$C_{22}H_{36}O_5$, m.p. 53–54.5°. The acid is potentially tribasic; it appears to have two carboxyl groups and one lactonic grouping. It affords stearic, oxalic and acetic acids on potassium hydroxide fusion. Its structure is not determined, but a hydroxytri-

carballylic structure with a normal C_{16} alkyl chain as substituent is tentatively suggested.

We wish to thank Prof. E. R. H. Jones, F.R.S., and Dr T. G. Halsall of Manchester University for supplying us with a specimen of the methyl ester of polyporenic acid C.

REFERENCES

- Asano, M. & Kameda, Y. (1941). *J. pharm. Soc. Japan*, **61**, 57.
 Birkinshaw, J. H., Bracken, A. & Findlay, W. P. K. (1944). *Biochem. J.* **38**, 131.
 Birkinshaw, J. H. & Findlay, W. P. K. (1940). *Biochem. J.* **34**, 82.
 Birkinshaw, J. H. & Morgan, E. N. (1950). *Biochem. J.* **47**, 55.
 Birkinshaw, J. H. & Raistrick, H. (1934). *Biochem. J.* **28**, 828.
 Birkinshaw, J. H. & Raistrick, H. (1936). *Biochem. J.* **30**, 801.
 Birkinshaw, J. H., Raistrick, H. & Smith, G. (1942). *Biochem. J.* **36**, 829.
 Brady, O. L. (1931). *J. chem. Soc.* p. 756.
 Brady, O. L. & Elsmie, G. V. (1926). *Analyst*, **51**, 77.
 Clutterbuck, P. W., Raistrick, H. & Rintoul, M. L. (1931). *Philos. Trans. B.* **220**, 301.
 Cross, L. C., Eliot, C. G., Heilbron, I. M. & Jones, E. R. H. (1940). *J. chem. Soc.* p. 632.
 Gascoigne, R. M., Holker, J. S. E., Ralph, B. J. & Robertson, A. (1950). *Nature, Lond.*, **166**, 652.
 Gascoigne, R. M., Holker, J. S. E., Ralph, B. J. & Robertson, A. (1951). *Nature, Lond.*, **167**, 570.
 Gruber, W. & Proske, G. (1950). *Mh. Chem.* **81**, 837.
 Heilbron, I. M., Moffat, G. L. & Spring, F. S. (1934). *J. chem. Soc.* p. 1583.
 Hesse, O. (1898). *J. prakt. Chem.* **57**, 261.
 Kariyone, T. & Kuruno, G. (1940). *J. pharm. Soc. Japan*, **60**, 110, 318.
 Lahey, F. N. & Strasser, P. H. A. (1951). *J. chem. Soc.* p. 873.
 Morgan, E. N. (1951). *Biochem. J.* **48**, xliii.
 Thoms, H. & Vogelsang, J. (1907). *Liebigs Ann.* **357**, 145.
 Vesterberg, K. A. (1923). *Ber. dtsh. chem. Ges.* **56**, B, 845.
 Walker, J. & Walker, A. P. (1905). *J. chem. Soc.* **87**, 11, 961.

APPENDIX

Antibacterial activity of the triterpenoid acid (polyporenic acid C) and of ungulinic acid, metabolic products of *Polyporus benzoinus* (Wahl.) Fr.

By SIDONIE MARCUS

Department of Biochemistry, London School of Hygiene and Tropical Medicine, University of London

METHODS

For the determination of antibacterial activity the sodium salts of the respective acids were used for preparing a series of dilutions in broth which were inoculated with the test organisms, incubated at 37° and observed after a suitable interval for growth, and in the case of the Mycobacteria, for pellicle formation. The dilutions were made as follows:

Triterpenoid acid. The purified acid of m.p. 285–290° (decomp.) (10 mg.) was dissolved in ethanol (5 ml.) with slight warming. The equivalent amount of 0.1 N-NaOH (0.255 ml.) was then added and the solution of the sodium salt was diluted to 10 ml. to give a 1:1000 solution and from this the desired twofold dilutions in Lab-Lemco-peptone broth + 0.2% glucose, pH 7.5, were prepared, starting at 1:10,000.

Ungulinic acid. The hydrated disodium salt of the acid was used. A 1:1000 solution was obtained by dissolving the salt (30.0 mg.) in glucose broth (30 ml.) with careful warming to 40–50°. From this solution twofold dilutions in broth were prepared, starting at 1:2000.

The serial dilutions (4.5 ml. quantities in $6 \times \frac{5}{8}$ in. test tubes) of the two substances were inoculated with one loopful of an undiluted culture of the micro-organisms used, viz. *Staphylococcus aureus*, Oxford H; *Bacillus coli*, N.C.T.C. 86; *Mycobacterium phlei*, N.C.T.C. 525; and *M. smegmatis*, N.C.T.C. 523.

RESULTS

The triterpenoid acid (Table 1) was found to have a relatively low antibacterial activity against *Staph. aureus* and *B. coli* (24 hr.) whereas the activity against the Mycobacteria was high, no growth being obtained with *M. phlei* after 72 hr. with a dilution of 1:1,280,000 of the antibiotic. In this case the activity disappeared on further incubation up to 7 days. The ungulinic acid (Table 2), on the other hand, showed a moderate activity against *Staph. aureus* (1:128,000), none against *B. coli* (24 hr.) and only low activity against *M. phlei* (1:8000) after 77 hr., which, however, was only slightly reduced in 7 days.

An attempt was made to determine the antibacterial action of the two metabolic products

Table 1. *Antibacterial activity of polyporenic acid C (as sodium salt)*

(Symbols: -, complete inhibition; ±, slight growth; +, moderate growth; ++, full growth; P, pellicle formation.)

Organism	Growth observed after	Dilutions 1 in								
		10,000	20,000	40,000	80,000	160,000	320,000	640,000	1,280,000	2,560,000
<i>Staph. aureus</i>	24 hr.	+	++	++	++	++	++	++	++	++
<i>B. coli</i>	24 hr.	-	++	++	++	++	++	++	++	++
<i>M. phlei</i>	72 hr.	-	-	-	-	-	-	-	-	++ P
<i>M. phlei</i>	7 days	+	++ P	.	.	.	.	.	.	.
<i>M. smegmatis</i>	72 hr.	-	-	-	-	-	-	-	++ P	++ P
<i>M. smegmatis</i>	7 days	++ P	.	.	.	.	.	.	.	.

Table 2. *Antibacterial activity of ungulinic acid (as disodium salt)*

(Symbols, as in Table 1.)

Organism	Growth observed after	Dilutions 1 in							
		2000	4000	8000	16,000	32,000	64,000	128,000	256,000
<i>Staph. aureus</i>	24 hr.	-	-	-	-	-	-	-	++
<i>B. coli</i>	24 hr.	++	++	++	++	++	++	++	++
<i>M. phlei</i>	77 hr.	-	-	-	± P	+ P	++ P	++ P	++ P
<i>M. phlei</i>	7 days	-	-	++ P	.	.	.	.	.

against *M. phlei* and *M. smegmatis*, using the medium of Dubos (1947), but the results were unsatisfactory, since the lower dilutions showed a turbidity which was undistinguishable from the growth of the organism. A point of minimum turbidity was noted however in each case, which may give some indication of the limiting dilution. This occurred with the triterpenoid acid at 1:16,000 and with ungulinic acid at 1:4000 for both species of Mycobacteria.

SUMMARY

1. The triterpenoid acid, polyporenic acid C, is a powerful antibacterial substance against Mycobacteria, but has little activity against *Staphylococcus aureus* and *Bacillus coli*. Even this high activity against Mycobacteria disappears on prolonged incubation.

2. Ungulinic acid is moderately active only against *Staph. aureus* of the organisms tested.

REFERENCE

Dubos, R. J. (1947). *Experientia, Basel*, 3, 45.

The Composition of the Depot Fats of a Pig Fed on a Diet Rich in Whale Oil

By G. A. GARTON,* T. P. HILDITCH AND M. L. MEARA

Department of Industrial Chemistry, University of Liverpool

(Received 11 July 1951)

The facility with which the pig can utilize dietary fat for the purpose of its own reserve fat has been recognized for many years. Thus, Ellis & Isbell (1926) showed that the depot fats of pigs fed respectively on soya beans and on ground nuts were markedly different from those of pigs fed on a normal (corn) diet low in fat and contained unusually large proportions of linoleic acid and minor

proportions of linolenic acid or of arachidic and higher saturated acids, which are present in the respective fatty oils of the soya bean or the ground nut. Similar results were observed by Ellis, Rothwell & Pool (1931) when cotton-seed oil was added to the normal diet of pigs. When a diet which included 14% of a fish (menhaden) oil was given to pigs, Brown (1931) observed that the pig body fat contained small but significant proportions of the unsaturated acids of the C₂₀ and C₂₂ series which are characteristic components of the fish oil.

* Member of staff, Rowett Research Institute, Bucksburn, Aberdeenshire.