

## The Role of Gram Positive Bacteria in Acne Vulgaris

Nourhan.A.Hegazy<sup>1</sup>, Wafaa.A.Elmosallamy<sup>1</sup>, Mahmoud.A.Mahmoud<sup>1</sup>, Nader.N.Nazmy<sup>2</sup>,  
Hasnaa.Sh.Abd Elhamid<sup>1</sup>

<sup>1</sup>Medical Microbiology & Immunology Dept., Faculty of Medicine, Benha University

<sup>2</sup>Dermatology, venereology and Andrology Dept., Faculty of Medicine, Benha University

E-mail: norahegazy486@gmail.com

### Abstract

**Background:** Frequent and chronic inflammation of the pilosebaceous unit of the hair follicle characterizes acne vulgaris (AV). It is a disease resulting from the interplay of hereditary and environmental factors. **Objectives:** Isolation and identification of gram-positive bacteria from Patients with AV. **Methodology:** Our study was done on 50 patients attended to the out-patient clinic of Dermatology, Venerology and Andrology Department of Benha University Hospital. The contents of open or closed comedones, papules, pustules, and cystic lesions of acne were sampled. The specimens were cultivated on blood agar plates and then incubated at 37°C for 24 to 48 hours under both aerobic and anaerobic conditions. **Results:** There was bacterial growth on both aerobic and anaerobic conditions. As *staph epidermidis* (*S.epidermidis*) were found in 70%, *staph aureus* (*S. aureus*) were found in 24%, *Micrococcus luteus* were found in 4% and *Leuconostoc mesentroides* were found in 2%. **Conclusion:** acne vulgaris is a common disease with multimicrobial causes.

**Keywords:** Acne vulgaris, staph epidermidis, staph aureus, Micrococcus luteus and Leuconostoc mesentroides.

### 1. Introduction

AV is a prevalent and chronic inflammatory skin disorder that primarily affects the face, neck, and back. It occurs in approximately 9% of the global population. AV is characterized by the presence of comedones, papules, pustules, nodules, and cysts. Inflammatory processes in the skin often lead to scarring.[1]

Approximately 85% of cases of persistent AV start during puberty in individuals aged 12-24 years. However, the condition can continue into adulthood, affecting individuals over 25 years of age. In fact, it persists in around 41% of adult women and tends to be localized to the upper area of the face.[2]

AV has been linked to increased rates of anxiety, depression, and suicidal ideation. Additionally, it can result in long-term physical damage and have a negative impact on quality of life and self-image.[3]

The epidermis, along with its adjacent structures such as sweat and sebum glands, encompasses a surface area of approximately 25 m<sup>2</sup>, making the skin one of the largest epithelial surfaces for microbial interaction. Estimates suggest that there are around 10<sup>12</sup> microorganisms residing on the skin. Healthy skin is known to host various microorganisms from multiple kingdoms, including bacteria, fungi, and viruses. Among the skin bacteria, four phyla are predominant: *Actinobacteria* (*Corynebacterineae*, *Propionibacterineae*), *Proteobacteria*, *Firmicutes* (*Staphylococcaceae*), and *Bacteroidetes*. Accumulating research indicates that *Cutibacterium acnes* (*C. acnes*), *S.*

*epidermidis*, and a diverse skin microbiota all play significant roles in the development of acne.[4-5]

Normal skin occupants *S. epidermidis* and *C. acnes* are regularly identified from acne-causing lesions, and these microorganisms are believed to contribute to acne inflammation. 6

### 2.Methodology

This research was conducted between May 2022 and March 2023 at the Microbiology and Immunology Department, Faculty of Medicine, Benha University.

This cross sectional study was conducted on 50 AV patients attending the outpatient clinic of the Dermatology, Venerology, and Andrology Department at Benha University Hospital.

#### Inclusion criteria

Included participants between the ages of 11 and 40 with mild to severe acne.

All patients were subjected to complete history taking, dermatological and physical examination, Laboratory investigations:

#### Microbiological examination

- Specimen collection involved using a sterile comedone extractor to obtain swabs from the contents of open or closed comedones, papules, pustules, and cystic lesions associated with acne.
- Culture and incubation were performed by moistening a sterile nutrient broth swab. The collected specimens were cultured on blood agar plates and then incubated at 37°C for 24 to 48 hours, utilizing both aerobic and anaerobic conditions. To facilitate the isolation of anaerobic

bacteria, an anaeroGen® compact sachet from Oxoid Co. was placed inside each anaerobic jar.

- Identification of isolated strains: colonies grow on blood agar were identified by: colony morphology, microscopic

examination: after staining with the Gram stain and biochemical reactions for identification of gram positive organisms such as catalase and coagulase tests.

### 3. Results

This present study was conducted on 50 AV cases. Their mean age was 21.3, ranged from 16 to 32 years. They were 44% males and 56% females, as shown in Table (1).

	Acne vulgaris n = 50	
	Number	%
<b>Sex</b>		
Male	22	44
Female	28	56
<b>Age (years)</b>		
Mean ± SD.	21.34 ± 3.93	
Median (Range)	20 (16 – 32)	

**Table (1)** Demographic data of patients with AV.

There was growth on both aerobic and anaerobic conditions, as 15% of specimens, taken from patients suffered from AV, showed growth on aerobic culture and 85% of specimens showed growth on both aerobic and anaerobic cultures, as shown in Table (2).

	Acne vulgaris n = 50	
	Number	%
<b>Specimen No. (Swab)</b>	50	100
<b>Culture growth results</b>		
Aerobes	8	16
Aerobes and anaerobes	42	84

**Table (2)** Results of specimens culture among patients with AV.

The result of specimens identification were 70% *s. epidermidis*, 24% *s. aureus*, 4% *Micrococcus luteus* and 2% *Leuconostoc mesentroides*, as shown in Table (3).

	Acne vulgaris n = 50	
	Number	%
<b>Results of identification of isolated strains</b>		
<i>S. epidermidis</i>	35	70
<i>S. aureus</i>	12	24
<i>Micrococcus luteus</i>	2	4
<i>Leuconostoc mesentroides</i>	1	2

**Table (3)** Results of identification of isolated strains among AV patients.

### 4. Discussion

AV is a chronic inflammatory skin disorder affecting the pilosebaceous unit, which consists of hair follicles attached to oil glands in the skin. <sup>7</sup> It commonly starts during adolescence but can also occur in adults. While it usually resolves by the fourth decade of life, it may persist in some individuals. Approximately 20% of patients with AV experience severe acne and scarring. [8]

This work aimed to isolate and identify bacterial causes of AV.

Our study comprised 50 patients whose ages varied from 16 to 32 years, with a mean of 21,3 years. They were composed of 44% males and 56% females.

Our results were consistent with the findings of [9] research, which indicated that AV is more prevalent among females between the ages of 18 and 25 and mostly affects young women. [10] revealed that the average age of patients was 20.5 4 years, and that 63 percent of patients were 20 years or older.

There was bacterial growth on both aerobic and anerobic conditions. As

*S. epidermidis* were found in 70%, *S. aureus* were found in 24%, *Micrococcus luteus* were found in 4% and *Leuconostoc mesenteroides* were found in 2%.

The study conducted by [9], it was found that *S. epidermidis*, *S. hominis* and *S. aureus* were the most commonly isolated bacterial species in aerobic culture, which aligns with our findings. Similarly, [11] reported that the growth of *S. epidermidis* was observed in 21 samples (52.5%), *S. hominis* in five samples (12.5%), and *S. hemolyticus*, *M. luteus*, and *L. mesenteroides* were each found in three samples (7.5%). Also [12] reported that the most common aerobic bacteria in AV was *S. epidermidis* (47,6%).

### 5. Conclusion

AV is a multimicrobial disease with the most common aerobic bacteria are *S. epidermidis* and *S. aureus*.

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