US005162430A

United States Patent [19]

Rhee et al.

[11] Patent Number: 5,162,430

[45] Date of Patent: Nov. 10, 1992

[54] COLLAGEN-POLYMER CONJUGATES

[75] Inventors: **Woonza Rhee**, Palo Alto; **Donald G. Wallace**, Menlo Park, both of Calif.; **Alan S. Michaels**, Boston, Mass.; **Ramon A. Burns, Jr.**, Fremont, Calif.; **Louis Fries**, Los Altos, Calif.; **Frank DeLustro**, Belmont, Calif.; **Hanne Bentz**, Newark, Calif.

[73] Assignee: **Collagen Corporation**, Palo Alto, Calif.

[21] Appl. No.: **433,441**

[22] Filed: **Nov. 14, 1989**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 274,071, Nov. 21, 1988, abandoned.

[51] **Int. Cl.**[5] **C08G 63/48**; C08G 63/91

[52] **U.S. Cl.** **525/54.1**; 523/113; 530/356

[58] **Field of Search** 525/54.1; 530/356, 840; 3/1; 128/DIG. 8; 604/891; 523/113

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,619,371	11/1971	Crook et al.	525/54.1
3,788,948	1/1974	Kagedal et al.	525/54.1
3,876,501	4/1975	Hanushewsky	3/1
3,949,073	4/1976	Daniels et al.	530/356
3,960,830	6/1976	Bayer et al.	530/351
4,002,531	1/1977	Royer	435/179
4,055,635	10/1977	Green et al.	424/78
4,088,538	5/1978	Schneider	435/179
4,192,021	3/1980	Deibig et al.	3/1.9
4,261,973	4/1981	Lee et al.	424/88
4,314,380	2/1982	Miyata et al.	530/350
4,357,274	11/1982	Werner	530/350
4,412,989	11/1983	Iwashita et al.	525/54.1
4,414,147	11/1983	Klibanov et al.	530/356
4,415,665	11/1983	Mosbach et al.	435/179
4,424,208	1/1984	Wallace et al.	514/21
4,488,911	12/1984	Luck et al.	106/161
4,495,285	1/1985	Shimizu et al.	435/215
4,496,689	1/1985	Mitra	525/54.1
4,557,764	12/1985	Chu	106/161
4,563,350	1/1986	Nathan et al.	514/21
4,563,490	1/1986	Stol et al.	530/356
4,582,640	4/1986	Smestad et al.	530/356
4,592,864	6/1986	Miyata et al.	530/356
4,642,117	2/1987	Nguyen et al.	623/11
4,678,468	7/1987	Hiroyoshi	623/1
4,687,820	8/1987	Hou et al.	525/54.1
4,689,399	8/1987	Chu	530/356
4,732,863	3/1988	Tomasi et al.	436/547
4,737,544	4/1988	McCain et al.	424/409
4,745,180	5/1988	Moreland et al.	530/351
4,766,106	8/1988	Katre et al.	524/12
4,847,325	7/1989	Shadle et al.	525/54.1
4,935,465	6/1990	Garman	525/54.1

FOREIGN PATENT DOCUMENTS

8401106	3/1984	World Int. Prop. O. .
8704078	7/1987	World Int. Prop. O. .

OTHER PUBLICATIONS

A. T. Viau et al., *J. Free. Rad. in Bio. & Med.*, (1986), 2:283–88.

A. T. Viau et al., *Am. J. Vet. Res.*, (1986), 47:1398–401 (Viau II).

Nishida et al., *J. Pharm. Pharmacol.*, (1984), 36:354–55.

Inada et al., *Biochem. & Biophys. Res. Comm.*, (1984), 122:845–50.

Takahashi et al., *Biochem. & Biophys. Res. Comm.*, (1984), 121:261–65.

Abuchowski et al., *Cancer Biochem. Biophys.*, (1984), 7:175–86.

J. A. M. Ramshaw et al., *Anal. Biochem.*, (1984), 141:361–65.

A. Bendich et al., *Clin. Exp. Immunol.*, (1982), 48:273–78.

R. H. L. Chen et al., *Biochim. Biphys. Acta*, (1981), 660:293–98.

Davis et a.l, *Lancet*, (1981), 2:281–83.

P. S. Pyatak et al., *Res. Com. Chem. Path. Pharmacol.*, (1980), 29:113–27.

K. J. Wieder et al., *J. Biol. Chem.*, (1979), 254:12579–87.

K. V. Savoca et al., *Biochim. Biophys. Acta*, (1979), 578:47–53.

M. Chvapil et al., *J. Biomed. Mater. Res.*, (1969), 3:315–332.

Primary Examiner—Nathan M. Nutter

Attorney, Agent, or Firm—Morrison & Foerster