to think what to do with what species,
what bugs lived there...

But an emerging paradigm is that diseases such as obesity and inflammatory bowel diseases
are associated with reduced diversity.

So many of you here, I'm sure,
are very pro-certain concepts within the Paleo community.

And the Hadza tribe in Tanzania are a tribe that are still hunter gatherers
and are relatively untouched by modern living.

And when we studied this it was really interesting,
because what we found
is that we've lost approximately 50% of the diversity that these guys had.

And there is multiple reasons why that is.

"Rapid environmental transition and modern lifestyles

"are likely driving the changes in the biodiversity of the human gut microbiota.

"With clear effects on multiple processes for our health,
"alterations in the gut microbiome and intestinal homeostasis
have the capacity for multisystem effects."

So it's an emerging paradigm.

And I'm using a lot of papers, appreciate that,
but it's to show that this is up-to-date modern science.

We haven't all gotten the answers yet, but I think it's fascinating.

And the field of gut microbiome research has already moved
from the idea of describing the core species
to identifying the core ecological functions various microbes perform.

Many species may fulfill any given role.

So there's another concept emerging, which is the keystone relationship -

The interaction between fiber and microbes that consume it
is the fundamental keystone interaction that everything else is built on in the gut.

It may lie at the heart of the symbiotic pact between microbes and humans.

So this is a little graphic just to show
that there is a three-way interaction going on when you eat food.

They are your diets.

The what you eat has an impact on those gut bugs.

And those gut bugs have a subsequent impact on your immune system.

It's bidirectional communication.

And this is a great paper from 2003 and it really is about the concept
that within our guts approximately 70% of immune system activity we think

resides in or around our guts.

And "the mucosa", so the gut mucosa, the lining,

"is directly exposed to the external environment

"and taxed with the antigenic loads

"consisting of commensal bacteria, dietary antigens

"and viruses at far greater quantities on a daily basis

than the systemic immune system sees in his lifetime."

Now that's a profound statement.

So it's saying that there's more immune reactions going on in your gut every day

than the rest of your body in its lifetime.

And the job of the immune system--

Most of the time the immune system's job is not to respond.

That is immune intolerance.

We don't want it to respond, but as we all know, food allergies, food intolerances,

many things are increasing in number for a variety of reasons.

And the immune system has lost its tolerance.

So how can we get immune tolerance?

We'll get back to that.

Before I go into exactly that point,

I just want to talk about acute versus chronic inflammation.

So I think it's a really important to understand that.

Inflammation is good for us.

Acute inflammations - if I fall skiing and I cut myself

I want inflammation to kick in.

But if that inflammation becomes chronic and unresolved,
then that can predispose to many of the modern chronic diseases that we are seeing.
Because at the cellular level in a lot of them, they're driven by inflammation.
Now what causes that inflammation, there are multiple factors.
So I just wanted to really get to that acute v chronic inflammation.

So this is one of my favorite papers, it's from 2014.
It's basically about regional specialization within the intestinal immune system.
So we are looking at the guts, we got the start, the esophagus.
Then we got the stomach, then the small bowel and the large bowel.
And they're saying that various parts of that gut
do different things with your immune system.

And this graphic is basically trying to demonstrate some of that.
And now one of the things that it's trying to demonstrate is as you go down your gut
you increase the amount of microbes that are there.
So many say that in your colon,
that's where the majority of-- when we talk about the gut microbiome
and the gut microbiota,
that's where those guts bugs mostly reside.
But it's also talking about various things like Vitamin A, AHR likens,
which are aryl hydrocarbons receptors, which I'll come to in just few minutes....
And here at the bottom is something called SCFA, Short Chain Fatty Acids,
and that we'll come up to in just a minute as well.

So these are the two things I'm going to talk about.

About how the foods that we eat can impact our microbiome and subsequently have a positive impact on our immune system.

So this paper is entitled, "You R what you eat."

Now R, AhR means Aryl Hydrocarbon Receptor.

But that's quite complicated.

I've been skiing, I'm tired, so we'll call it R.

So it's a great paper linking the diets to our immune system.

And it says, "From childhood we learn that vegetables are good for us.

"And most of us eat our vegetables without giving much thought

"to the evidence behind the accepted wisdom

"or to the mechanisms underlying the purported health-boosting properties of a vegetable rich diet."

But scientists are now "uncovering a link between diet and immunity."

And they show that "specific dietary compounds

"found at high-levels in cruciferous vegetables

"such as broccoli, cauliflower and cabbage

"are essential for sustaining the intestinal immune function.

"Moreover, they show that the molecular basis for this link

involves the aryl hydrocarbon receptor" - the R receptor.

So those are receptors that basically reside in the small intestine, the bit after the stomach.

I think it's profound.

We talk about eating things like broccoli, cauliflower, cabbage that actually have in them...

They've got AHR Ligands - so that's the key.

So in the small intestine we've got the lock, the receptor and in these vegetables we've got a key that has been studied--

These receptors have been studied for years by toxicologists, because that's one of the ways we metabolize poisons.

But now we're seeing how diets, certain dietary compounds can have that key fit in their lock...

What it does is it stimulates something called intraepithelial lymphocytes.

These are immune regulating white cells.

If you don't have enough of them, you get T reg cells, which basically propagate inflammation.

So basically what I'm saying is if you eat broccoli, cauliflower and cabbage, you're eating a key that fits into a lock that helps balance your immune system.

So that was the small intestine.

And then the early paper I put back up again...

And by contrast if you go lower down, so into the colon,

so, "By contrast immunomodulatory short-chain fatty acids, such as butyrates,

"are generated by anaerobic digestion of oligosaccharides

"derived from the mucus and dietary fiber.

"Short-chain fatty acids are found at higher concentrations in the colon

and thus probably have a more predominant role in shaping immune responses at this site."

So we're moving down basically.

In that graphic I showed you before, the small intestine...

The diet effect - these R receptors which affects your immune system.

The same food, what remains undigested makes its way down to the colon, your gut bacteria ferment and metabolize them and make the short-chain fatty acids.

Now the colon cells--

Is widely recognized now that primary fuel source is butyrate.

Now the way we get butyrate...

I should say one of the ways we get butyrates

is by the breakdown of these vegetables by--

well, the vegetable fiber by the gut bugs.

And I put something called regulatory T cells up here,

because it's a really important concept when you talk about the diet and the immune system.

Short-chain fatty acids help propagate regulatory T cells.

We want regulatory T cells.

Because there's a balance to be had.

You've got mucosal homeostasis.

On one hand you've got T effector cells.

These are the cells that propagate inflammation.

They are pro-inflammatory.

So what we want to do is select foods that promote T reg cells,

regulatory T cells - they help switch off inflammation.

So it's like a see-saw and we want to get the balance right.

So what I'm saying is vegetable fiber through its interaction with the microbiota and its subsequent impact on the immune system makes more regulatory T cells.

They are anti-inflammatory at the cellular level.

And you know many papers call them a bit of a peacekeeper,
"when we lose control of immunological balance,
"T-reg cells are inadequate in number
to compensate for effector cells that are propagating inappropriate inflammation."

Remember what I said before, inappropriate chronic inflammation
is driving many chronic diseases.

And when you go on a low-carb high-fat diet since...

You know that last slide was fantastic, looking at, you know,
tracking his COP and the inflammation is coming down.

So actually making those dietary changes, a lot of them actually are helping.

And they all bring inflammation down.

So, just a few more papers...

So, I'm trying to tell you a story of how this has all come about in the literature.

And there was a guy called Gordon back in 2005

who did some studying of obese people and lean people
and saw a difference in their composition.

And this is a paper where they talk about that trial

and the basis show that two phyla of anaerobic bacteria are linked to obesity.

Linked - doesn't mean causative, but linked.

So in the obese subjects

they still had more firmicutes.

And in the lean subjects, they had more bacteroidetes.

It was not quite that simplistic.

This was just to tell a story,

but we didn't know this was cause or consequence.

But things have moved on a lot in the last 10 years.

And this is a paper that basically just says, "A complicated relationship status"

Because it is very complicated.

And we don't know yet by taking this...

You know, people say the microbiome research is overhyped.

I don't think it's overhyped, I don't think we necessarily know the answers yet.

But it's early science.

It is complicated but it is a relationship between our diet, our gut bugs

and whether we're obese or not.

The exact mechanism is not that clear yet.

"Researchers have since shown over the past 10 years

"that the gut microbiotes can affect the body signaling systems

"related to hunger and feeling full,

"and even how quickly food passes through the gut.

"Other studies have traced how diets and microbes interact to produce inflammation

"and an impaired gut barrier or a leaky gut,

which may contribute to obesity."

The problem with the microbiome research is a lot of it has been done in animals.

Although that started to change and there is a guy...

I forgot his name...

Prof. Liping Jing, I think, who's now doing human trials

"But essentially in mice it is possible

"to reverse some of these effects with prebiotics,

"the most widely of which that they used was oligofructose,

"a type of indigestible carbohydrate found in fruits such as green bananas,

garlic and Jerusalem artichokes."

And the author says, "We found that mice fed with oligofructose

"had an improved gut barrier function,

"and the mice that were given prebiotics also had improved metabolic markers,

reduced the fat mass and reduced inflammation."

Now we don't know yet what bug exactly does this,

but the prime candidate at the moment in the last couple of years

is a bug called *Akkermansia muciniphilia*.

Now it's just a name, a complicated name...

It doesn't really matter, we're not at the stage where we can give this to people,

but "this bacterium is found in most people's guts,

"but at lower numbers in obese individuals.

When people lose weight after gastric bypass surgery", the bug flourishes.

Now this is a human intervention looking at *Akkermansia muciniphilia*.

And basically they took 49 individuals, some lean, some obese,

and put them on the same diet,

it was sort of calorie restricted for six weeks,

then it was sort of a normal regulated diet for six weeks and they just observed what happened.

And it was quite interesting.

You know, this bug really is the prime candidate of the moment for, you know,

"Is this really a link to obesity and metabolic markers?"

The higher *Akkermansia muciniphilia* was associated with a healthier metabolic status.

The guys who had the best improvement in their metabolic markers,

had more *Akkermansia muciniphilia* right at the start,

but that doesn't mean we can start taking *Akkermansia muciniphilia* by mouth

and suddenly everything is going to be okay.

I'm a big fan of a diet low in refined and processed carbohydrates and higher in good quality fats for a lot of my patients.

Not all of my patients,

but those with type 2 diabetes, those with abdominal obesity, those with insulin resistance... absolutely.

But what's interesting about this... "What can we do?"

It's all fine presenting the science,

but what can we do in practical terms with our patients?

What is it that improves Akkermansia muciniphilia?

It's onions.

It's garlic.

It's leaks, it's artichokes.

Yams will come too, because of the starchy vegetables, can do it as well.

But I think in various cases you got to be careful with that.

Chicory roots, agave, green bananas,

dandelion greens, Brussels sprouts, cauliflower, broccoli...

You see, I recommend these things on a low-carb diet.

And I think the term low-carb, personally for me,

is something that works as a public health message.

It's simplistic, but we'd have the low-fat diet,

we'd demonize the whole food group for many, many years.

So when I talk about low-carb, what I mean--

And I appreciate not everyone in this room talks about it like this,

but I mean a diet low in refined and processed carbohydrates.

But I don't mind a diet that has slow carbs in them.

These are the carbs that abounds of fiber,

because I think that fiber is important for the microbiome

and I think it propagates an anti-inflammatory phenotype through the immune system.

So that's what I do with my patients on the show

as well as cutting out completely your pastas,

your breads, your rices, your grains.

I said, "Look, guys, try to eat five portions of veg a day."

It wasn't so much starchy veg,

but I do, if people improve their metabolic status,

I personally increase things like...

I say sweet potatoes twice a week in small amount.

Yeah, I don't have a problem with that and I get good results with that.

And I appreciate guys here are getting very good results with nutritional ketosis.

Someone says we'd do use ketosis.

I don't know.

I've never measured.

I'm pretty sure I do,

because if you are eliminating all those refined and processed carbs.

And actually like the first family, she found it hard to have the vegetables.

I'm almost certain from what I'm hearing here that she was in ketosis.

And the one thing I'm looking forward to learning in this weekend

is what the benefit for me is to measure whether my patients are in ketosis,
because currently I don't do that.

I'm getting good results without doing that

but I am truly fascinated by hearing so many other reports there.

So maybe I will change my practice.

But I'm basically trying to say that when I go low-carb,

I increase slow carbs as well.

Because I think long-term that's all the science now which is showing
that they are very beneficial for our microflora.

I think you could do both, I think you could do low-carb

and I think you could feed your microbiome.

I don't think it's mutually exclusive, I really don't.

I think lot of groups, we fight about lots of different things.

The Paleo community, the low-carb high-fat community,

80% or 90% of them are the same.

We fight about the 10% that's different.

And the problem with that is that the public get confused.

You polarize opinion of the public, they don't know who to believe anymore.

Whereas a lot of what we're saying is the same.

So I'm wrapping it up now.

I appreciate it was all science there, but I was hoping to sort of say in practical terms
what we can do with that science...

Just basically each more veg.

This paper from 2009, "The composition of the microbiota

can shape a healthy immune response or predispose to disease."

I think you guys would like this quote.

I certainly hope so.

I've tried not to be too controversial,

although I'm sure I'll be heckled later for some of the things I've said about fiber.

But from 2013,

"About 75% of the food in the Western diet

"is of limited or no benefit to the microbiota in the lower gut.

"Most of it, can be specifically of refined carbohydrates,

"is already absorbed in the upper part of the G.I. tract

"and what eventually reaches the lower part, the large intestine,

"is of limited value,

"as it contains only small amounts of the minerals, vitamins and other nutrients necessary for maintenance of the microbiota."

I think most of you probably agree anyway

that about 75% of the food in the Western diet is junk.

If not more probably.

So I taught my patients about MAC's,

about increasing their intake of MAC's.

I didn't mean Big Macs, I'm talking about these kind of MAC's.

Microbiota-Accessible Carbohydrates.

That's the term in the literature.

These are the carbohydrates that are resistant to host digestion and actually feed your gut bugs.

So I say, "I want you to increase the amount of MAC's,
but it's these kind of MAC's" - so I give them a list.

Again I am a doctor who... I'm interested in clinical results.

I use the science, I use the research to guide me, but it does not dictate me.

Because medicine is more complex than that for me.

It's about reading the patient in front of you,

seeing where they are at, seeing what they want to do.

And seeing how you can help them.

So I hope you found it interesting, I hope it stretched some of us.

I'm hoping these are things that a lot of you have not heard before,

because when I was invited to speak I really did feel,

"Yeah, I could talk about insulin, I could talk about hormones."

And I am a big fan, but I thought "I'm also a big fan of microbiome."

And I think it is relevant and I think it will become

increasingly more and more relevant as the science emerges.

So I hope you enjoyed it.

I'm going to leave you with a photo of a place I like to ski.

The place is called Chamonix in France.

And that's where I spend a lot of my winters.

And you have a skiing here who's almost as good as there,

so thank you very much.