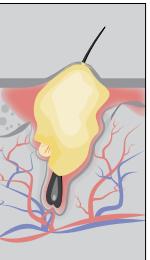



The gut-skin connection *Acne vulgaris*

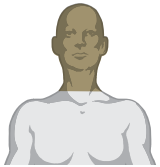
ACNE VULGARIS
is a common skin condition that occurs when your hair follicles become plugged with oil and dead skin cells¹

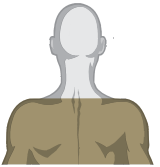


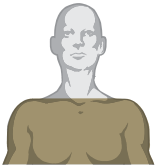
ACNE
AFFECTS AT LEAST
85%
OF THE POPULATION
AT SOME TIME DURING THEIR LIVES¹



ACNE MOST COMMONLY DEVELOPS ON:¹

FACE

99%
of all cases

BACK

60%
of all cases

CHEST

15%
of all cases

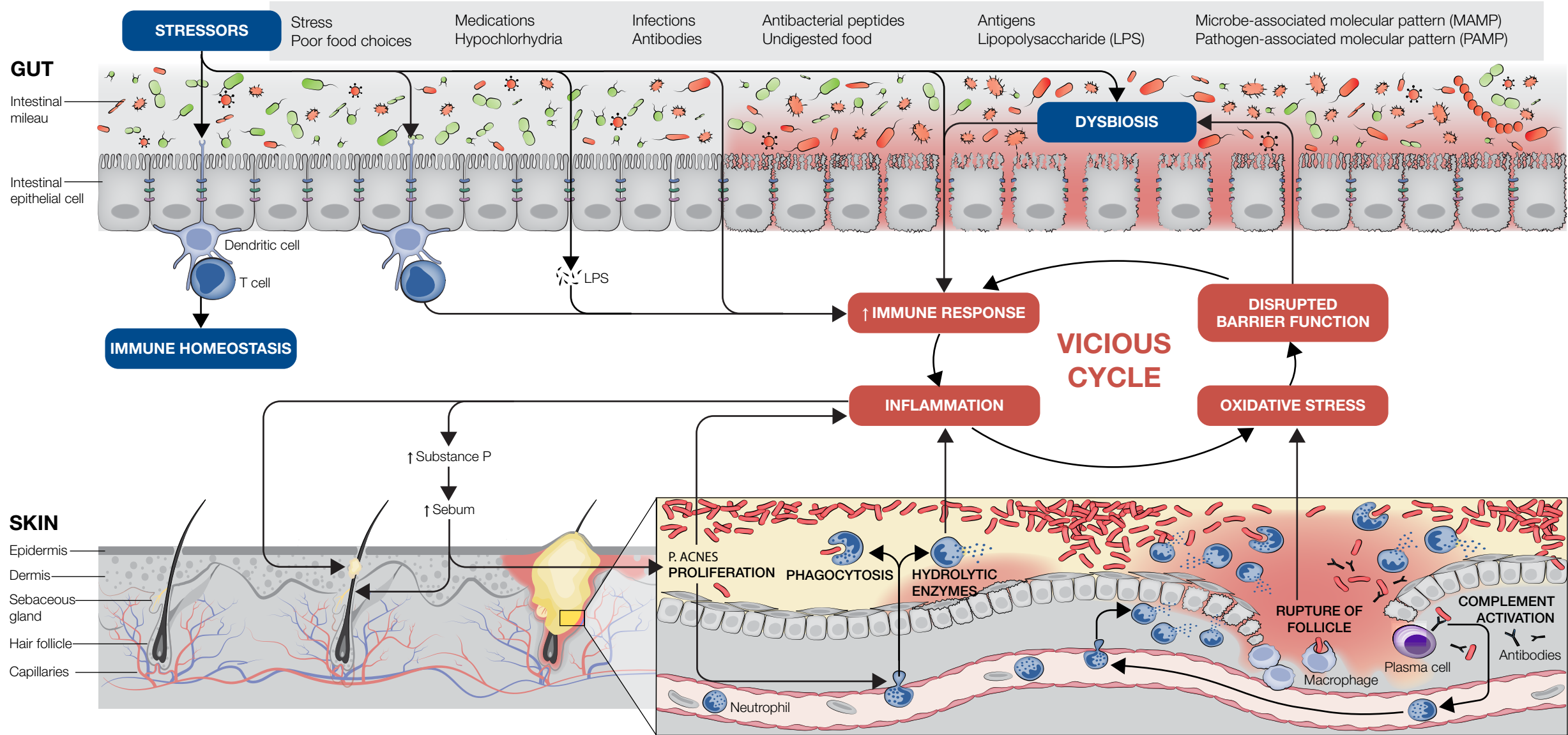
ACNE SUFFERERS ARE MORE LIKELY TO EXPERIENCE GASTROINTESTINAL SYMPTOMS INCLUDING:²
CONSTIPATION
HALITOSIS
GASTRIC REFLUX
ABDOMINAL BLOATING



54%
of acne sufferers
have marked alterations to their
INTESTINAL MICROFLORA³



THE GUT-SKIN CONNECTION¹⁻¹⁴





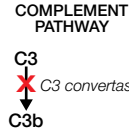
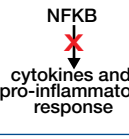
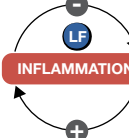



NORMAL INTESTINAL PERMEABILITY AND SKIN FUNCTION
Normal intestinal permeability allows for gut immune homeostasis. Immune unresponsiveness is induced to prevent reactions to innocuous substances.

MINOR INTESTINAL PERMEABILITY AND COMEDONE FORMATION
Minor intestinal permeability results in increased passage of antigens. Prolonged exposure may cause a vicious cycle of inflammation and tissue damage. Altered gut microbiota may enhance the presence of circulating LPS endotoxins with ensuing inflammation contributing to acne pathogenesis. Inflammation and gut dysbiosis results in the nervous system releasing substance P in the gut and skin, further exacerbating inflammation and increasing sebum production in the skin.

SEVERE INTESTINAL PERMEABILITY AND INFLAMMATORY PAPULE
Increased intestinal permeability is a consequence of increased inflammation, tissue damage and loss of barrier function, leading to even greater passage of antigens. This vicious cycle leads to excess sebum secretion in the skin causing overgrowth of the bacterium *Propionibacterium acnes*. *P. acnes* further triggers inflammatory pathways with neutrophil and macrophage migration in the comedone driving inflammation and tissue damage. Plasma cells release antibodies which trigger complement activation and chemotaxis of more neutrophils inducing intense inflammation and rupture of the comedone.

ACTIONS OF LACTOFERRIN¹²⁻¹⁴

ANTIMICROBIAL	
• Antibacterial - Disrupts cell membrane, depletes iron leading to cell death	
• Antiviral, antifungal - Interacts with microbial, viral and cell surfaces to inhibit microbial and viral adhesion and entry into host cells	
• Promotes growth of beneficial microbes in gut and skin	
ANTI-INFLAMMATORY	
• Binds LPS - Preventing efflux of LPS endotoxins into systemic circulation	
• Decreases complement pathway - Reduces inflammatory mediators - Reduces chemoattraction of immune cells	
• Decreases gene expression and cytokine production	
• Regulates inflammation to limit pathological damage (increased and decreased production of pro-inflammatory cytokines according to requirement)	
IMMUNOMODULATORY	
• Promotes phagocytosis and intracellular killing activity of phagocytes	
• Modulates innate and adaptive immunity via alteration of T cell expression	