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綜　　説

凍結乾燥法に關する文献集

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凍結乾燥法は今世紀の初期に考案されたといわれるから，この方法の今日に至るまでの発展の歩みには凡そ50年の歴史が伴つている。その間に発表された本法に関する内外の文献は夥しい数に上つた。特に今次大戦後は応用の範囲が非常に拡大されたので，ここ10年間の公刊論文数も亦それに比例して急激に増した。Flosdorf は1949年発行の彼の著書に於て既に凍結乾燥に関する文献は凡そ300に達すると述べている。

編者は3年前 (1951年) に本法に関する綜説を試み，その当時として集録しうる限りの文献凡そ200を記載した。その後も年々歳々相当数の新しい報文が手許に集り，一方本法に関する綜説も続出し，殊に最近 Harris 編の好著が入手できたので，前回の文献に追加補充すると同時に多少索引の便を考慮して分類収録を企ててみたものである。

そこで以下のような分類を行つてみたが，論文の内容によつては2項目以上に亘るようなものもある。大体に於て主として述べられていると思われる項目の方に編入させたつもりであるが，必ずしも分類の適当でないものがあるかもしれない。

凍結乾燥を論ずるに当つては，その前提条件として当然凍結 (Freezing) の問題にふれなければならない。従つてこの文献集に於ても先ず第一に生物学的材料の凍結に関する論文を載せる必要がある。しかし生きた細胞組織から無生物である溶液に至るまでの極めて多種多様に亘る生物学的材料についての凍結の問題は余りにも範囲が広く，その論文は乾燥の論文にも劣らないくらいの多数に上るので，今回は乾燥に関連した文献のみをとり上げることにした。凍結に関するものは別の機会に譲りたい。

文献欄中 * 印は各項目に関し綜説的に書かれたものを示す。

I. 全般に亘るもの

1). 単行本

Flosdorf の著書をもつて嚆矢とするが，最近刊行された Harris の編著は各専門分野の権威者を網羅し且つ広範囲の文献を収録している。

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2). 雑誌その他に掲載されたもの

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II. 基礎的な問題

凍結乾燥法の方法そのものに関する基礎的な条件，或は技術的な問題を主としてこの項目に集めてみた。

従来は一般に真空技術に関する記載が多く，むしろ試料である生物学的材料自身が凍結や乾燥によつて受ける影響について，その機序の基礎的な追及が不充分なように感ぜられる。

なお使用材料の面からみて応用の項に編入した文献の中にはこの項に入れた方がよいと思われるものもある。

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III. 装置に關するもの

装置と操作とは切りはなすことはできないわけであるが，主として操作に関するものは前項 (II.) に入れ，ここでは装置そのものの記載を目標とした。

大型装置では経済的効率から割り出して設計様式が大体固定されてしまつたが，実験室向きの小型装置としては簡易型から高性能型にいたるまで各種型式の考案が夥しい数に上つている。

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IV. 應　　用

1). 血　　液

凍結乾燥法創案の最初から利用され，しかもその保存には本法の利用を最も必要とするところの材料である。主として血漿や血清を乾燥し，輸血材料や免疫体，補体の保存を目的とするが，その外，最近では血球，血漿よりの各種誘導物質の精製保存にも利用されている。

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2). 藥物，化學的物質

ペニシリン製造過程の最後の段階に凍結乾燥法が利用されたが，その結果はこの分野での劃期的な進歩を促すことになつた。

また酵素，ビタミン，ホルモンなどの活性保持の目的にも利用されている。

今日，細菌の菌体成分或は毒素などの保存には殆んど必ず凍結乾燥が用いられるが，それらの文献は枚挙に暇がないので殆んど省略した。

更に種々の材料の化学的抽出の前提として単に脱水の目的だけに凍結乾燥を行うこともある。

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3). 細菌，バイラス

細菌，バイラスの株の保存には昔から利用され，従つてその応用の範囲は殆んどあらゆる菌種に亘つている。

またワクチンにも利用されるようになり，BCG については最も詳細に検討された。

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4). 組　　織

組織への応用には2つの大きな傾向がある。

1つは各種の動物組織或は腫瘍組織を乾燥保存することで，移植用材料としての目的に多く用いられるものであり，他は顕微鏡標本作製時の固定方法として，主として組織化学的檢査に用いられる外，radioautography，螢光顕微鏡，電子顕微鏡標本としても応用されるものである。

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5). 食　　品

食品の凍結乾燥は新鮮なものの性質をなるべく失なわないということを最大の目的としている。

果汁類への応用が多いようであるが, いずれにせよ工業的な大量生産のものばかりである。

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