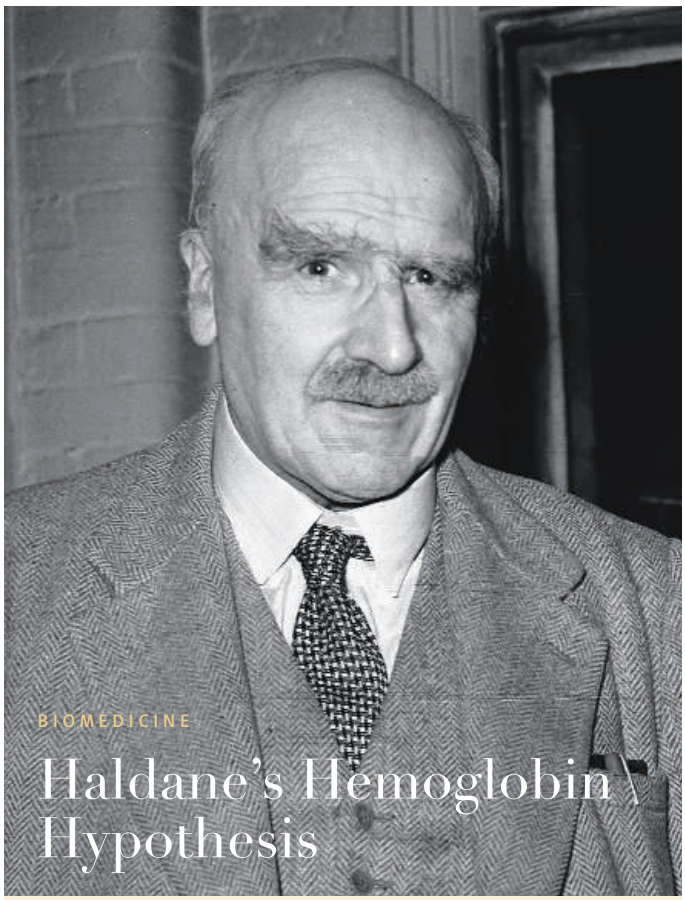


BIOMEDICINE

Haldane's Hemoglobin Hypothesis

Malaria parasites invade and feed within human red blood cells and can cause high rates of mortality if untreated. Consequently, and as hypothesized by Haldane, in recent human history malaria has selected for several hemoglobin mutations with distinctive patterns of global distribution, which hinder the parasite to different degrees. Penman *et al.* have investigated the population genetics of the contrasting distributions of hemoglobin mutations associated with thalassemias (which exhibit quantitative deficiencies in α- and β-globin synthesis that can provide up to 60% protection against malaria) in the Mediterranean, and those of sickle-cell anemia (a structural defect in β-globin that confers in excess of 90% malaria protection) in sub-Saharan Africa. The authors suggest that the distinct geographies reflect an active exclusion of the sickle-cell mutation from Mediterranean populations as a result of intracellular interactions between the α- and β-globin variants. The pathophysiology of the thalassemias is caused by an imbalance in the globin subunits; several mutations coexist, and if an individual inherits two different thalassemia mutations, the imbalance may be ameliorated without any loss of the malaria-protective effect. In contrast, co-inheritance of an α thalassemia with sickle cell anemia ablates any malaria-protective effect and transmits a double whammy of hemoglobinopathy and malaria risk to the afflicted individual. — CA

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.0910840106 (2009).

CELL BIOLOGY

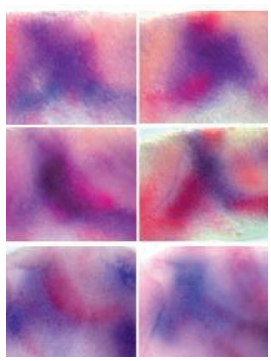
A Message in a Vesicle

When cells undergo programmed cell death, small portions of the plasma membrane pinch off and form microvesicles known as apoptotic bodies. Zernecke *et al.* show that apopototic bodies carry a message from the dying cells to healthy ones that promotes the repair of atherosclerotic lesions. Apoptotic bodies from dying human umbilical vein endothelial cells were taken up by healthy endothelial cells and increased expression of the gene encoding CXCL12, a chemokine that recruits progenitor cells to sites of repair. The active component of the apoptotic bodies was not a protein but the microRNA miR-126, which inhibited the translation of the mRNA encoding an inhibitor of signaling via CXCR4, which is the receptor for CXCL12 and also enhances its expression. In a mouse model of atherosclerosis, administration of apoptotic bodies or miR-126 promoted the production of CXCL12 and reduced the size of lesions in the blood vessels. — LBR

Sci. Sig. **2**, ra81 (2009).

DEVELOPMENT

Bounded Excitement



Glutamatergic neurons (red) in the caudal thalamus.

Brain development is characterized by shifting patterns of gene expression and by gradients of cell differentiation. Scholpp *et al.* have analyzed the zebrafish thalamus to understand how one such gradient defines neuronal phenotype. Proteins of the Hes/Her family repress transcription of their target genes, which in some cases keeps a neural progenitor cell in its precursor state. Initially, *her6* is expressed throughout the developing thalamic region. Cells in the rostral thalamus, which maintain *her6* expression longer, normally develop into inhibitory GABAergic neurons, whereas cells in the caudal thalamus, from which *her6* expression recedes earlier, begin to express *neurog1* and develop into excitatory glutamatergic neurons. Overly persistent expression of *her6* in the caudal thalamus suppresses *neurog1* and induces those cells to develop into GABAergic neurons. Thus, the shifting pattern of *her6* expression defines separate identities for these two thalamic regions. — PJH

Proc. Natl. Acad. Sci. U.S.A. **106**, 19895 (2009).

EDUCATION

Elementary Partnership

The Elementary Science Education Partnership (ESEP) was created to bring elementary school teachers into working partnerships with science-literate college students, who would carry their knowledge, confidence, and enthusiasm for science into the teachers' classrooms. Goebel *et al.* report the implementation and preliminary impact of the program. ESEP hired experienced educators and administrators to guide the professional development of the classroom teacher mentors, including instruction at summer institutes in both the science content and pedagogical strategies required to teach a science kit. These teacher mentors, called SKIL teachers, went on to train their colleagues at their home schools. Undergraduates completed a one-semester course where they learned inquiry-based approaches to science learning and

CREDITS (TOP TO BOTTOM): NEWSCOM; SCHOLPP *ET AL., PROC. NATL. ACAD. SCI. U.S.A.* **106**, 19895 (2009)