

Why does the sea foam? (Short and adapted version for family audiences)



Audience: general public including children from 7 to 12 years

General objective: how can we explain the appearance of 'foam' on the beach?

Theme	Specific objectives	Message	Text or material to show
Introduction	<ul style="list-style-type: none"> . Creating curiosity . Origin of the foam 	<p><i>Have you ever seen this phenomena before? Is there a difference between the two types of foam?</i></p> <p>Difference between scum and foam: scum is deposited on the beach when the sea is rough and disappears immediately whereas the foam can remain on the beach for several hours.</p> <p><i>Do you know where it comes from?</i></p> <p>The foam is caused by a micro-alga called <i>Phaeocystis</i>.</p> <p>Two short experiments can help to understand more...</p>	<p>Photos of foam on the beach</p> <p>Photo of scum</p>
Plant growth requirements and needs	<ul style="list-style-type: none"> . What do terrestrial and aquatic plants need in order to grow? 	<p>Plants but also macroscopic and microscopic algae (short macro-and microalgae) need sunlight, water, air and minerals (often called nutrients) to grow. The energy from the sunlight is used to chemically transform water and carbon dioxide to sugar, a process known as photosynthesis. Nutrients are required to carry out metabolic processes.</p> <p>Nutrients are naturally present in seawater. They have been brought there for thousands of years by rivers and streams.</p>	<p>A plant in a clay pot, algae in a container with water, a watering can and stickers to symbolize the sun, nutrients and carbon dioxide.</p> <p>Illustration of the water cycle</p>
The micro-algae <i>Phaeocystis</i>	<ul style="list-style-type: none"> . Why does the sea foam? . How can these algae produce foam? 	<p>According scientists, the foam is produced by <i>Phaeocystis globosa</i>. It is a microscopic alga (microalgae are also called phytoplankton). The algae have several stages of development according to their environment. Initially they exist as solitary free-living cells but when conditions are right the cells can proliferate and congregate together forming large colonies. Each colony is encased in a gelatinous membrane and secretes mucus to protect itself from grazing by other species. When the sea is calm, a viscous film can be observed at the surface.</p> <p>Formation of foam is observed when weather conditions are stormy or windy: the sea is moving and the waves play an important role now. In this condition, the viscous film made by the microalgae <i>Phaeocystis</i> deteriorates: the "old" colonies crack and emulsify in contact with moved water creating the foam (as would the egg whites). At this stage, the phytoplankton bloom is in its degradation phase: the microscopic algae <i>Phaeocystis</i> dies.</p> <p><i>What happens next? This mass of dying phytoplankton is then broken down by bacteria and viruses which use up oxygen in the surrounding seawater so reducing the concentrations available for fish and other marine life.</i></p>	<p>Photos of <i>Phaeocystis</i> and its development</p> <p>Imitation of the foam: Put the whites of eggs in a jar. Shake. The more you whisk the more foam appears (just like dying <i>Phaeocystis</i> colonies in a rough sea).</p>

Human activities	. Natural phenomenon but amplified by human activities	<p>The foam spring bloom is a natural phenomenon but is amplified by human activities such as the overuse of fertilizers in agriculture and transport of untreated wastewater from sewage and industry to the sea. When we use the right quantity of fertilizers to feed the plants (in our fields but also in our gardens) they will grow very well. But when using too much, plants do not have the capacity to absorb all... This excess will runoff from the land and will be transported by rivers to the sea causing an overload of nutrients along the coast which can cause changes in the type and quantity of macro / microalgae. Solution is to reduce the nutrient input to our fields and gardens and use environmentally friendly fertilizers (organic based).</p> <p><i>To go further: Chemically produced agricultural fertilizers do not bind readily with soil particles and are likely to run-off in the rivers quicker than organic based material.</i></p> <p>When wastewater is not connected properly to water treatment stations, the water runs off into the sea. This enriches the environment with nutrients which are added to washing powders and products we use to clean our houses (so called detergents). Solution is to use biodegradable products rather than chemical based products and invest more in wastewater management.</p>	Illustration of the human activities (or an illustration of the water cycle + little tractor...)
Conclusion	. The ISECA project	<p>This activity was created by NAUSICAA (French National Sea Center) in the frame of an European project called ISECA in which scientists from various institutions and research disciplines are united. For decades, they have observed the anarchic algae development on the coastline individually with their own scientific tools. Thanks to ISECA, their knowledge is now brought together in a single database in order to anticipate the phenomenon's evolution and to inform the authorities and the stakeholders so they can take appropriate measures in future...</p> <p>If you want further information, please do not hesitate to visit our website: www.iseca.eu/en/ and remember: all our activities on the land have an impact on the sea!</p>	ISECA documentation at disposal (free download on the website)

Creation, translation and adaptation:
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