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GI News is published online by the University of Sydney, School of Life and Environmental Sciences and the Charles Perkins Centre, and delivered to the mailboxes of our 97,000 subscribers every month. Our goal is to help people choose the high-quality carbs that are digested at a rate that our bodies can comfortably accommodate and to share the latest scientific findings on food and diet with a particular focus on carbohydrates, dietary fibres, blood glucose and the glycemic index.

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FOOD FOR THOUGHT

TOPPING UP THE TANK

It's often said that we run on fuel just as a car runs on petrol. In fact we burn a mix of three key fuels that we get from the foods and drinks we consume. Nutrition scientists call these fuels "macronutrients" because our bodies need lots of them. They provide us with energy (calories or kilojoules) along with vitamins and minerals and phytonutrients. They are (in alphabetical order):

- **Carbohydrates** (sugars and starches) from fruit, vegetables, legumes, grains, some nuts and milk. These foods give us much more than energy, they provide us with the fibre, vitamins, minerals and phytonutrients we need. – 1 gram of carbohydrate contains 4 calories or 17 kilojoules.
- **Fats** from nuts, seeds, oils, avocados, fish, meat, dairy foods and coconuts provide us with the fatty acids that are part of our cell membranes and they help us absorb the fat-soluble vitamins A, D, E and K. – 1 gram of fat contains 9 calories or 37 kilojoules.
- **Proteins** from dairy foods, eggs, fish, meat, chicken, legumes, nuts and grains. These are the body builders. They maintain our body tissues and help us meet our needs for certain vitamins (especially B vitamins) and minerals (especially iron, zinc and calcium from dairy foods if you eat them). – 1 gram of protein contains 4 calories or 17 kilojoules.

Our fuel mix changes at different stages of our lives. A growing baby has different needs from a toddler, a teenager, a sedentary adult, a very active adult, an elderly person, or someone with a chronic condition such as diabetes.

Mother's milk provides the perfect mix of nutrients—carbs, fat, protein and many vitamins and minerals—for our babies to grow and thrive and that's all they need (or baby formula) for the first six months of life. But after infancy, we have considerable flexibility in our fuel mix options because we are omnivores. Our diet is not limited to One Size Fits All. It doesn't need to; it never has because we evolved to be adaptable. That's what made us successful in populating the planet and thriving in very different parts of the world with very different food supplies.

These days, our tastes and our family and cultural background play a large part in what we eat and like to eat. Remember, it's the overall quality and quantity of the foods we consume – what we put on our fork or pick up with our fingers or chopsticks is what really matters. That means building healthy eating habits and being a good role model for the kids – they are watching us more carefully than we will ever know.
–Reproduced from *The Good Carbs Cookbook* (Murdoch Books) with permission.

WHAT'S NEW?
FOUR LANDMARK STUDIES
WHAT MAKES MICE FAT?

Since food consists of fat, protein and carbs, it has proven difficult to pinpoint exactly what aspect of the typical diet leads to weight gain. Part of the problem is that it is very difficult to do studies on humans where what they eat is controlled for long enough periods to work out what are the most important factors, however studies on animals that are similar to us can help point us in the right direction.

Scientists from the University of Aberdeen and the Chinese Academy of Sciences have undertaken the largest study of its kind looking at what components of diet – fat, carbohydrates or protein – caused mice to gain weight. The study was published in the journal *Cell Metabolism* and includes 29 different diets that vary in their fat, carbohydrate (in particular sugars) and protein contents.

The mice were fed these diets for three months, which is equivalent to nine years in humans. In total over 100,000 measurements were made of body weight changes and their body fat was measured using a micro MRI machine.

Professor John Speakman, who led the study, said: "The result of this enormous study was unequivocal – the only thing that made the mice get fat was eating more fat in their diets. "Carbohydrates including up to 30% of calories coming from sugar had no effect. Combining sugar with fat had no more impact than fat alone. There was no evidence that low protein (down to 5%) stimulated greater intake, suggesting there is no protein target. These effects of dietary fat seemed to be because uniquely fat in the diet stimulated the reward centres in the brain, stimulating greater intake. A clear limitation of this study is that it is based on

mice rather than humans. However, mice have lots of similarities to humans in their physiology and metabolism, and we are never going to do studies where the diets of humans are controlled in the same way for such long periods. So the evidence it provides is a good clue to what the effects of different diets are likely to be in humans. – https://neurosciencenews.com/fat-consumption-weight-gain-9573/

Read more:

- Dietary Fat, but Not Protein or Carbohydrate, Regulates Energy Intake and Causes Adiposity in Mice

HOW SLEEP LOSS MAY CONTRIBUTE TO WEIGHT GAIN

Epidemiological studies have shown that the risk for obesity and type 2 diabetes is elevated in those who suffer from chronic sleep loss or who carry out shift work. Other studies have shown an association between disrupted sleep and adverse weight gain, in which fat accumulation is increased at the same time as the muscle mass is reduced – a combination that in and of itself has been associated with numerous adverse health consequences.

In a new study, researchers at Uppsala University now demonstrate that one night of sleep loss has a tissue-specific impact on the regulation of gene expression and metabolism in humans. This may explain how shift work and chronic sleep loss impairs our metabolism and adversely affects our body composition.

The researchers studied 15 healthy normal-weight individuals who participated in two in-lab sessions in which activity and meal patterns were highly standardised. In randomised order, the participants slept a normal night of sleep (over eight hours) during one session, and were instead kept awake the entire night during the other session. The morning after each night-time intervention, small tissue samples (biopsies) were taken from the participants' subcutaneous fat (fat under the skin) and skeletal muscle. These two tissues often exhibit disrupted metabolism in conditions such as obesity and diabetes. At the same time in the morning, blood samples were also taken to enable a comparison across tissue compartments of a number of metabolites. These metabolites comprise sugar molecules, as well as different fats and amino acids (building blocks of proteins).

The tissue samples revealed that the sleep loss condition resulted in a tissue-specific change in DNA methylation, one mechanism that regulates gene expression. DNA methylation is a so-called epigenetic modification that is involved in regulating how the genes of each cell in the body are turned on or off, and is impacted by both hereditary as well as environmental factors, such as physical activity.

“Our new findings indicate that sleep loss causes tissue-specific changes to the degree of DNA methylation in genes spread throughout the human genome. Our parallel analysis of both muscle and adipose [fat] tissue further enabled us to reveal that DNA methylation is not regulated similarly in these tissues in response to acute sleep loss,” says Jonathan Cedernaes who led the study. “It will be interesting to investigate to what extent one or more nights of recovery sleep can normalise the metabolic changes that we observe at the tissue level as a result of sleep loss. Diet and exercise are factors that can also alter DNA

methylation, and these factors can thus possibly be used to counteract adverse metabolic effects of sleep loss," he says.

Read more:

- Acute sleep loss results in tissue-specific alterations in genome-wide DNA methylation state and metabolic fuel utilization in humans
- For more information, please contact: Jonathan Cedernaes, M.D., Ph.D. at the Neuroscience Department, Uppsala University. jonathan.cedernaes@neuro.uu.se

AN INSIDE LOOK AT PROBIOTICS

Every day, millions of people take probiotics – preparations containing live bacteria that are meant to fortify their immune systems, prevent disease or repair the adverse effects of antibiotics. Yet the benefits of probiotics have not really been medically proven. It is not even clear if probiotic bacteria really colonize the digestive tract or, if they do, what effects these have on humans and their microbiomes – the native bacteria in their guts. In two back-to-back reports published in *Cell*, researchers at the Weizmann Institute of Science show – in both mice and in humans – that a probiotic preparation of 11 strains of the most widely used probiotic families may sometimes be less-than-beneficial for the user and their microbiome.

To explore how probiotics truly affect us would turn out to be an "inside job": For the first study, 25 human volunteers underwent upper endoscopy and colonoscopy to sample their baseline microbiome composition and function in different gut regions. Fifteen of those volunteers were then divided into two groups: The first were administered the 11-strain probiotic preparation, and the second were given placebo pills. Three weeks into the four-week treatment, all participants underwent a second upper endoscopy and colonoscopy to assess their response to the probiotics or placebo, and they were then followed for an additional two months.

The researchers discovered that probiotics' gut colonization was highly individual. However, they fell into two main groups: The "persisters" guts hosted the probiotic microbes while the microbiomes of "resisters" expelled them. The team found they could predict whether a person would be a persister or resister just by examining their baseline microbiome and host gene expression profile. Persisters, they noted, exhibited changes to their native microbiome and gut gene expression profile, while resisters did not have such changes.

"Our results suggest that probiotics should not be universally given to the public as a 'one size fits all' supplement," says Dr Eran Elinav. "Instead, they could be tailored to each individual and their particular needs. Our findings even suggest how such personalization might be carried out." Dr Eran Segal continues: "These results add to our previous ones on diet that had revealed a similar individual response to foods, and which have highlighted the role of the gut microbiome in driving very specific clinical differences between people."

In the second study, the researchers addressed a related question that is of equal importance to the general public, who are often told to take probiotics to counter the effects of antibiotics: Do probiotics colonize the gut following antibiotic treatment, and how

does this impact the human host and their microbiome? The researchers administered wide-spectrum antibiotics to 21 human volunteers, who then underwent an upper endoscopy and colonoscopy to observe the changes to both the gut and its microbiome following the antibiotic treatment. Next, the volunteers were randomly assigned to one of three groups. The first was a "watch and wait" group, letting their microbiome recover on its own. The second group was administered the 11-strain probiotic preparation over a four-week period. The third group was treated with an autologous fecal microbiome transplant (aFMT), made up of their own bacteria that had been collected before giving them the antibiotic.

Probiotics, after the antibiotic had cleared the path, could easily colonize the human gut - more so than in the previous study in which antibiotics had not been given. To the team's surprise, the probiotics' gut colonization prevented both the host gut's gene expression and their microbiome from returning to their normal pre-antibiotic configurations for months afterward. In contrast, autologous FMT resulted in the native gut microbiome recolonizing and the gut gene expression profile returning to normal within days. "These results," says Elinav, "reveal a new and potentially alarming adverse side effect of probiotic use with antibiotics that might even bring long-term consequences. In contrast, personalized treatment – replenishing the gut with one's own microbes – was associated with a full reversal of the drugs' effects."

Since probiotics are among the world's most traded over-the-counter supplements, these results may have immediate, broad implications. "Contrary to the current dogma that probiotics are harmless and benefit everyone," says Segal, "we suggest that probiotics preparations should be tailored to individuals, or that such treatments such as autologous FMT may be indicated in some cases."

Read more:

- Personalized Gut Mucosal Colonization Resistance to Empiric Probiotics Is Associated with Unique Host and Microbiome Features
- Post-Antibiotic Gut Mucosal Microbiome Reconstitution Is Impaired by Probiotics and Improved by Autologous FMT

PREVENTING DIABETES

The PREVIEW diabetes prevention learning module provides an up-to-date, evidence-based and easy-to-use interactive summary of healthy eating, physical activity and psychology for the prevention of type 2 diabetes and is freely available at: http://preview-preventing-diabetes.com/

PERSPECTIVES: DR ALAN BARCLAY

DIETS: LET'S BREAK THE 50-YEAR FAD CYCLE

Overweight and obesity is a global phenomenon, with the World Health Organisation estimating in 2016, that 1,900 million adults and 380 million children have a body mass index (BMI) greater than 25 kg/m^2. The causes are multifaceted and complex. In 2007, the Foresight Programme of the UK Government Office for Science published an obesity system map, developed through a multi-stakeholder process.

This qualitative, conceptual model has 108 variables, some of which are measurable (eg, the ambient temperature of the indoor environment), and others that are more difficult to quantify (eg, desire to differentiate food offerings). The relationships between the variables are illustrated with more than 300 solid or dashed lines to indicate positive and negative influences. All the variables are interconnected, some with large numbers of inputs and others with large numbers of outputs. The connections give rise to feedback loops with as few as two variables (eg, **a** affects **b** which in turn affects **a**) or involving as many as 16 variables.

At the core of the map is "energy balance" (energy intake versus energy expenditure).

The highest quality (Level 1) scientific evidence from randomised controlled trials in humans shows quite clearly that in the long-term (more than 2 years), the macronutrient composition (ie, fat, carbohydrate or protein) of the diet doesn't matter – with respect to body weight, it's total energy intake (kilojoules/calories) that ultimately counts. Despite this, most purveyors of popular diets continue to focus on single nutrients or ingredients as the cause of all our current lifestyle-related ailments, and most state of course that all you need to do to solve the problem is to avoid them. If only it was that simple …

We have a really good recent example of the lack of success of the one-nutrient-at-a-time approach – the vast variety of low fat diets contrived in the final quarter of the 20th century. Low fat diets (in contrast to traditional low-fat eating patterns as enjoyed by certain ethnic groups for hundreds of years) did not deliver the improvements in health that were expected by their original proponents.

Present day narrative suggests that in an academic showdown spanning both sides of the Atlantic in the 1960s and 70s, "anti-fat" scientist Dr Ancel Keys defeated "anti-sugar" scientist Dr John Yudkin, and the low-fat message was enshrined in Dietary Guidelines worldwide, paving the way for low-fat variants of all of our favourite foods for the next quarter of a century. In the mean-time we all gained more weight and developed type 2 diabetes. Again, if only it was that simple …

Not everyone agreed with Keys hypotheses, and as characteristic of scientific research, academic debate continued. Mindful of this, the very first edition of the Dietary Guidelines for Americans published in 1980 included a range of practical advice to help people choose a healthful pattern of eating. There was a chapter on how to "Avoid too much fat, saturated fat, and cholesterol" and also one on how to "Avoid too much sugar", thus addressing both Keys' and Yudkin's concerns. Dietary Guidelines from 1980 onwards have always included practical advice on reducing saturated fat and added sugars. The problem is, the average person didn't know about the Dietary Guidelines as they were a government publication in a pre-internet world. Needless to say, they would not have been on the best seller list in the local bookstore back in 1980. Even today few people have actually read them despite their being freely available over the internet.

In the 1970s and 80s, low-fat diet books by Nathan Pritikin in the USA and Ross Horne in Australia (an engineer and a pilot respectively) made the best seller lists. They had both experienced dramatic health improvements when they started consuming a low-fat diet.

There were many other similar titles as the publishing industry caught and rode the wave. Devout followers of the various low-fat gurus sought low-fat foods in their local supermarkets and food industry caught on, producing low-fat versions of all of our favourite foods, often replacing the fat with dietary fibres (eg, gums), maltodextrins, starches, added sugars and refined proteins. The rest, as they say, is history …

Sadly, history has a bad habit of repeating itself. With respect to fad diets, the cycle appears to last around 50 years. Here's a snapshot of the past 50 years.

- High fat, low carbohydrate diets were fashionable in the early 1970s thanks to Dr Atkins' and his *Diet Revolution: The High Calorie Way to Stay Thin Forever*
- Low fat, high carbohydrate diets came into fashion in the early 1980s, thanks to Nathan Pritikin's *The Pritikin Promise: 28 Days to a Longer Healthier Life* and Ross Horne's *The New Health Revolution*, and stayed with us for around 20 years
- Low carbohydrate, high protein diet variants came back in vogue in early 1999 with the release of *Dr Atkins New Diet Revolution*, and *The CSIRO Total Wellbeing Diet* in 2006.
- Low sugar diets became popular in the mid-noughties, and low carbohydrate (starches and sugars) diets have been popular in more recent years. Indeed, extremely low carbohydrate/high fat diets are now in vogue, with ketogenic diets rapidly gaining in popularity – last popular back in 1971 ...

When you break it down and do the math it's pretty simple – there are 3 macronutrients:

50 years/3 macronutrients = new focus for fad diets every 15–20 years.

So it's protein's turn for the hit list next. Veganism or test-tube meat anyone?

Let's break the cycle. Diets don't work. Instead, opt for what we know works for long-term health and wellbeing.

- Enjoy a healthful pattern of eating that suits your cultural, family and personal food preferences and budget
- Be as physically active as you can every day
- Find ways to deal with stress, and
- Get a good night's sleep. Eight hours.

Read more:

- Low carbohydrate versus isoenergetic balanced diets for reducing weight and cardiovascular risk: a systematic review and meta-analysis.
- Making progress on the global crisis of obesity and weight management

Alan Barclay PhD is a consultant dietitian. He is author of *Reversing Diabetes* (Murdoch Books), and co-author of 30-plus scientific publications, *The Good Carbs Cookbook* (Murdoch Books), *Managing Type 2 Diabetes* (Hachette Australia) and *The Ultimate Guide to Sugars and Sweeteners* (The Experiment Publishing). Follow him on Twitter or check out his website.

KEEPING IT GREEN – EATING FOR BODY AND PLANET

THE ETHICS OF MEAT

The fairy tale farm evokes images of pigs rolling in muddy pig pens, cows grazing in green pastures and hens happily sitting on eggs in wooden hen houses. While this may have been the scene in the 1890s, the reality today is not so pretty. Increasing demand, corporatisation of agriculture and the expectation of low prices has encouraged the intensive production of animal products, along with a decline of our humanity and compassion for animals.

Many of us are blissfully ignorant of how our meat, milk and eggs get to the shops but there has been a shift in our attitudes and preferences. Social media, vegan activism and a growing awareness of animal welfare have helped to fuel the rise of flexitarianism, or eating less meat, as well as a rise in ethical claims on food such as 'free-range', 'organic' and 'cruelty free'. Here we take a look at the main welfare issues within animal farming and how industries are responding with more ethical alternatives.

- CONFINEMENT – Chickens and pigs are commonly kept in cages or crates with little room to turn around. Lack of exercise weakens their bones and as chickens are grown unnaturally fast, broken bones are a common issue. Free-range chickens and 'sow-stall free pork' offers a more ethical alternative.
- DENIAL OF NATURAL BEHAVIOURS – chickens instinctively like to run around, roost, and dust bathe and all these behaviours are denied or severely curtailed in intensive farms. Free range farming allows chicken to engage in their natural behaviours. Similarly, pigs like to root around outside with their specially adapted snouts, and free-range farming allows them to do this.
- UNWANTED CHICKS AND CALVES – Only female chickens lay eggs, yet 50% of chicks born are males. Shockingly, male chicks are killed, either gassed or – horrifyingly - thrown alive into grinding machines. Similarly, dairy cows only produce milk if they have recently given birth so most calves are slaughtered, except for a small number of female calves that are raised to produce milk themselves.
- PAINFUL PROCEDURES – For a variety of reasons, intensive farming often involves hurting animals. Farmers may trim chicken beaks, dock horns, castrate pigs, lambs and calves, clip teeth, dock tails, ring noses, remove horn buds. These painful procedures are usually done without anaesthetic.

Ethical farming meat, egg and dairy farming are more labour intensive and therefore more expensive. In the case of milk, organic milk from smaller farms with kinder practices can cost double the amount of conventionally produced milk. This is out of reach for many. Another issue is the limited supply of more ethical products. While the situation is changing, ethically produced meat is still harder to find. How we can increase the supply is to demand it, and the food supply will gradually change to give us what we want.

How to be an ethical omnivore

- Enjoy a plant-based diet and when you eat your 'just enough' amount of animal products, choose the most ethical options available to you – a win for the animals and you! Eating just enough animal foods, and perhaps less than you do now, will reduce the cost impact as well.

- Choose organic, free range, cruelty free or humane choice meat and dairy. Organic farming standards include welfare for farm workers and animals.
- Choose wild, game meats – such as rabbit, kangaroo, venison (deer) that are free to roam before slaughter (and also have a smaller environmental footprint).
- Support smaller organic/biodynamic farms – as they use kinder and more environmentally sustainable production methods.
- Dine at ethical eateries – Support restaurants that use higher welfare animal ingredients – e.g. cage-free eggs. There are online directories such as *Choose Wisely* in Australia that help locate ethical eateries near you.
- Eat nose-to-tail and waste nothing – if we're going to kill animals for food the least we can do is eat everything and not waste it. This means eating all the cuts and not just the popular ones. The bonus is they're cheaper.

Thanks to Rachel Ananin aka TheSeasonalDietitian.com for her assistance with this article.

In this series we explore how you can reduce your ecological impact through your food choices. We'll help you do your bit for the environment, one mouthful at a time.

Nicole Senior is an Accredited Nutritionist, author, consultant, cook, food enthusiast and mother who strives to make sense of nutrition science and delights in making healthy food delicious.
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GOOD CARBS FOOD FACTS A TO Z

SPELT

Spelt is one of today's trendy grains with organic cred and a mystical "ancient grains" health halo. An older wheat variety of uncertain parentage – possibly a hybrid of emmer and bread wheat – it was long cultivated in parts of Europe, but fell out of fashion because it is a hulled wheat (meaning it has a tough husk and is harder to process). Today it is back big time and available whole, pearled, cracked, rolled and green or milled to make flour and products such as couscous, pasta, bread and breakfast cereals. In the kitchen you'll find it's a very versatile grain with a nutty, al dente texture that happily pairs with robust flavours or substitutes for regular wheat in most recipes. We think it's a good carb to stock in your pantry and doesn't need the accompanying hype.

Some nutrition and food writers make Very Rash Claims that many people who can't tolerate wheat can tolerate spelt. There is no evidence for this in peer-reviewed science journals. Spelt is a variety of wheat and it contains gluten (about 80% of its protein is gluten) putting it very much on the Absolutely Avoid List for people with medically diagnosed celiac disease.

Fans like to claim it is nutritionally superior to regular wheat. But when the Grains and Legumes Nutrition Council checked this out recently they found a very mixed bag of research findings. "The nutrient composition of spelt," they report "appears to vary depending on the variety and the environmental conditions where it is grown. Belgian

research examining milled and wholemeal grain samples found that de-hulled spelt contains more copper, zinc, iron, magnesium and phosphorus than soft winter wheat. Another study in Italy showed that spelt contains more protein and soluble fibre than conventional wheat varieties. This research further showed that bread made from wholemeal spelt flour has less total starch and more resistant starch compared with bread made from white flour (milled from both spelt and conventional wheat). However, other research has shown no significant difference between the nutritional content of spelt and (hard red) winter wheat in terms of protein, fibre, vitamin and mineral content. The exception was zinc content, which was found to higher in spelt wheat."

As for its glycemic index, it hasn't been GI tested but we would guesstimate pearled spelt to be similar to whole wheat kernels. The GI of other spelt products from breads to breakfast cereals will depend on the product and the amount and type of processing.

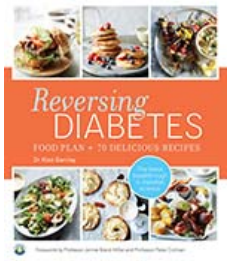
Good Carbs Food Facts **Spelt**	
★ ★ ★ ★ ★	
Glycemic index 52 **(estimated based on GI of whole wheat kernels)**	
Contains gluten	
Serving size – Half cup cooked pearled spelt (100 grams/3½oz)	
Kilojoules	515
Calories	125
Protein	5g
Fats – Total Includes: --Saturated fat –Unsaturated fat –Cholesterol	1g 0.2g 0.8g 0g
Saturated : unsaturated fat ratio	0.25
Carbohydrates – Total *Available* Includes: --Natural sugars –Natural starches –Added sugars –Added starches *Unavailable* Includes: –Dietary fibre	26g 22g <1g 22g 0g 0g 4g 4g
Sodium	5mg
Potassium	139mg
Sodium : potassium ratio	0.03
Glycemic load	11
Diabetes exchange	1.5

Ingredients: Spelt, water

Source: USDA National Nutrient Database

IN THE GI NEWS KITCHEN

ALAN BARCLAY: REVERSING DIABETES



The latest research into type 2 diabetes shows that for some people it's possible to put diabetes into remission and for others they can prevent or at least delay the complications of diabetes. In *Reversing Diabetes* (Murdoch Books), Dr Alan Barclay explores what these findings mean and includes 70 inspiring, delicious recipes for households large and small. Available from online retailers and bookshops everywhere.

SPELT SPAGHETTI WITH RATATOUILLE

Use regular wheat spaghetti if that's what's in the pantry. To go gluten-free is you need to, substitute with rice or other gluten-free pasta. Serves 2 • Preparation 15 minutes • Cooking 15 minutes

Olive oil spray
1 red onion, roughly chopped
1 eggplant (aubergine), chopped
1 red capsicum (pepper), chopped
2 zucchini (courgettes), chopped
2 garlic cloves, crushed
250g (9oz) cherry tomatoes, halved
140g (5oz) spelt spaghetti
1 small handful basil leaves, to serve

Spray a large non-stick frying pan with olive oil and place over medium–high heat. Cook the onion, stirring, for 2 minutes or until softened. Stir in the eggplant, capsicum, zucchini and garlic, and cook, stirring occasionally, for 8 minutes. • Stir in the tomatoes and 1 cup water, and cook for a further 2 minutes or until the tomatoes have softened and the other vegetables are tender. Remove the pan from the heat. • While the vegetables are cooking, bring a large saucepan of water to the boil and cook the pasta for 8–10 minutes or until al dente. • Drain the pasta, add it to the ratatouille and gently toss to combine. Serve the pasta and ratatouille with the basil scattered over the top.

Per serving
Energy 1495kJ/ 355Cal; protein 14g; fat 3g (includes 0.3g saturated fat; saturated : unsaturated fat ratio 0.11); carbohydrate 62g; fibre 12g; sodium 30mg; potassium 1085mg; sodium : potassium ratio 0.03

ANNEKA MANNING: BAKECLUB

Anneka Manning is an author, food editor, cooking teacher, home economist, mother of two and the founder of BakeClub. With over 27 years' experience, she specialises in teaching the 'why' behind the 'how' of baking, giving home cooks the know-how, understanding and skill to bake with confidence and success, every time. She has written and contributed to a number of books, including *The Low GI Family Cookbook* (Hachette), *Mastering the Art of Baking* (Murdoch Books) and *BakeClass* (Murdoch Books).

SALMON AND ROAST VEGETABLE FRITTATAS

Make sure you roast extra vegetables when making them for dinner for a quick and easy lunch or light meal the next day. Serve with a green salad. Makes: 8 • Preparation time: 15 minutes (+ 5 minutes cooling time) • Baking time: 25 minutes

Olive oil, to grease (optional)
3½ cups (about 630g) chopped roasted vegetables (see Baker's Tips)
210g/7oz tin red or pink salmon in spring water, drained and coarsely flaked
½ cup (50g/2½oz) coarsely grated vintage cheddar cheese
⅓ cup chopped chives, flat-leaf parsley and/or basil
6 eggs
Salt and freshly ground black pepper, to taste

Preheat the oven to 190°C/375°F (170°C/325°F fan-forced). Grease 8 holes of a 1/3 cup (80ml) muffin tin with olive oil or line with paper muffin cases. • Place vegetables, salmon, cheese and herbs in a large mixing bowl and toss gently to combine evenly. Spoon the mixture into the muffin holes, dividing evenly. Crack the eggs into a jug, season well with salt and pepper and then use a fork to whisk to combine. Carefully pour into the muffin holes over the vegetable mixture, dividing evenly. • Bake in the preheated oven for 25 minutes until set and golden. (The eggs will continue to cook in the tin, so it's ok if the centre is a little soft, just not runny). Stand in the tin for 5 minutes, then use a small palette knife or butter knife to remove the frittatas from the tin. Serve warm or room temperature with a green salad.

Baker's tips

- Roasted pumpkin, capsicum, carrots, sweet potato, zucchini, eggplant and mushrooms all work well in these frittatas.
- Add chopped fresh herbs such as rosemary, sage or thyme to your vegetables before roasting them for an extra flavour hit.
- These frittatas will keep in an airtight container in the fridge for up to 2 days. Serve at room temperature or reheat in an oven preheated to 180°C/350°F (160°C/320°F fan-forced) for 5–10 minutes.

Per serve (one frittata)
630kJ/ 150 calories; 13g protein; 8g fat (includes 3g saturated fat; saturated : unsaturated fat ratio 0.6); 5g available carbs (includes 2.5g sugars and 2.5g starches); 5g fibre; 340mg sodium

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Nutritional analysis To analyse Australian foods, beverages, processed products and recipes, we use FoodWorks which contains the AusNut and Nuttab databases. If necessary, this is supplemented with data from www.calorieking.com.au or http://ndb.nal.usda.gov/ndb/search.

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