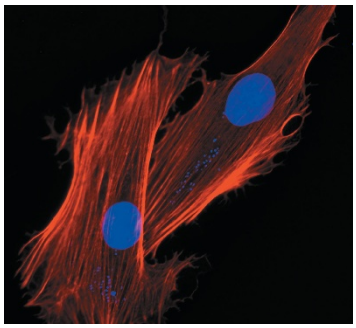
Ozone plug

Ozone might be a scarce substance in some locales, but scientists have found a new source of this highly reactive molecule: arteries. In the 7 November *Science*, Paul Wentworth *et al.* suggest that ozone contributes to atherosclerotic plaque formation. The study provides a mechanistic link between two major players in plaque formation: cholesterol deposition and inflammation.

Ozone seems to promote the oxidation of cholesterol, a key step in plaque formation. To determine this, the investigators recreated an inflammatory response typical during plaque formation. When they cultured excised atherosclerotic tissue in the presence of a neutrophil-stimulating chemical, the tissue oozed ozone and built up products of cholesterol oxidation. These products promoted yet another critical step in plaque formation: uptake of cholesterol into macrophages. The investigators found that such 'ozonolysis' products could potentially serve as indicators of disease severity. They found elevated levels of these products in blood from patients with advanced atherosclerosis.

The new studies build on earlier, perhaps even more unusual findings from the same group. The investigators had found that antibodies could act as catalysts, generating ozone in the presence of water and singlet oxygen, a highly reactive form of oxygen. The convergence in inflamed sites of antibodies and a source of singlet oxygen—neutrophils—led the investigators to examine ozone in arteries.

Subtle *Salmonella*



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Over evolutionary time, *Salmonella enterica* has negotiated an exquisite ritual that it shares with its host, the intestinal cell. Upon infection, *Salmonella* coaxes cells to take up the bacterium by inducing membrane ruffling and cytoskeletal rearrangement. Several hours later, the bacterium restores the cellular architecture and its host regains composure. Tomoko Kubori and Jorge Galán have now discovered the molecular basis for this ritual.

Salmonella and many other bacteria possess a system, called the type III protein secretion system, for injecting proteins into host cells. This system is known to inject a protein, SopE, that induces ruffling by activating the Rho GTPase family members Cc42 and Rac-1. The cessation of ruffling occurs through downregulation of these GTPases by the bacterial protein SptP. Yet both bacteria effectors, SopE and SptP, are injected into the host at the same time, posing a regulatory conundrum.

Reporting in the October 31 *Cell*, the investigators found that SopE has a short half-life. The SopE protein disappeared from the host cell within 30 minutes of infection, whereas SptP persisted as long as three hours. It appears that *Salmonella* injects equivalent amounts of SopE and SptP, but SopE induces ruffling even in the presence of SptP. After SopE degrades, SptP takes over and ruffling subsides (as in these host cells, post-infection). The signals choreographing the degradation reside in protein domains that mediate secretion and translocation through the type III system.

Written by Charlotte Schubert and Pierrette Lo

HSCs play the field

Hematopoietic stem cells (HSCs) are versatile, differentiating into more than ten defined lineages, and morphing into a variety of nonhematopoietic cell types (see News and Views, page 1461). How do these cells stay so flexible? A report in the November *Immunity* bolsters the notion that these cells keep all their options open by expressing a large repertoire of genes. Previous experiments have indicated that HSCs express genes promiscuously, turning off sets of genes as differentiation progresses, and upregulating others. This process, so the theory goes, keeps HSCs at the ready, quick to respond to external differentiation-promoting stimuli. But experiments in support of the theory have not been definitive—PCR studies, for instance, left open the possibility that cells expressing particular genes were already earmarked for differentiation. Now, Min Ye *et al.* have found that HSCs expressing lineage-specific markers are fully capable of differentiating into the whole hematopoietic cell repertoire. Using the Cre-*lox* system, they were able to test this in mice that expressed lineage-specific genes in all HSCs. The HSCs in these experiments remained fully plastic.

Lymph node mother lode

Why do people rush to buy bobble-head dolls and why are celebrities voted into public office? Many mysterious but everyday occurences seem to have no explanation, including the enduring question: why do lymph nodes swell? At least now there is an answer to the last question. A report in the December *Nature Immunology* implicates mast cells, best known for their role in allergic reactions. When triggered by bacterial or viral infection, mast cells release tumor necrosis factor (TNF), say James McLachlan *et al.* The compound recruits T cells in the circulation and traps them in lymph nodes where they can fight the infection—causing the characteristic puffiness. The researchers found that *Escherichia coli* infection did not trigger lymph node swelling in mice without mast cells, or in mice whose mast cells lacked TNF. On the other hand, injecting normal mast cells into mast cell–deficient mice left them vulnerable to swelling. Directly stimulating mast cells in the absence of infection also puffed up lymph nodes.

Light, then heat

A nanotechnology used in optical sensing now shows promise as a precise tumor-burning tool, according to a study in the 28 October *PNAS*. Metal nanoshells consist of a core, such as silica, that poorly conducts electricity, surrounded by a thin metal shell. Jennifer West and colleagues constructed a special gold-coated nanoshell that strongly absorbed near-infrared light. These gold particles were particularly good at converting light into heat, a property that the investigators were quick to take advantage of. They first incubated the nanoparticles with cancer cells in a culture dish and then exposed the cells to near-infrared light. The nanoparticle-containing cells burned up and died. The investigators next injected the particles into tumors growing on mice. The tumor cells fried within minutes after a near-infrared zap. The technique left surrounding healthy tissue unscathed and appeared to rival the precision of other techniques, including those that rely on microwaves or ultrasound. The ultimate aim is to eliminate small, poorly defined tumors or those in vital regions that more conventional surgery could pass by or bungle.