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The isolation and purification of biologically active molecules can be greatly facilitated with Affinity Chromatography.<sup>1,2,3</sup> Our new listings only begin to cover the variety of combinations of matrices, ligands & modes of attachment possible. We invite your comments and suggestions.

- Ref: 1. *Silman & Katchalski, Ann. Rev. Biochem.* **35**:873 (1966).  
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 3. *Affinity Chromatography, Methods in Enzymology* **34**: *Jakoby and Wilchek, Eds., Acad. Press, New York, (1975).*

SIGMA already offers the following:

### READY TO USE AFFINITY MEDIA

- |   |  |
|---|--|
| <b>A 7013</b> Adenosine 5'-Diphosphate-Agarose          | <b>G 5007</b> Guanosine 5'-Diphosphate-Agarose*                    |
| <b>A 7138</b> Adenosine 5'-Monophosphoric Acid-Agarose* | <b>G 5132</b> Guanosine 5'-Monophosphoric Acid-Agarose*            |
| <b>A 6888</b> Adenosine 5'-Triphosphate-Agarose*        | <b>G 5257</b> Guanosine 5'-Triphosphate-Agarose*                   |
| <b>C 7511</b> Concanavalin A-Agarose*                   | <b>N 6130</b> Nicotinamide Adenine Dinucleotide-Agarose*           |
| <b>C 4762</b> Cysteamine-Agarose                        | <b>N 6255</b> Nicotinamide Adenine Dinucleotide Phosphate-Agarose* |
| <b>C 5634</b> L-Cysteine-CM Cellulose                   | <b>U 9751</b> Uridine 5'-Diphosphate-Agarose*                      |
| <b>C 5012</b> Cytidine 5'-Diphosphate-Agarose*          | <b>U 9876</b> Uridine 5'-Monophosphoric Acid-Agarose*              |
| <b>C 5137</b> Cytidine 5'-Monophosphoric Acid-Agarose*  | <b>U 9626</b> Uridine 5'-Triphosphate-Agarose*                     |
| <b>C 4887</b> Cytidine 5'-Triphosphate-Agarose*         |  |

- AMP-4B** Sepharose 4B Coupled with 5'-AMP  
**CON-4B** Sepharose 4B Coupled with Concanavalin A  
**PolyU4B** Sepharose 4B Coupled with Polyuridylic Acid

\*Attached to Agarose by way of Ribose Hydroxyls.

### READY-TO-USE WATER-INSOLUBLE MATRICES

- B 3130** Bromoacetyl Cellulose  
**C 7760** Carboxymethyl Cellulose Hydrazide  
**C 7510** Cellulose Carbonate  
**P 8885** Polyacrylamide Hydrazide  
**CNBr-4B** Sepharose 4B, CNBr-Activated

### BIFUNCTIONAL SPACER ARMS

- A 0638** Adipic Acid Dihydrazide  
**A 2504** Amino-N-Caproic Acid  
**P 7630** Putrescine (Diaminobutane)  
**H 7377** N-Hydroxysuccinimide  
**S 7626** Succinic Anhydride

### WATER INSOLUBLE MATRICES

#### WITH SPACER ARMS CONTAINING TERMINAL FUNCTIONAL GROUPS

- |   |   |
|---|---|
| <b>A 6763</b> ε-Amino-N-Caproic Acid-Agarose                | <b>AH-4B</b> Sepharose 4B Coupled with 1, 6-Diaminohexane |
| <b>D 8260</b> Diaminohexane-Agarose                         | <b>ACH-4B</b> Sepharose 4B, Activated CH-4B               |
| <b>CH-4B</b> Sepharose 4B Coupled with 6-Aminohexanoic Acid | <b>ATH-4B</b> Sepharose 4B, Activated Thiol               |

### LIGANDS SPECIALLY PREPARED TO CONTAIN SPACER ARMS

- A 8888** p-Aminobenzyl-1-Thio-2-Acetamido-2-Deoxy-β-D-Glucopyranoside  
**A 8138** 8-(6-Aminohexyl)-Amino Adenosine 3':5'-Cyclic Monophosphoric Acid  
**A 9387** 8-(6-Aminohexyl)-Amino Adenosine 5'-Monophosphoric Acid  
**A 9638** p-Aminophenyl α-L-Fucoside

### REAGENTS

**E 7750** 1-Ethyl-3(3-Dimethylaminopropyl)-Carbodiimide

**G 6257** Glutaraldehyde

9/75

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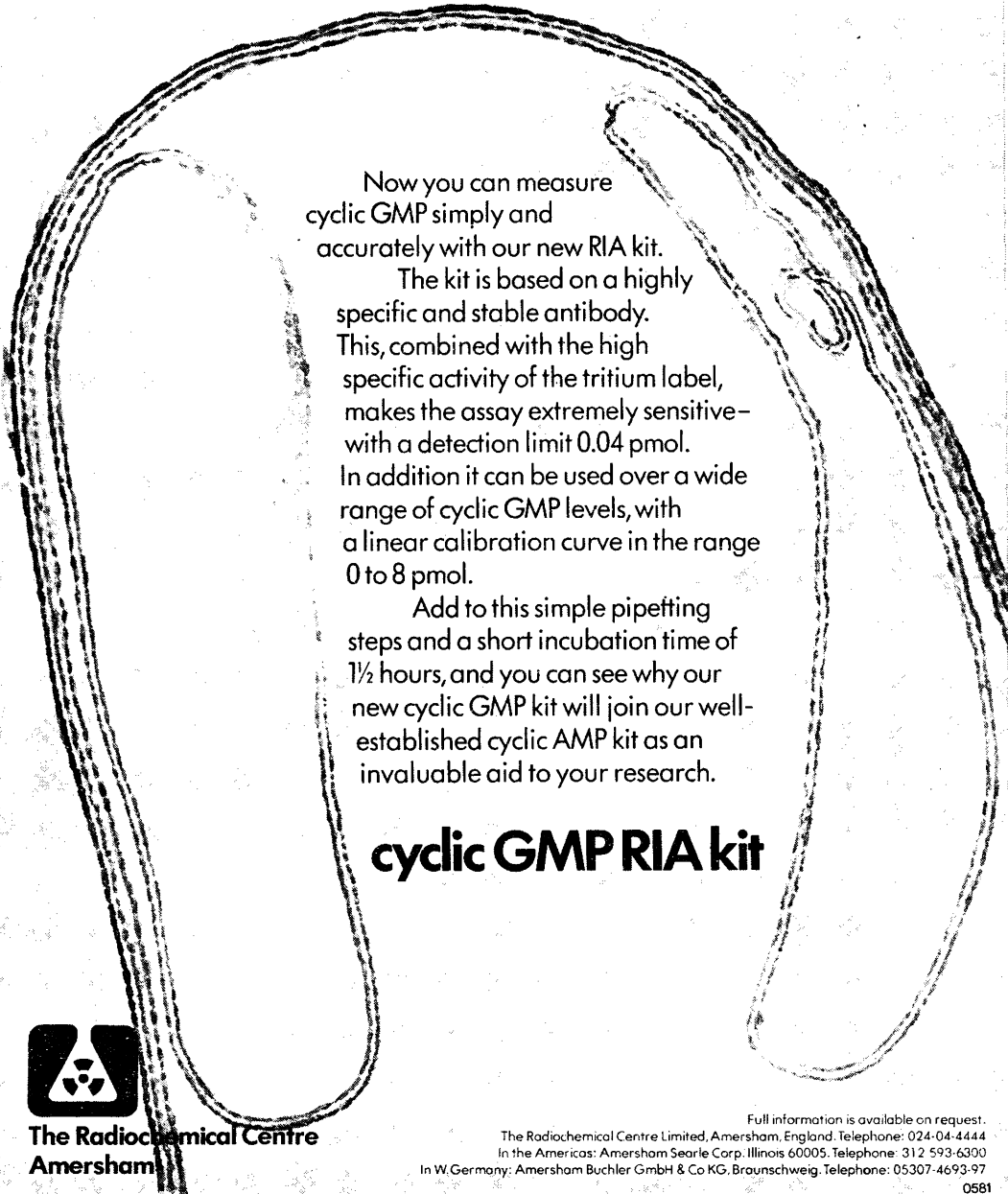
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# Peptide Reagents

It is in the Aldrich tradition to offer a wide variety of intermediates and reagents to the synthetic chemist. For peptide synthesis,<sup>1</sup> we offer one or two reagents for each peptide coupling method described in the literature. Since each method has its advantages and disadvantages, a variety of reagents is necessary.

We offer isobutyl and ethyl chloroformates for the classic "mixed anhydride" method.<sup>2</sup> Generally, isobutyl chloroformate is preferred for the synthesis of peptides of moderate to high molecular weights, and ethyl chloroformate for the synthesis of dipeptides.<sup>3</sup> The carbodiimide method<sup>2</sup> is another versatile and convenient method. The very popular DCC (*N,N'*-dicyclohexylcarbodiimide) is a highly reactive coupling agent and can be used in solid-phase peptide synthesis (SPPS). The related reagents, 1-cyclohexyl-3-(2-morpholinoethyl)carbodiimide metho-*p*-toluenesulfonate (morpho-CDI) and 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride, are water-soluble diimides which permit simplified purification of the peptide products because the corresponding ureas are water-soluble. Racemization in the DCC method can be minimized or completely suppressed by using an additive,<sup>1</sup> such as *N*-hydroxysuccinimide,<sup>4</sup> *N*-hydroxyphthalimide, *N*-hydroxypiperidine or 1-hydroxybenzotriazole. The last-named compound is exceptionally good at suppressing racemization, prohibiting *N*-acylurea formation and improving yields of high-purity peptides.<sup>4</sup> These additives can, of course, be used in SPPS.<sup>1</sup>

The use of DCC-pentachlorophenol (DCC-PCP) and DCC-pentafluorophenol (DCC-PFP) complexes in the preparation of acylpeptide-PCP and -PFP active esters,<sup>5</sup> as well as other uses<sup>6</sup> of DCC, has been described.

Another versatile reagent, EEDQ (*N*-ethoxycarbonyl-2-ethoxy-1,2-dihydroquinoline), has many more advantages: it gives volatile and easily-removable by-products, there is practically no racemization, and it is useful with *O*-unprotected hydroxy amino acids. EEDQ and its more reactive analog, IIDQ (2-isobutoxy-1-isobutoxycarbonyl-1,2-dihydroquinoline),<sup>7</sup> another Aldrich first, can also be used for SPPS. Woodward's Reagents K and L offer similar advantages: they afford water-soluble by-products, yields are high and they are useful with *O*-unprotected hydroxy amino acids.

An oxidation-reduction condensation method<sup>8</sup> employs Aldrithiol-2 (2,2'-dipyridyl disulfide) and triphenylphosphine as coupling reagents. This system can be used in a variety of solvents at a wide range of temperature, affords high yields with little racemization,<sup>9</sup> and can be used in

## SPPS.<sup>9</sup>

Other reagents include trimethylacetyl chloride,<sup>10</sup> triphenylphosphine with CCl<sub>4</sub> or CBr<sub>4</sub>,<sup>11</sup> triphenyl phosphite and imidazole,<sup>12</sup> 1,1'-carbonyldiimidazole,<sup>2</sup>  $\alpha,\alpha$ -dichloromethyl methyl ether,<sup>1</sup> chloroacetonitrile,<sup>13</sup> *p*-nitrophenyl trifluoroacetate,<sup>13</sup> 2-hydroxypyridine<sup>14</sup> and 2-mercapto-pyridine.<sup>15</sup>

Listed below are six of the many peptide reagents we offer. Please send for a free list and/or consult our current Catalog-Handbook for packaging and pricing information on the reagents and blocked amino acids.

\* Active ester reagents

## References:

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