On *Streptomyces aerocolonigenes* nov. sp., Forming the Secondary Colonies on the Aerial Mycelia^{*,**}

by Ryuji SHINOBU^{***} and Mineko KAWATO^{***}

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The strain, No. 701 isolated from the soil at Nagasaki City in October, 1958, formed many little colonies on the aerial mycelia, especially on the cottony ones. The characteristics of this strain were carefully compared with the known species described in Bergey's Manual, 7th Edition²), and other reports^{3,4,5}) so far published. As the result, this strain was decided to be a new species, and the details of it will be given in the following.

I. Morphological Characteristics

1. Macrocolony

Somewhat unstable; concentric pattern on glycerine starch glutamate agar; a little convex and wrinkled colony at the center. (Photo. 1, A and B)

Photo. 1: Macrocolony

A and B were cultivated on glycerine starch glutamate agar at 28–30° for 20 days.

Many little colonies could secondarily be seen on the aerial mycelia, especially on the cottony ones. As the mycelia of the secondary colonies were short and the spore formation occurred in 4 to 7 days at least, each secondary colony looked like a mass of conidia. (Photo. 2, A, B, C, D, and E)

Conidia: spherical to oval; about 0.8–1 μ in length.

Substrate mycelium: long and wavy; about 0.4–0.6 μ in width.

2. Microscopical observation

Glucose asparagine agar was mainly used for the microscopical observation, because of the comparatively good growth of the aerial mycelia, and the observation^{****} was carried on upon the colony cultivated for 3–15 days at 28–30°.

Aerial mycelium: somewhat cottony and wavy on glucose asparagine agar; sometimes a little wetted; monopodial branching; no whirl; no spiral; about 0.8 μ in width.

II. Physiological Characteristics

1. Tyrosinase reaction: positive

* The outline of this study was already reported at the 24th General Meeting of Botanical Society of Japan (1959).

** As for the description of this species, Shinobu's method¹) was adopted.

*** Hirano Branch, the Osaka University of the Liberal Arts and Education, Osaka, Japan.

**** For the microscopical observation the direct observation method and Shinobu's screen method⁶) were employed.

Photo. 2: Formation of the secondary colony

A, young colony; B and C, moderate; D and E, matured ones; F, spherical mass of spores.

All of them were cultivated on glucose asparagine agar at 28-30°. A, B, C, and D for 5 days; E for 7 days; F for 10 days.

2. Nitrite production: positive
3. Diastase reaction (iodine reaction): positive; moderate
 Enzymatic zone { 4-6 mm. on starch agar (Waksman's A) after 8 days' cultivation
 (Clear zone) { 6-8 mm. on glycerine starch glutamate agar after 8 days' cultivation
4. Konjakmannase reaction: positive and weak
5. Utilization of carbon sources
 Xylose, fructose, galactose, lactose, trehalose, mannitol, and inositol were utilized.
 Raffinose was not utilized.
 Rhamnose was doubtful.

III. Cultural Characteristics

Notes { Ggrowth of the colony
 { Aformation of the aerial mycelium and its color
 { Scolor of the substrate mycelium
 { Pproduction of the soluble pigment

1. Ammonium Czapek agar
 G : moderate—poor; thin
 A : none—trace; partial and thin; brownish white
 S : brown—yellowish brown—Golden Yellow
 P : uncertain; probably none
2. Glycerine Czapek agar
 G : good; sometimes net-like growth
 A : trace; small white patches
 S : Tan—Ambergrow—yellowish brown
 P : brown
3. Glucose asparagine agar
 G : good—moderate; somewhat thin
 A : moderate; thin; somewhat cottony; white
 S : Buff

- P : pale brown
4. Ca-malate agar
 - G : good—moderate; somewhat thin
 - A : poor; partial; small white or brownish white patches
 - S : brown
 - P : pale brown
 5. Starch agar (Waksman's A)
 - G : good—moderate; somewhat thin
 - A : moderate—poor; many small white patches
 - S : Apricot Yellow—pale dull yellow orange
 - P : none
 6. Urea glycerine agar
 - G : good—excellent
 - A : poor; thin; sometimes partial; pinkish white—brownish white—yellowish white
 - S : light brown—Tan
 - P : Tan
 7. Glycerine starch glutamate agar
 - G : good—excellent
 - A : moderate—poor—none; thin and partial; white
 - S : Buff—Golden Yellow
 - P : pale brown

IV. Habitat

Soil (at Nagasaki City)

V. Consideration

No. 701 had a tendency to become weak and to lose its formation ability of the aerial mycelia by the successive cultures, though it formed the white aerial mycelia on various media. Generally, the growth of the aerial mycelia were thin or partial, and the patterns of the macrocolony were concentric at the periphery; and convex and wrinkled at the center, though they were somewhat unstable.

On various media, such as potato peptone glycerine agar, glucose asparagine agar, and glycerine starch glutamate agar, etc., No. 701 did not form any whirl and spiral, but formed many little colonies secondarily on the aerial mycelia, especially on the cottony ones. At first, some short branches came out resembling bushes on certain spots of the aerial mycelia, and later they became a mass of spores on account of sporulation, which occurred after 4 to 7 days' cultivation. (Photo. 2, A, B, C, D, and E) As these secondary colonies were fragile, they were crushed and diffused easily under the weak pressure. (Photo. 3) When a droplet was produced in the neighbourhood of the secondary colony, it turned the colony into a spherical mass, due to the surface tension of droplet, as in the case of *Streptomyces massasporeus*⁵). (Photo. 2, F)

Photo. 3: Crushed colonies under the weak pressure

There could not be seen any remarkable characteristics in the shape and the thickness of the substrate mycelia and conidia.

In order to compare these characteristics of No. 701 with the physiological and cultural characteristics

of the species reported in the past, various experiments, i. e., milky-, gelatin-, cellulase-⁴ invertase-reaction, etc.; and many media, i. e. Bouillon agar, nutrient agar, glucose peptone agar, glucose broth, potato plug, carrot plug, and egg medium, etc. were attempted besides the media stated above. Some important characteristics of No. 701 will be summarized in the following.

No. 701 formed the white aerial mycelia on many media. The substrate mycelia produced brown or brownish pigment, and sometimes yellow or orange series ones. Water soluble pigments (brown—brownish) were often produced on some synthetic media.

Now, there are many species which apparently resemble this strain in some points, especially in the color of the aerial mycelium and in the pigment production. They are *Streptomyces albus*^{2,3,4,7)} (Rossi-Doria emend. Krainsky) Waksman and Henrici, *Streptomyces longisporus*^{2,3,4)} (Krassilnikov) Waksman, *Streptomyces albidus*^{2,3,4)} (Duche) Waksman, *Streptomyces felleus*^{2,3,8)} Lindenbein, *Streptomyces achromogenes*^{2,3,9)} Okami and Umezawa, and *Streptomyces globisporus*^{2,3,4)} (Krassilnikov) Waksman. But none of them formed a secondary colony on the aerial mycelia. Furthermore, the former three formed spiral, while No. 701 did not. The morphological and cultural characteristics of the latter three are different from those of No. 701 as below.

		<i>Str.</i> <i>felleus</i>	<i>Str.</i> <i>achromogenes</i>	<i>Str.</i> <i>globisporus</i>	<i>Str.</i> No. 701
Sporophore				short, often gathered together in thick tufts or bushes	no tufts or no bushes
Spore			cylindrical		spherical~oval
Color of the substrate mycelium	On potato medium	reddish pigment	reddish brown (soluble)		dull yellow
	On egg medium		reddish brown		growth: poor; no reddish brown
Soluble pigment	On synthetic medium			none	brown
	On glucose asparagine agar	none			pale dull yellow orange

Upon the basis of the results stated above, No. 701 was decided to be a new species and was named ‘*Streptomyces aerocolonigenes*’, as the secondary colonies were often formed on the aerial mycelia.

VI. Conclusion and Summary

No. 701 isolated from the soil at Nagasaki City, October, 1958, as one of the *Actinomycetes* strains, formed, secondarily, many little colonies on the aerial mycelia. It was found to be a new species in comparison with those species reported so far in their morphological, physiological and cultural characteristics. The authors will advocate to give it the new specific name ‘*Streptomyces aerocolonigenes*’.

References

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摘 要

気中菌糸に第二次のコロニーを形成する新種 *Streptomyces aerocolonigenes* について

信 夫 隆 治・川 戸 峯 子

1958年10月、長崎市の土から分離した放線菌の一種 No. 701 は気中菌糸に多くの小型 colony を形成する。本菌を従来記載された species と形態的、生理的および培養の諸性質を比較した結果、新種であることがわかったので *Streptomyces aerocolonigenes* と命名することを提唱する。(大阪学芸大学平野分校)