

## **A Little Sulphur Can Make a Big Stink**

**Don Mercer**  
**Associate Professor, Department of Food Science**  
**University of Guelph**

It's a smell that is familiar to most of us and is one that's hard to forget. We even use the term "rotten egg smell" to describe other offensive odours that have absolutely nothing to do with eggs. The basis of this smell, of course, is hydrogen sulphide – but how did the sulphur get into the eggs in the first place?

According to some sources, sulphur is present in both the whites and yolks of eggs in concentrations of less than one-quarter of one percent by weight. It is actually a component of some of the amino acids (cysteine and methionine) that make up the egg proteins - predominantly albumen in the whites.

When eggs are fresh, they are slightly acidic due to the presence of carbon dioxide. However, with time, the carbon dioxide diffuses out of the egg through the shell and the egg becomes less acidic. The less acidic environment is favourable for the separation of sulphur from the amino acids and hydrogen sulphide gas is formed. Since the human nose is so sensitive to hydrogen sulphide, it doesn't take very much to trigger a nasty response.

You may have noticed the odour increases when eggs are hard-boiled. This is because chemical bonds are broken due to heating, and sulphur is liberated. Not only do you smell the results, but you may also notice a grey ring around the outside of the yolk. It is caused by the reaction of iron from the yolk with sulphur from the white to form iron sulphide, or more properly ferrous sulphide. Even though it looks a bit unappealing, there is no risk in eating these eggs. To lower your chances of creating the iron sulphide ring, avoid overcooking the eggs and try to cool them as quickly as possible after cooking by running cold water over them.

There are other sources of offensive odours attributable to sulphur as well as eggs. Skunks rely on sulphur-containing compounds called "mercaptans" to create their potent spray. A little bit literally goes a long way. During my graduate research, I used methyl-mercaptan to create cross-linking in a certain chemical reaction. We kept the small bottle of liquid in the refrigerator to reduce the vapours. Even then, I had to do that work in the evening, or on weekends, when the place was relatively empty, due to the strong odour that permeated through the entire wing of the building.

One highly beneficial use of sulphur-containing mercaptans is as a trace-additive to natural gas. If there is even the slightest leak in a natural gas line, the human nose can detect the pungent "rotten egg" odour. Without this early warning, gas leaks would not be as easily detected.

Another source of hydrogen sulphide gas may be from decaying organic material. In homes, such odours may be coming from sewer gases. If you do notice such a smell, it may indicate that the traps in a forgotten floor drain in the basement have gone dry and are no longer capable of blocking the flow of gases into your home. A simple fix may be to pour some water into the drain. This will fill the trap and block the back-up of gases. If the problem persists, it's a good idea to get some professional attention.

Hopefully, the next time you smell a skunk or make hard-boiled eggs knowing that its all because of a bit of sulphur will make the situation a little more tolerable.



**The greyish colour in the egg yolk on the right is due to overcooking. The egg on the left was chilled immediately after cooking.**