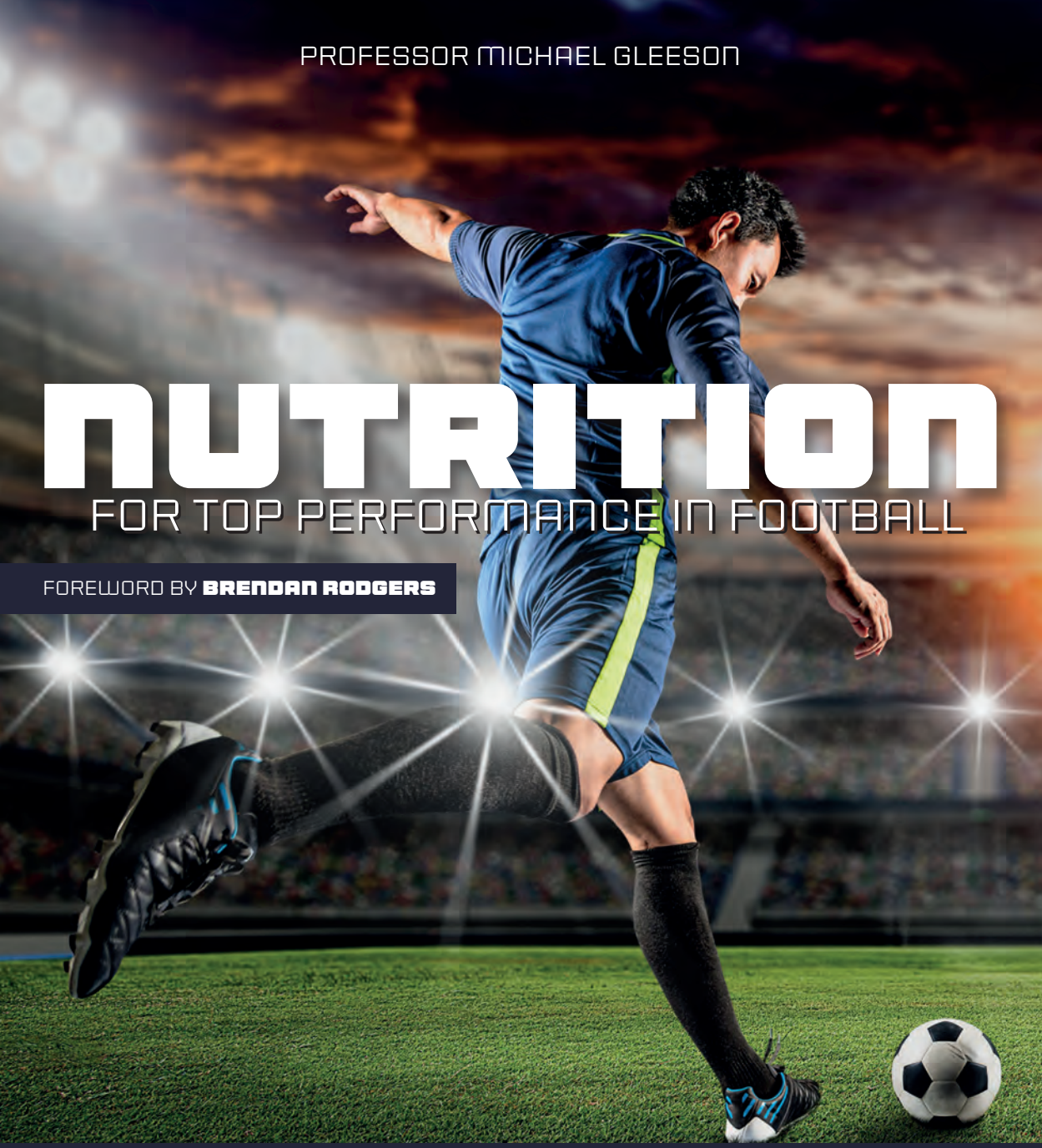
PROFESSOR MICHAEL GLEESON

NUTRITION

FOR TOP PERFORMANCE IN FOOTBALL

FOREWORD BY **BRENDAN RODGERS**



EAT LIKE THE PROS AND
TAKE YOUR GAME TO THE NEXT LEVEL

MEYER & MEYER SPORT

Nutrition for Top Performance in Football

The content of this book was carefully researched. However, readers should always consult a qualified medical specialist for individual advice before adopting any new nutrition plan. This book should not be used as an alternative to seeking specialist medical advice.

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FOREWORD

While the fundamentals remain the same, football has changed dramatically in recent years. The modern game is an exciting spectacle with supporters across the world fanatically cheering on their team and many young children dreaming of becoming the next superstar. In truth, to get to the top takes a lot of hard work, dedication, and do not forget talent. Not only is the intensity of matches higher than ever before but teams are required to compete more regularly due to extremely congested fixture schedules. I pride myself on leading a team that plays with a high energy level, the ability to make continuous high-speed running actions and to a high technical level; all of which require the highest levels of football and physical fitness possible.

Given the increased demands placed upon the modern player, where possible, clubs seek to invest in Medical and Sports Science expertise while also developing cutting-edge facilities in an attempt to maximise the potential of their playing squad. It is of course my role to ensure that each department and individual brings a passion to their work, an expertise and knowledge of the subject that allows us to progress, an ability to communicate with the players in order to improve them and a persistence to ensure not only short but long-term development. I am continually looking to evolve in an attempt to ensure no stone is left unturned when it comes to the preparation of my players. Undoubtedly, nutritional support is a very important aspect for players to get right, which is why we must ensure high standards at the training ground day in and day out. First and foremost, the food we provide must meet the needs of the players and should be tailored to the demands of training and match play. However, this doesn't mean it has to be boring; of course not. It is the role of the team chef to utilise healthy, lean produce to create exciting dishes bursting with flavour which will aid performance.

Historically, players may have only considered nutrition to be the measure of their percentage body fat, a crude marker of whether they were in appropriate shape or not. However, nutritional support is now so much more than that. Body composition is important in order to be strong, athletic and robust on the pitch and so, for many emerging talents, improving muscle mass and ensuring they are eating enough is important for their development. It is about educating the players in the hope that we can inform their decision making when it comes to food choices. It is now widely accepted that nutrition plays a very important role in performance. Players must fuel their bodies to perform at the highest intensity throughout the full 90 minutes. This doesn't just mean having a bowl of pasta three hours before kick-off; it is instead about the choices that are made and strategies that are in place throughout the days leading into a match. The need to fuel is just as important throughout the training week, with it being essential before tough training sessions when the squad are put through

their paces. For me I expect the starting point to be the player's work ethic. Before strategy, tactics, theories, managing, organising, philosophy, methodology, talent or even experience you are dead in the water without this significant attribute.

Nutrition also plays a vital role after competitive matches and heavy training sessions, aiding recovery and supporting the body as it attempts to repair and adapt to the workload undertaken. This is important for not only reducing the risk of injury among the squad, but also helps speed up the turnaround so I can safely work with the players on technical and tactical aspects on the pitch. Given the busy fixture schedule teams often face when competing in European competitions, it is important to identify windows of opportunity when the science can help accelerate the recovery process. Despite our best efforts, the stresses and strains of competition may take their toll on the body; however, clean, lean, healthy food can be a powerful medicine when it comes to reducing risk of illness and boosting player health. We should never underestimate the power that a nice meal has in improving our mood, boosting our energy levels, and helping support our immune system. Professional clubs tend to support their players by providing breakfast and lunch either side of training; however, the decisions which players make away from the training facility are just as important. Through this relentless pursuit of excellence, players begin to understand the level that they need to operate at and in time they change their habits, behaviours and ultimately expectations of the food they eat.

As you can tell, I see the importance of putting in place good nutritional support and that is why I entrust nutritionists and sports science staff to implement strategies which they deem appropriate. When it comes to experts on this specific area, Professor Michael Gleeson is a leader in the field. He has immersed himself in the science and literature throughout his career, sharing his insights and theoretical knowledge along the way which I know has helped shape the careers of so many practitioners working in sport today. Nutrition for Top Performance in Football is a fantastic resource for anyone looking to improve their knowledge and understand the effect that nutrition can have on performance. It doesn't matter what age you are or what level you play at, this book is a great read for anyone who is interested in improving their performance. It will also be of interest for anyone wanting to begin a career working in football as it provides valuable insight into how evidence-based guidelines are put into practice within the professional game. Enjoy the read and good luck in your pursuit of continued improvement, whatever your individual goal may be.

picture alliance / dpa | Peter Powell

–Brendan Rodgers, Leicester City FC manager

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Many people have helped me to write this book and I am indebted to them for the helpful information, advice, insights and quotes they have provided me with. I have tried to list as many of them as I can remember here and I apologise if I have omitted anyone. Any mistakes you find in this book are unintentional and entirely my own. I particularly want to thank all the co-authors of the 2020 UEFA Expert Group Statement on Nutrition in Elite Football, namely (in the order in which they are listed in the paper): James Collins, Ronald Maughan, Johann Bilsborough, Asker Jeukendrup, James Morton, Stuart Phillips, Lawrence Armstrong, Louise Burke, Graeme Close, Rob Duffield, Enette Larson-Meyer, Julien Louis, Daniel Medina, Flavia Meyer, Ian Rollo, Jorunn Sundgot-Borgen, Benjamin Wall, Beatriz Boullosa, Gregory Dupont, Antonia Lizarraga, Peter Res, Mario Bizzini, Carlo Castagna, Charlotte Cowie, Michel D'Hooghe, Hans Geyer, Tim Meyer, Niki Papadimitriou, Marc Vouillamoz and Alan McCall. I am also extremely grateful to Brendan Rodgers for writing the foreword to this book and explaining the importance of nutrition in elite football from an expert manager's perspective. My grateful thanks for anecdotes, quotes (in person or from books and media articles), edits and/or comments also go to: the late George Best and Nick Broad, James Collins, Julian Dowe, Becky Dowst, Sam Erith, Sir Alex Ferguson, Pep Guardiola, Ilkay Gundogan, Harry Kane, Trevor Lea, Don Maclaren, Ron Maughan, Alan McCall, Brian McClair, James Morton, Jordan Nobbs, Tom Parry, Matt Reeves, Alex Savva, James Sinclair, Jamie Vardy, Neil Warnock and Arsène Wenger. Thanks also to Ron Maughan and Matt Reeves for supplying me with some of their own photos and giving me permission to use them in this book. My special thanks go to my friends and superbly talented, world-renowned, elite performance chefs Rachel Muse and Bruno Cirillo who have provided many of the meal plans, recipes and accompanying photos in chapter 12. I also want to extend my grateful thanks to my fantastic editor Liz Evans and the wonderful Sarah Pursey for her assistance with the promotion of the book. Finally, and undoubtedly most important, thanks and lots of love to my lovely wife Laura for your love and support, putting up with all the time I spend researching and writing, for just being there for me and for helping to promote my books. Without you, life would not be worth living.

CHAPTER 1

Does Nutrition Really Matter in Football?

- Why Nutrition Is Important for Football Performance
- Who am I?
- What Is Different About This Book?
- A Brief History of Nutrition for Football
- The Role of the Performance Chef
- Demons and Wizards
- Some of the More Surprising Nutrition Choices Players Have Made

Firstly, I want to thank you for buying *Nutrition for Top Performance in Football*, or if you're from across the pond, *Nutrition for Top Performance in Soccer,* and congratulate you on your decision. The aim of this book is to provide you with an insight into nutrition for football (or soccer as the game is called in some parts of the world, such as in North America, Australasia and the Pacific Islands). In other words, I will describe what elite football players eat and drink and explain some of the science that underpins the current recommendations made by nutrition experts. If you are an amateur player at any level – from national amateur leagues to pub teams – you can use the same nutritional strategies as the top professional players to improve your own game, increase your endurance, recover more quickly and avoid illness. This book is aimed primarily at the amateur player, but it will also be of interest to professional players, academy players (and their parents), nutritional, medical and sport science support staff, football coaches, managers, match officials and frankly anyone who is a fan of the beautiful game. For secondary school,

college and university students studying physical education, sport science or sports nutrition this book will provide a useful resource and an understanding of how nutrition research can be applied in a real-world sport setting.

Nutrition is an important issue in many sports and football is no exception because it plays a crucial role in the health of the individual, in adaptations to exercise training, in weight maintenance and in match performance, whether by professional players or by those who play the game for fun or for health reasons. Indeed, nutrition influences nearly every process in the body involved in energy production, adaptation to training and recovery from exercise. If we look back 30 years or more, nutrition was largely ignored by those involved in professional football. Nowadays, it is seen as an essential component to maximise player performance, health and recovery as outlined in the foreword by Brendan Rodgers.

WHY NUTRITION IS IMPORTANT FOR FOOTBALL PERFORMANCE

Pep Guardiola, current manager of Manchester City and one of the most successful managers in club football, puts it very simply: 'For me the food is so important in football.'

So why exactly is nutrition considered to be so important for football performance now, when quite frankly, it wasn't only some 30 or so years ago? A good place to start is by quoting Arsène Wenger, the former Arsenal manager who was tasked by the Union of European Football Associations (UEFA) with writing an editorial in 2020 about his perception of the role of nutrition in football. He stated: 'The goal of any elite team is performance – to win as many matches as possible over the duration of the season. To achieve this performance there are myriad factors that are involved including technical, tactical, mental and physical qualities. One area that I have advocated for many years (as early as the 1980s) that can help us achieve our performance goals is "nutrition", an area which has grown in importance within the game.'

For the manager or coach, according to Mr Wenger, nutrition has the following objectives (figure 1.1) within the performance model: '(1) To ensure that players are in the best physical condition for the match: with an optimal level of body fat and muscle mass; (2) to accelerate their recovery from the previous match or from hard training sessions; (3) that players are fuelled and have the energy to sustain the intensity for 90 minutes or even more if called upon; and (4) to support an overall healthy, balanced lifestyle both inside and outside of the club environment.'

Playing football involves lots of running with repeated, high-intensity actions interspersed by periods of less-intense physical activity over the course of a 90-minute

Photo 1.1 Arsène Wenger, one the first top managers to appreciate the importance of nutrition for the performance, recovery and health of footballers.

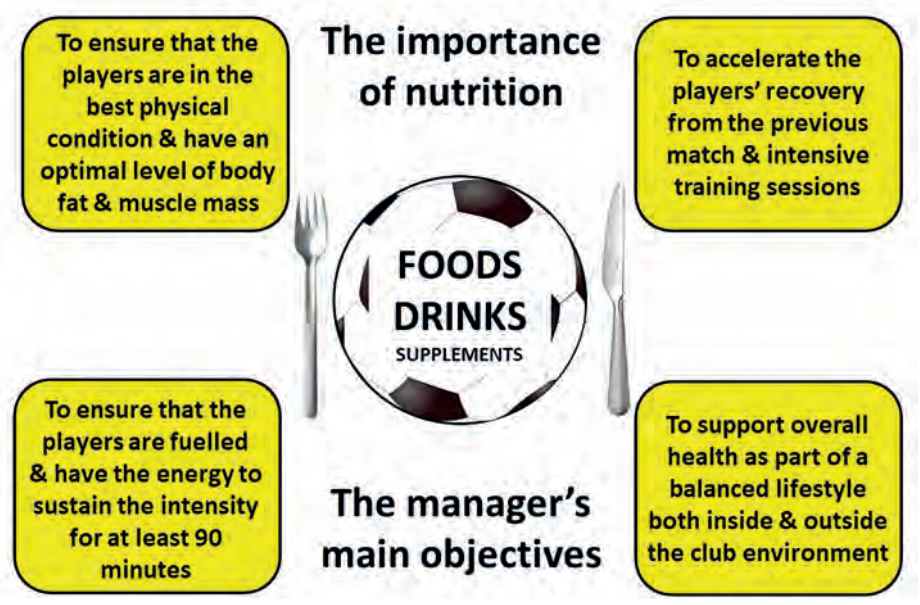

Figure 1.1 The coach's perception of the importance of nutrition in the club's football performance model (according to Arsène Wenger).

match. An elite soccer player typically covers at least 10 km (6 miles) in a 90-minute match with about 600 metres covered at full sprint speed. Heart rate is maintained at about 85% of maximum and the total amount of energy expended by players who complete the full 90 minutes is about 1,600 kilocalories (kcal) with around 60–70% of that energy coming from carbohydrate. Match play involves not only running but also various in-play actions, such as jumping, tackling, passing the ball, dribbling and shooting. In addition, mental functioning is important for the timing of ball strikes and tackles, quick reactions, passing accuracy, decision making and staying concentrated. All of these are affected by fatigue. Minimising fatigue relative to the opposing team is an important strategy in football, because most goals are conceded in the last few minutes of each half (figure 1.2) and are commonly attributed to fatigue. Appropriate nutrition can address two of the major contributors to the development of fatigue, namely carbohydrate depletion and dehydration. In addition, some dietary supplements such as creatine, beetroot juice and caffeine can produce small improvements in performance in some players. Recovery starts immediately after the match ends, and nutrition is crucially important at this time for muscle repair and refuelling, particularly

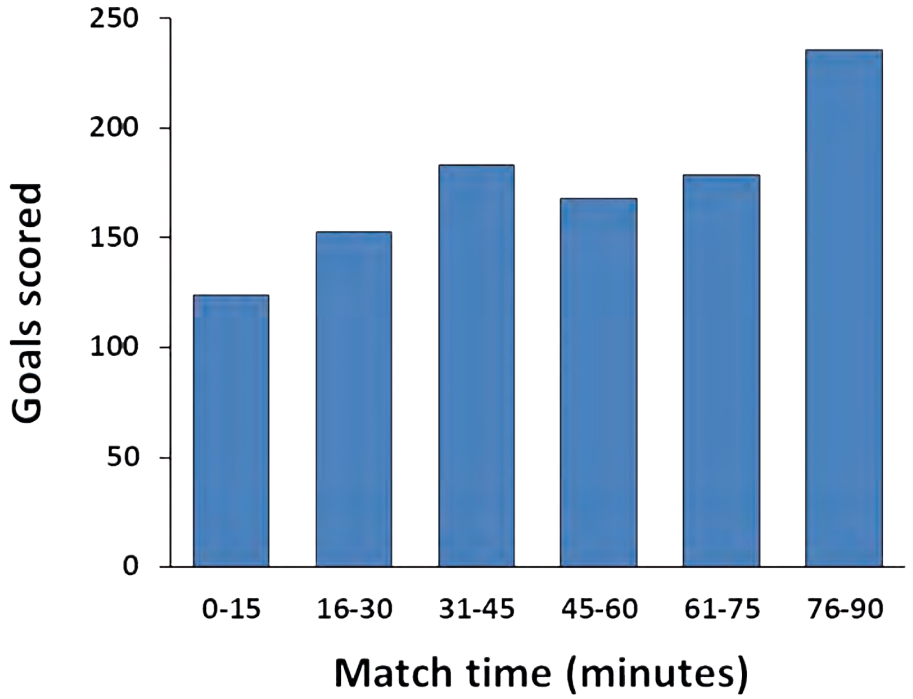

Figure 1.2 Average number of total goals scored in the English Premier League in the five full seasons from 2015–2016 to 2019–2020 during different periods of a match. The values for periods 31–45 and 76–90 minutes include added time.

in congested fixture periods when the next match can be less than 72 hours away. Appropriate food choices and timing are also important to allow a player to perform hard training, avoid illness, reduce injury risk, maintain mental concentration, sleep well, maintain an appropriate body weight and composition, and recuperate from injury (see the infographic at the end of this chapter).

It is important to appreciate that the amount and type of physical activity that a player does varies from day-to-day and that nutrition in football is what scientists call 'periodised' meaning that the diet changes to suit the players' specific training and match schedule. The concept of periodised nutrition is fully embraced by all top football clubs and, although every club will do things a little differently, the core elements of a nutrition plan will be essentially the same. Each player will receive a nutrition plan in the form of a day-by-day calendar that is tailored to their individual needs, which will depend on their body size, body composition, playing position, training load and training goals, their involvement in match play and their health status (by that I mean that the plan will change drastically if a player cannot play or train due to injury or illness, or is undergoing a period of recuperation from injury). Table 1.1 provides an example of a typical weekly periodised nutrition plan for a healthy player who plays one match per week. Note that the percentage contribution of protein to daily energy intake remains relatively constant, but the relative contributions of carbohydrate and fat vary more widely from day-to-day to accommodate pre-match carbohydrate loading and post-match carbohydrate replenishment.

So, the answer to the question 'does nutrition really matter in football?' is yes, it does. It matters very much indeed. Good nutrition may not make a footballer with average talent into a world-class player, but it can improve endurance, delay both physical and mental fatigue and speed up recovery – an important consideration not only for the professionals but also for many amateur players who may have a tiring match on a Sunday morning and have to go to work on Monday. It is also true that a poor choice of food and beverages can make an elite footballer become a pretty average player.

WHO AM I?

I am a recently retired university professor who has spent the last 45 years of his life teaching, researching and writing in the field of exercise physiology, metabolism, immunology and health with a particular interest in sport nutrition and a love of watching football. My last two academic positions were at the University of Birmingham and Loughborough University, two of the top universities in the world for sport and exercise

Table 1.1 A typical weekly nutrition calendar showing daily needs for a professional player

Day	MD-4	MD-3	MD-2	MD-1	MD	MD+1	MD+2
Main activity	Intense training	Moderate training	Intense training	Light training	Match play	Recovery	Light training
Energy (kcal)	3,300	3,000	3,300	2,800	3,500	2,500	2,800
Carbohydrate (g/kg BM)	6.0	5.5	6.0	6.5	7.5	6.0	5.7
Carbohydrate (g)	440	405	440	488	562	453	430
Carbohydrate (%EI)	53	54	53	70	64	72	61
Protein (g/kg BM)	1.8	1.6	1.8	1.4	1.8	1.4	1.5
Protein (g)	135	120	135	105	135	105	113
Protein (%EI)	16.4	16.0	16.4	15.0	15.4	16.8	16.1
Fat (g/kg BM)	1.5	1.3	1.5	0.6	1.0	0.4	0.9
Fat (g)	110	100	110	48	78	30	70
Fat (%EI)	30	30	30	15	20	11	22

MD = match day. %EI = percentage of total daily dietary energy intake. g/kg BM = grams per kilogram body mass. The daily energy expenditure and amounts of carbohydrate, protein and fat are based on a player weighing 75 kg and playing a full match on one day per week with weekly energy intake sufficient to match weekly energy expenditure.

science. I have authored several books on the biochemistry of exercise and training, immune function in sport and exercise, nutrition for sport, a trilogy of healthy lifestyle guidebooks and contributed chapters to more than 30 other books. I have published over 250 research papers in scientific and medical journals, and much of this was focused on the well-being of athletes, including footballers, and the factors influencing their performance.

My longstanding interest in football began when my father took me to watch my first live match in 1961. It was at Boundary Park, home of Oldham Athletic, my hometown team that I have supported ever since. I was only five years old and would not have been able to see anything with the supporters standing all around us, but my dad perched me on his shoulders and as he was 6 ft 4 in (1.93 m) tall I probably had the best view in the

ground! Oldham beat Mansfield Town 3–1 that day and I was hooked. I have loved the game from that day onwards. Oldham may not be the most fashionable or successful team in England, but in my lifetime, they have had their moments including beating the likes of Manchester United, Liverpool and Chelsea when, for a few years in the early 1990s, they made it into the Premier League. Currently they are back in the same division as when I saw them first play; so is Mansfield Town.

Many of my former university students now work in sport science support roles at major football clubs including several in the English Premier League and the North American Major Soccer League (MLS). I occasionally provide nutrition advice to Leicester City FC, who became the Premier League Champions in 2016 as 5,000–1 outsiders and won the FA Cup for the first time in their history in 2021. Leicester is the other team I support, having lived not far from the city for the past 35 years. Plus, Matt Reeves, who is the Head of Fitness and Conditioning at the club, is a past student and a friend of mine.

Photo courtesy of Michael Gleeson.

Photo 1.2 The author (far left) with members of the Leicester City FC team support and management staff at the King Power Stadium in 2009. A very young Matt Reeves is on the far right.

WHAT IS DIFFERENT ABOUT THIS BOOK?

This book is unique as it provides useful and (hopefully) interesting information about what footballers eat and drink and – more importantly – explains what they are recommended to eat and drink (and when) by football nutrition experts. This information is based on the 'UEFA expert group statement on nutrition in elite football', which was first published online in October 2020 in the *British Journal of Sports Medicine*. The authors of the paper were experts in applied sports nutrition research as well as practitioners working with elite clubs and national associations and were asked to issue a statement on a range of topics highly relevant to elite football nutrition. These topics included match-day nutrition (e.g. what to eat and drink on match day), training nutrition (e.g. what to eat and drink on training days), body composition (e.g. what is the desired body composition of a player and how it can be changed), stressful environments and travel (e.g. the influence of playing in the heat or cold or at altitude as well as long-distance travel challenges), cultural diversity and dietary differences (e.g. the implications of things like Ramadan and vegan diets), dietary supplements (e.g. which supplements might improve performance or training adaptation), rehabilitation (e.g. what can be done to optimise the rehabilitation from injury process and accelerate return to play), the specific nutritional needs of referees and junior high-level players and differences between the needs of elite male and female players (figure 1.3). I contributed to the writing and editing of this landmark paper – the first one of its kind since 2006 – but I have attempted to explain it all in simpler terms in this book – at least in a way that any reasonably intelligent person can understand.

As well as giving evidence-based guidelines to optimise football performance through appropriate nutrition, the book also provides some amusing anecdotes about the history of football nutrition, comments from people that I have worked with in the professional game, and some of the obscure, and even absurd, food and beverage choices that professional footballers have made over the years, including right up to the present day. It also provides numerous meal plans and recipes to allow anyone to emulate exactly what the professional players are eating.

Football nowadays is a truly global game that is constantly evolving. Over the past decade, there have been substantial increases in the physical and technical demands of match play. Now, players do more high-intensity actions, more sprinting and more tracking back. Some teams adopt what is called a pressing style of play, meaning the forwards and attacking midfielders, in particular, are expected to put pressure on opposition defenders who have the ball in an attempt to regain possession while still in the attacking third of the pitch. This, of course, requires more running and tackling from those attacking players. In order to cope with these increased demands, teams' training

Figure 1.3 Nutrition-related aspects of football that were considered in the '2020 UEFA Expert Group Statement on Nutrition in Elite Football' by Collins et al. (2021).

regimens have become more multidimensional, in an attempt to prepare players optimally to cope with such evolutions and to address individual player needs. As part of this multidimensional approach, nutrition can play a valuable integrated role in optimising the performance of elite players during training and match play, and in maintaining their overall health throughout a long season. An evidence-based approach to nutrition that emphasises, a 'food first' philosophy (i.e. prioritising food over supplements to meet nutrient requirements) is fundamental to ensure effective player support. This requires relevant scientific evidence to be applied according to the constraints of what is practical and feasible in the football setting.

There is obviously little opportunity for nutrition during actual match play, and this is usually limited to taking a drink during breaks in play when a player is being treated for an injury by the physio on the pitch or when a substitution is being made. But what a player eats and drinks before a match, during the half-time interval and after a

match can have important consequences for their match performance and subsequent recovery. The science underpinning sports nutrition is evolving at a fast pace, and practitioners must be alert to new developments. Knowing what the top professional players are doing in terms of their nutrition can help amateur players improve their own performance. To understand and apply the principles of sport nutrition in football, some basic understanding of nutrition is necessary, as is some fundamental knowledge of metabolism and the physiological and technical demands of the game itself. The first few chapters of the book provide all this basic background information.

The book provides the very latest comprehensive information on nutrition guidelines for professional players. The needs of adolescent and female players, as well as match officials, are also covered. Relevant issues such as eating and drinking during travel, food hygiene and the influence of cultural and religious beliefs are also considered. Most of these issues are also very relevant to the amateur player who wants to be able to perform to the best of their ability. People who engage in similar team sports to football in terms of physical, energy and mental demands, such as rugby, hockey, basketball and netball can also benefit from the information about nutrition provided in this book. The book contains numerous tables and figures that are used to illustrate important data and information. At the end of each chapter, there is an infographic that summarises the most important take-home messages from the chapter. The final chapter provides some example meal plans and snacks for training days and match days. For this final chapter of the book, I am joined by two of the best performance chefs in the world, Rachel Muse and Bruno Cirillo, who prepare meals for several English Premier League and Danish Superliga players, respectively.

A BRIEF HISTORY OF NUTRITION FOR FOOTBALL

Football was, for a long time, classed as just another endurance sport akin to long-distance running or cycling largely because a football match lasted at least 90 minutes. Therefore, 30 years ago, much of our understanding of the nutritional requirements of football players was simply extrapolated from early scientific research carried out in relation to these other endurance sports. However, the training loads associated with these sports are vastly different from those in football. A closer inspection of the energy demands makes it abundantly clear that daily energy expenditure of professional football players may not be particularly high compared with, for example, an athlete training for a marathon race or an elite cyclist training for the Tour de France. Football players are generally pretty inactive when not directly involved in match play or training, and their

training load will vary depending on factors such as the stage of the season, or whether tactical or fitness drills predominate in training.

Professor Ron Maughan, a colleague and friend of mine, who worked at the University of Aberdeen, was the first British scientist to assess the dietary intakes of top professional footballers. In 1997, he managed to get 51 players from two Scottish Premier League clubs to perform seven-day weighed food intakes and found their average daily energy intake to be approximately 2,840 kcal, which was considerably lower than the reported intakes of most other endurance athletes, which were typically 3,500–5,500 kcal/day. If football players were to consume 7–10 g of carbohydrate per kilogram (kg) body mass each day (a common recommendation both then and now for athletes in endurance sports) then a quick calculation that included reasonable amounts of protein and fat would generate a daily energy intake closer to 4,200 kcal. Clearly, the early dietary recommendations for professional football players had been slightly misjudged. One potential problem is that this dietary energy excess would likely lead to weight gain if maintained for more than a month or two. That could be one of the reasons why you can remember (if you are over 40 years of age) that prior to the 1980s there were a few seemingly somewhat overweight players in your favourite team. Another reason was that players were generally less fit, the game was played at a less frantic pace, and most players were ignorant of the need for good nutrition.

When finally the importance of nutrition for performance in football was actually properly recognised, a number of other problems developed and persisted in the delivery of nutritional support in football. In many teams, the responsibility of implementing a nutritional support strategy was given to the strength and conditioning coach, physiotherapist or sport scientist. From the early 1990s, football started to attempt to apply scientific analytical techniques, and experts employed by clubs tended to adopt a 'measure everything' approach, in part because they didn't want to be seen to be missing anything of potential importance, but also because nobody at the time actually knew what was most important. Hence, blood, saliva, urine, sweat and expired air were all being indiscriminately extracted from players, often with very little feedback offered in return. In the world of nutrition and football, at first, science was calling the shots, although in a rather haphazard way, until a more discriminatory approach was adopted, discarding what was found to be not useful and a better understanding was gained of what really needed to be known.

Nowadays, football has caught up with science and now dictates where most efforts are directed. For example, rather than just recommending a high-carbohydrate, low-fat diet with sufficient protein and micronutrients all the time, emphasis is now placed more on achieving optimum carbohydrate intake before matches, and during the recovery period after matches, particularly when some clubs find themselves involved in up to three

games per week in the busiest parts of the season. The importance of the amount, timing and quality of protein consumed on training adaptation and recovery is now recognised, as are the roles of certain micronutrients, such as vitamin D and iron, and the potential value of performance-enhancing dietary supplements, such as creatine, caffeine and nitrate. The role of the sport nutritionist in professional football is now seen as one of manipulating carbohydrate, protein, fat, fibre, fluid and micronutrient intake through diet, and the occasional use of supplements to maintain health, promote adaptation to training, speed recovery and ultimately enhance performance or at least help to maintain performance over the course of a season. Also, a more personalised approach to nutrition advice for individual players has been adopted rather than a 'one-size-fits-all' strategy.

It has taken rather a long time for good nutrition to be accepted in professional football, and one of the main reasons is that the game is steeped in tradition, with many coaches and support staff employed from within who have not been educated in sport science or nutrition and have not taken on what other sports have been doing. Having mentioned that, it is also true that these people know the sport and its peculiarities better than anyone. Furthermore, the practice of employment from within, and improved coach education in tandem with the recruitment of expert nutritionists to the support staff of professional clubs, has spawned a new breed of coaches that now have a far better understanding of the value of sport nutrition.

Another issue has been the power of the players and the desire of managers, coaches and support staff to try to keep them happy at all times, or at least most of the time. However, letting players eat and drink what they want, when they want, is not usually the best strategy to achieve their best performance on the pitch. Given a choice, many players would choose to eat fish and chips, pies, burgers, hot dogs or pizza after a game (no doubt washed down with a few beers), and only 20 to 30 years ago it would not be unusual to see a team bus parked outside a fish and chip shop or even a pub when travelling home on the coach from an away match! Before a match, many players opted for some crisps and chocolate an hour or two before kick-off rather than a nutritious, high-carbohydrate meal a little earlier than that. When Arsène Wenger arrived in England in 1996 he was alarmed at the diet – or more accurately, the lack of any scientifically-led, performance-enhancing diet – among his Arsenal players. Wenger banned chocolate immediately, causing several senior members of the squad to bristle with resentment. He recalls the resistance en route to his first game: 'We were travelling to Blackburn and the players were at the back of the bus chanting: "We want our Mars bars!"' Now, some 25 years later, the landscape has changed dramatically in English football. Clubs now provide detailed nutritional advice to their players, with pretty much all top clubs employing their own full-time nutritionists and chefs. The same is true of other top clubs in Europe and in the MLS. Many elite players now employ their own personal performance

chefs to prepare and cook their food when they are at home (i.e. on their days off and for evening meals on training days).

In the past, nutritional support was brought in as and when needed, rather than being a service that was required on a day-to-day basis, but the modern attitude is to take a more holistic approach and be open to anything that can be done – nutritionally or otherwise – to help players from both a performance and recovery perspective. Nowadays, players are so much more receptive and open-minded than they used to be, and they have come to realise what an impact good nutrition can have on their performance, recovery and injury/illness prevention, and will act upon it accordingly. Eating together has always been an important part of bonding as a team. To quote Arsène Wenger again: 'Previously food was provided at the training ground and players were educated on how to eat at home. We are now witnessing clubs managing every aspect of nutrition, such as preparation of meals, and the use of chefs to deliver club guidelines, away from the training ground.'

The technology available to nutritionists has also improved, with everything from heart rate, distance covered in training (using GPS devices), body mass and body-fat percentages checked and monitored on a regular basis. There are even occasional blood tests on the players that can help to detect deficiencies in certain nutrients such as iron or vitamin D, and which can be used as a basis to target a correctional nutrition intervention by modifying the diet or providing supplements. The role of the nutritionist has also become more complex as professional clubs now have more players from all over the world. Not only does the nutritionist have to understand the technical side of their subject area, but also the foods, culture and religious practices that influence individual player food preferences in order to build trust and work effectively with players of different nationalities.

Educating all the players themselves is key to the successful implementation of desired nutritional strategies, and the nutritionist has the important role of engaging all players and taking them on a journey to understand the use of food for fuel, performance, recovery and overall health. This will include advising not only the current first team squad but also the under-23 squad, youth players within the academy and all new signings. Some players know quite a lot about nutrition and the macronutrient contents of different foods but it is probably true to say that most do not, so even relatively simple terms such as 'legume' need to be explained to them. I was told by a club nutritionist that one player (whom I will not name to avoid embarrassing him) was asked if he knew what a legume was. He said he did not have a clue, so the nutritionist asked him if he knew the difference between a parsnip and a chickpea. After a little thought, the player laughed and replied 'Not really but I know I would not pay £200 to have a parsnip on my face'. A little crude, I know, but I assume you get the point.

In the past – and we are only talking about 25–30 years ago – players ate just to satisfy their hunger and remain weight stable. Now, after just a few decades of the application of science in professional football, we know that what a player eats before, during and

after training or a competitive match can have huge implications on how they perform, how they recover and how they feel. That is why, in modern-day football, nutrition is no longer overlooked or viewed as just a treatment or basic necessity but very much as a performance and recovery enhancer.

Other advances in nutrition provision and means of influencing players' food choices have been introduced in recent years. As James Collins, lead author of the UEFA expert group statement on nutrition in elite football and former head nutritionist at Arsenal FC explains: 'We used to have a lot of information on the walls. We've moved away from that because the messages became like wallpaper and they weren't changing the players' behaviour. Today, whether downstairs in the changing room or upstairs in the restaurant, we believe in simple signposting. In the restaurants we may use colour-coded containers for the proteins, carbohydrates, healthy fats and vegetables. We also look at the flow and set up easy access around restaurants so that food is labelled and the players can build their plates. The priority now is to send digital information direct to their mobile phones. Their physical activity loading changes from day to day, so what we're asking them to eat on each day must also change as well. We can send them their plans and supporting educational information about their nutrition for the day. The engagement is far higher.'

At some of the top clubs in Europe, nutrition provision for players has gone beyond even this to the next level as Sam Erith, head of sport science at Manchester City FC has revealed: 'Nutrition has taken huge steps forward for us in recent years; we now employ full-time nutritionists. Their role is so much more practically based, with presence at all meals offering advice to players in the here and now rather than just more "clinical" reviews periodically. The food has also become incredibly more adventurous and tasty! Very different to the days of pasta, chicken and tomato sauce!' This reflects the increasing involvement of the performance chef, a person who is expert in cookery and who has a good understanding of nutrition, who can provide delicious meals for players that are tailored to the nutritionist's plans for daily energy and macronutrient intakes for individual players while at the same time taking on board each player's personal food preferences.

THE ROLE OF THE PERFORMANCE CHEF

Some players have now taken to hiring their own personal chefs. Matt Reeves is a key member of the sport science support team at Leicester City FC and liaises with the club's nutritionist, the medical staff and performance chefs to ensure that players get the nutrition that is right for them. He recently told me 'Clearly in the last five to ten years there has been a big shift in the nutritional mindset within the professional game, with players focused not just on what they eat but how food is prepared. In the past couple of

years, we have seen more players investing their money in having a private chef at home which reflects the importance they place on fuelling and recovering appropriately.' Harry Kane, the Tottenham Hotspur and England striker (who also had a loan spell at Leicester in his younger days) started working with his own chef a few years ago. A newspaper article in 2017 quoted him as saying 'It kind of clicked in my head that a football career is so short. It goes so quickly, you have to make every day count. I have a chef at home to eat the right food, helping recovery. You can't train as hard as you'd like when you have so many games, so you have to make the little gains elsewhere, like with food. He's there every day, Monday to Saturday, and leaves it in the fridge for Sunday. I hardly ever see him because I'm at training, but he'll cook the food and leave it in the fridge. We've got a good plan going.'

Photo 1.3 Matt Reeves, head of fitness and conditioning at Leicester City, liaises with the club's nutritionist, the medical staff and performance chefs to ensure that the players in the first team squad get the nutrition that is right for them.

Having a personal chef is commonplace among top players now, and several businesses have developed to help arrange and manage this union of footballers and expert cooks. The chefs will usually liaise closely with the club nutritionist to ensure menus are tailored specifically towards the players' requirements and tastes. Nutritional advice will differ depending on the individual player's age, metabolism, position, training or recovery demands, as well as their cultural background and food preferences. Chefs need to be able to prepare a variety of menus suitable for a Mediterranean, Scandinavian, African, Asian or South American diet, as well as English or Scottish ones. Sometimes chefs may cook in the players' homes, but more often the meals will be prepared for the week ahead and then be delivered all over the country to the players.

Rachel Muse is one of the top performance chefs in the world, and she cooks meals for many English Premier League players. Here she shares her experience of working with club nutritionists and the players themselves: 'As a private performance chef my team and I cook for one particular player (and their family or the friends they live with) in their own home. On training days, the football club provides breakfast and lunch (plus snacks) at the club's training ground. On match days the club will provide a pre-match meal for their players. In my experience all Premier League clubs take nutrition seriously, they all have an individual who is responsible for nutrition, either a member of the in-house team or a consultant. The club will have great kitchens with knowledgeable chefs who, together with the nutritionist, design menus. The food provided on training days and match days is always fresh, colourful and packed with nutrition. At the training ground food and nutrition are treated seriously and the player has no choice but to eat well. However, outside of the training ground players are left to their own devices when it comes to nutrition. A player will be given guidance by the club's nutritionist for the food that should be eaten when the player isn't being catered for by the club. However, the player may not understand this information, may not have the cooking skills to follow the advice or may simply not be interested in following the guidance. This is where a private performance chef steps in.'

Now Rachel explains how she interacts with the club nutritionist and the player to come up with suitable meals that the player will enjoy. After all, eating good food is part of the enjoyment of life and there is no point in preparing a wonderfully nutritious meal if it is made with some foods that the player does not like. The chef wants the player to really enjoy their food and eat everything that is served on the plate to achieve the nutrition goals provided by the nutritionist. She continues: 'When I work with a player, I will first receive instructions from the player's nutritionist. The nutritionist is almost always employed by the club the player is currently playing for. Very occasionally the player will use the nutritionist they have worked with before arriving at their current club. On the rare occasions this happens, the current club agrees that the player should continue to use the advice from the previous nutritionist. My belief is that it is a personal

Photo 1.4 Rachel Muse is one of the top performance chefs in the world, and she cooks meals for many English Premier League players. She runs a business that provides well-trained performance chefs for many professional players in the UK.

preference based on a cultural tie or a language tie that keeps the player attached to their previous nutritionist. When I talk to the nutritionist, I will receive the nutritional advice for the individual player and I'll ask about body composition. What are the targets for the individual player? The player will know exactly what the nutritionist has told me and will often be present when this happens: either at a face-to-face meeting or a three-way telephone call. We are all working together towards the common goal of a happy, well-fuelled, relaxed player. We (nutritionist, private chef and player) all need to know exactly the same things about the player's diet and be able to communicate clearly within this group. So it begins with the club nutritionist (in the presence of the player) giving the performance chef the body composition target and the daily macronutrients required to achieve that target. The performance chef asks about anything that's unclear or they don't understand.'

Note that when Rachel mentions 'body composition targets' she does not simply mean body weight or percentage body fat. Nutrition requirements for evening meals will depend on many factors including the player's body size and the physical demands of training on that particular day and whether the food to be consumed is intended for match preparation or recovery from a hard training session. The main purpose of the meals is to provide the desired macronutrients (i.e. carbohydrate, protein and fat) and usually the nutritionist will give the chef a simple list of the number of grams of carbohydrate, protein and fat a player should be eating for their evening meal. If the protein is given as 30 g then that is the actual amount of protein in the protein source (meat, fish, beans, tofu, etc.), not the weight of the protein source. So for example, 30 g of protein would be found in 100 g of chicken, 100 g of lean beef, 150 g of sea bass, 185 g of tofu or 330 g of chickpeas. These macronutrients, specifically designed by the nutritionist to achieve the target for the individual, can potentially be 'built' into thousands of different meals, so it may as well be the meal the player actually wants to eat for their dinner that evening. That is just what Rachel does: she asks the player what they would like to eat. This can become an interesting discussion as she explains: 'Often the player doesn't have a great knowledge of cuisine and their vocabulary for describing food is somewhat limited. That's absolutely fine, we can always find a way to communicate. The player might take photos of things they have liked eating in the past or show things they have seen on social media that they would like to try. Or a player may mention foods from their childhood that the chef isn't familiar with. In that case the chef "googles" the food the player has mentioned, and then shows what they have found to the player. When the exact childhood dish has been found, the chef works out how to cook that particular meal in a way that will provide the desired macronutrient content. The chef can then write the menu. The next steps are to shop, prepare and cook the food for the menu. The food must always be "built" accordingly the nutritionist's instructions. This invariably involves "monkeying" with the ingredients and how the dish would be cooked if nutrition (the macronutrients) were not a vital element of the food.'