

Chemistry at Home

Exploring the Ingredients
in Everyday Products

**John
Emsley**

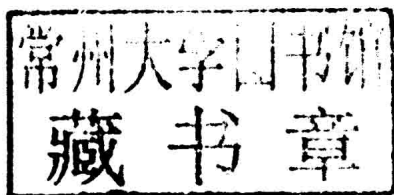


ROYAL SOCIETY
OF CHEMISTRY

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The Royal Society of Chemistry is not responsible for individual opinions expressed in this work and does not endorse or recommend the products mentioned herein. Other products are also available. Products should be used in accordance with the manufacturer's instructions.

Readers should be aware that the products discussed in this book were those that were available in the UK in 2014. The ingredients in current versions of these items may be different.

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Preface

When spring comes, Nature gets to work making millions of different chemicals. Some are beneficial and some are dangerous, some smell nice and some smell awful, some heal and some harm, some are essential and some are superfluous. Should chemists add other chemicals to this collection? Some people think not, but most people accept that what we produce makes our lives better. However, we must make sure they are not a threat to our health, nor must they pollute the environment when we dispose of them.

If you are one of those people who think that today we are exposed to far too many chemicals, and that these are all suspect, then this is not the book for you. However, if you appreciate that chemicals are what makes life healthier, cleaner, longer, colourful, and safer, then read on. You will discover in *Chemistry at Home* just what these substances are and what they do for us. If you are worried that they might still present a risk to health, then be reassured that testing is now so thorough, and approval for use so difficult to obtain, that nothing is included that might pose a risk to anyone except a few rare individuals. They will be aware for medical reasons that certain perfumes or food ingredients, for example, may affect them and to avoid products that indicate these on their labels. For the rest of us, modern household products are safe to use and they create a home that we can take pleasure in living in.

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So what the ingredients in the things we buy and use? Their names mean little or nothing to most people, and that's the reason for writing this book. The ingredients listed on a product label provide information that needs interpreting if we are to understand why they have been included. Sadly for chemists, some people have done this interpreting already and supplied the media and internet with their opinions. Of course there have been chemicals used in the past that we now know should not have been used, but that was at a time when health and safety testing was in its infancy. Today things are very different, but there are still those who are inclined to condemn almost everything that chemists produce, the implication being that they are unnatural and so must be harmful.

Walk round a supermarket, a garden centre, or DIY store, and you are surrounded by thousands of different products competing for your attention, although many are very similar.

Want a household cleaner? Here are 20 to choose from, some being variants of the same brand. Want a shampoo? There are scores of those, every one claiming a special benefit. Want something refreshing to drink that doesn't add calories to your diet? Lots to choose from there. Of course many of the same kinds of product contain the same kinds of ingredients, and in this book I have chosen a representative selection. They are typical of those you will find in most UK homes, and I have chosen to discuss them in chapters devoted to the various locations where you might encounter them.

The main entry for each category will explain what a typical product is designed to do and the chemistry involved in its use. Then follows a list of the ingredients and I give the reason for their being included in the product. Often I will be repeating the same information and explanation, but I have done this because *Chemistry at Home* is a book to be read as a source of information and you may only need the information on one particular page. For those who wish to know more, there is a Glossary in which the ingredient names are translated into chemical names and formulae, together with their reason for being used.

The major manufacturers generally list all the ingredients on their products or on their websites. In some cases, such as cosmetics, there may be more than 20 – often in tiny lettering making it difficult to read – which to some may look a little

suspicious. I suspect most consumers ignore the list, trusting as they do that all chemicals have been tested as safe – as indeed they are.

This book is published by the Royal Society of Chemistry. On its LearnChemistry website is a section called ‘Chemistry in your cupboard,’ which includes nine products: Calgon[®], Cillit Bang[®], Dettol[®], Finish[®], Harpic[®], Gaviscon[®], Nurofen[®], Vanish[®], and Veet[®], all of which are products of the Reckitt Benckiser[®] company. Some of these are also in this book, but here we look at them slightly differently, concentrating on saying exactly what every ingredient is and what it is there to do.

There are still some ingredients that are targeted by groups who run campaigns against them, although often their claims are not backed up by meaningful research and tend simply to be scare stories. They like to report finding man-made chemicals in unexpected places, such as in blood – the implication that these pose a serious risk. What they fail to explain is that the amounts detected are in parts per billion (ppb), a unit unfamiliar to most people. However, 1 ppb is like 1 second in 30 years – not a lot. Nevertheless, the result of such scare stories may be that companies whose products include these chemicals will replace them because they are fearful of the adverse publicity that has been generated. However, we still need many ingredients that these groups campaign against, such as sweeteners, preservatives, disinfectants, pesticides, and fragrances, which may have been used for years because of the benefits they confer.

The Sense About Science movement has published a booklet called *Making Sense of Chemical Stories* and a new edition of this came out in 2014. It got very sympathetic media coverage, and I would like to think that a rational debate can now begin of the role of chemicals in everyday life. All being well, the days of ill-informed suspicion about the work of chemists are coming to an end.

I’ve said enough. So start reading and discover what’s really in the things you buy. And remember that products are continually being launched and existing ones re-formulated or even removed from the market place. What you read about in this book relates to the state of play in 2014.

John Emsley

Acknowledgements

First let me acknowledge those unsung heroes of the modern world: the chemists who have provided us with all the products that are in *Chemistry at Home*: food chemists, fragrance chemists, analytical chemists, pharmaceutical chemists, cosmetic chemists, colour chemists, horticultural chemists, polymer chemists, and research chemists. Without their skills we would be living as people lived 200 years ago, in a world where for the vast majority of people life was short, hungry, dangerous, dirty, dull, and painful. Chemistry is the science that transformed life for everyone in developed countries and will, I hope, one day do the same for all people in the world.

I also need to acknowledge more direct help from others. Although I understand the chemicals used as ingredients in terms of their molecular structure and properties, when it came to explaining why these were used in the many products discussed in this book I was in less familiar territory, although not entirely so. For many years I was the chemist consultant for the Broadcast Advertising Clearance Centre – now called Clearcast – whose job it is to see that claims made in television adverts are supported by scientific evidence. My role was to check adverts for household products which involved chemicals, such as cleaners, detergents, stain removers, air fresheners, and the like. This entailed visiting the research laboratories of the various manufacturers to see the evidence, which meant inspecting their

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research facilities and meeting their research chemists. Invariably the labs were well funded and their researchers were qualified chemists. Customer care was a key factor in what they did.

Having written the chapters of *Chemistry at Home*, I needed to consult experts and ask them to check what I had written. Thankfully I was able to count on the help of various individuals whom I have met over the years. One particularly helpful one was Sir Geoffrey Allen, one time Head of Research of the international consumer products company, Unilever, and he put me in touch with John Russell, retired chemical engineer who came up with some useful suggestions. Others who were prevailed upon to read what I'd written were the following:

Alistair Crawford MD. He diagnosed Chapter 1 and suggested remedies.

Chapters 2 and 5 were laundered by a specialist in detergents who removed any stains.

Dr Christopher Flower of the Cosmetic, Toiletry & Perfumery Association examined Chapter 7 and advised how it could be made more appealing.

Gem Bektas, of the Society of Cosmetic Scientists, examined Chapters 3 and 7.

For Chapters 4 and 6, I take full responsibility.

Chapter 2 was also inspected by Colin Butler, Regulatory Affairs Manager at Reckitt Benckiser and Stuart Bell, Reckitt Benckiser who cleaned it up.

The chapters devoted to food, its preparation and consumption, namely 8, 9, and 10, were chewed over by Dr Sandy Lawrie, a long-time employee of the UK Government's Food Standards Agency, and then the Food Standards Agency, who improved several of them.

Philip Glynn-Davies of Jaguar Land Rover drove through Chapter 11 and pronounced it free of obstacles.

Susan McGrath-Cole, a member of the Society of Chemical Industry's Horticulture section, inspected Chapter 12 and found nothing to report.

Drs Marshall and Mary Smalley examined Chapter 1 and weeded Chapter 12 and came up with cures for the former and suggestions for improving the look of latter.

Catherine Adams read Chapters 1 and 2 and made useful suggestions.

Professor Steve and Rose Ley of Cambridge were persuaded to read all of the manuscript and made invaluable comments. And of course my wife, Joan, who purchased many of the products discussed in this book and offered useful comments about their efficacy.

Finally I should like to thank Kathryn Duncan for editing my text thoroughly and conscientiously, and uncovering several inconsistencies that have now been corrected; and Sylvia Pegg, who is Senior Production Controller for Books at the Royal Society of Chemistry.

Biography

John Emsley has written 12 popular science books over the past 20 years and several of them have been about the impact of chemistry in everyday life. His first was *Consumer's Good Chemical Guide*, which appeared in 1994 and won the Science Book Prize. Other followed such as *Molecules at an Exhibition* in 1998, *Vanity, Vitality, Virility* in 2004, which is about cosmetics, food and sex, and *Better Looking, Better Living, Better Loving* in 2007, which continued those key themes. *A Healthy, Wealthy, Sustainable World* appeared in 2010 and in this he discussed the products we have come to rely on, in terms of whether they were sustainable. More information about the author can be found on www.johnemsley.com.

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