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REVIEWS

IMMUNOLOGY



STRESSED OUT
Oxidative stress alerts the innate immune system

Messages in vesicles
Intercellular communication through exosomes

► **COVER:** 'Buzzers and bells' by Simon Bradbrook, inspired by the review on p535.



ELAINE BELL



LUCY BIRD



KIRSTY MINTON



OLIVE LEAVY

Compartmentalization of the immune system operates at many levels, from the environmental niches that support the development or survival of immune cells to their differentiation into specialized subsets. Several articles this month look at the membrane compartmentalization that occurs within immune cells.

When Mechnikov won the Nobel Prize in 1908 for his pioneering work on phagocytosis, this internalization of particles into internal membrane compartments was the first description of cellular immunity. In the Innovation article on page 594, David Russell and colleagues describe how we have progressed from analysing phagosome compartments by their membrane markers to considering their functional activities. They describe new assays to measure the changing milieu of the phagosome lumen.

After phagocytosis, pathogen-associated molecular patterns of the internalized particles can be detected by Toll-like receptors (TLRs) to trigger an innate immune response. The differential expression of TLRs and their signalling components by endosomes is another example of subcellular compartmentalization. Gregory Barton and Jonathan Kagan (page 535) discuss how this can modulate TLR activation and signal transduction.

However, membrane compartmentalization is not static; the interaction and exchange of membrane between cells is also important for the proper functioning of the immune system. Daniel Davis (page 543) focuses on the direct contacts that occur between cells through immunological synapses and membrane nanotubes. He discusses the regulation of contact duration and how this can have quantitative and qualitative effects on immune cell effector function. Clotilde Théry and colleagues (page 581) look at indirect membrane exchange between cells involving secreted membrane vesicles, which can function in the activation and inhibition of immune cells.

EDITORIAL OFFICES

LONDON NatureReviews@nature.com
The Macmillan Building, 4 Crinan Street,
London N1 9XW, UK

Tel: +44 (0)20 7843 3620;
Fax: +44 (0)20 7843 3629

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MANAGEMENT OFFICES

LONDON nature@nature.com
The Macmillan Building, 4 Crinan Street,
London N1 9XW, UK

Tel: +44 (0)20 7833 4000;

Fax: +44 (0)20 7843 4596/7

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NEW YORK nature@natureny.com

Nature Publishing Group,
75 Varick Street, 9th floor, New York,
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Tel: +1 212 726 9200;

Fax: +1 212 696 9006

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Tel: +81 3 3267 8751; Fax: +81 3 3267 8746

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Tel/Fax: +91 11 2324 4186

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