

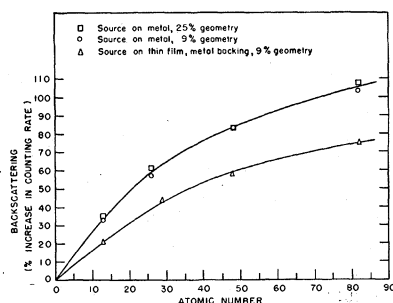


FIG. 4. Saturation backscattering of P^{32} β radiation as a function of atomic number of the backscatterer.

The backscattering data for P^{32} are shown in Fig. 4; the effect is again found to be the same for the two shelf positions, and greater for sources on metals than for sources on films with metal backings. The data for the latter type of source mounting are in reasonable agreement with the data for P^{32} given by Engelkemeir (6), Zumwalt (7), and Burt (8), who used only this mounting procedure.

It is also seen from a comparison of Figs. 3 and 4 that the backscattering of the high-energy β radiation of P^{32} (1.7 mev) is apparently greater than that of the low-energy β radiation of S^{35} (0.17 mev) for a given atomic number, and that there is a noticeable dip in the curve

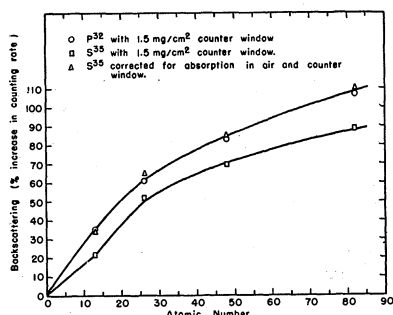


FIG. 5. Saturation backscattering for P^{32} and S^{35} with absorption corrections applied to S^{35} .

for S^{35} on metal at low atomic number. These differences were found, however, to be due entirely to absorption of the backscattered β radiation of S^{35} in the air gap and counter window.

Absorption curves were obtained with thin aluminum foils for the S^{35} sources (in the shelf 1 position) evaporated on film, aluminum, steel, cadmium, and lead. From the first absorption curve the initial half-thickness of the primary radiation from the film was observed to be 2.5 mg/cm². By subtraction of this curve from the rest of the absorption curves, the initial half-thickness of the radiations backscattered by aluminum, steel, cadmium, and lead were found to be 1.3, 1.7, 1.7, and 1.7 mg/cm², respectively. The lower value for aluminum is probably responsible for the dip observed in the backscattering curve and indicates that β radiation is more degraded in energy by scattering from materials of low Z than by scattering from materials of high Z .

Using the above absorption data, the backscattering results for S^{35} were corrected for absorption of the β radiation in the air gap and counter window. The results are shown in Fig. 5, where the squares and triangles represent the uncorrected and corrected data, respectively. The circles represent the data for P^{32} , which require no correction for absorption because of the high energy of P^{32} β radiation. It is seen that the corrected backscattering of S^{35} is in good agreement with that of P^{32} , indicating that the backscattering of β radiation for a given atomic number is independent of the β energy, at least over the range of energy from 0.17 to 1.7 mev. This is in agreement with Zumwalt (7) and Burt (8), who have reported the same result for the range of energy from 0.3 to 1.7 mev.

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The Pungency Taste Characteristics of Some Piperazine Derivatives

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Staudinger and Schneider (1) found that the piperidides of β -cinnamyl acrylic acid, 5-phenyl-2-pentenoic acid, 5-phenyl-3-pentenoic acid, and 5-phenyl- n -valeric acid have the same pungent taste characteristics of the piperine of black pepper, *Piper nigrum*. Riccomanni (2) reported that the piperidine nucleus could be substituted by piperazine and stated that the di-(5-phenyl-3-pentenyl)-piperazine has a biting peppery taste.

On repeating the work of Riccomanni, it was found by the authors that, although the crude product does have a pungent taste, this is not due to the diacyl piperazine, but to the presence of the di-5-phenyl-3-pentenyl piperazonium salt, which can be removed from the crude product by water extraction.

The diacyl piperazine and the diacyl piperazonium salts in this investigation were prepared substantially in the manner recommended by Pollard and Adelson (3) for these types of compounds. The former were prepared by reacting the corresponding acyl chloride with piperazine hexahydrate, and the latter by heating equimolecular amounts of acid and base. Both series of com-

TABLE 1
DIACYL PIPERAZINES AND PIPERAZONIUM SALTS

Compound	Formula	Mp (uncorr.)	Nitrogen, %		Remarks
			Calcd	Found	
Piperazines					
Di- β -cinnamenyl acrylyl	C ₂₆ H ₂₆ O ₂ N ₂	209-9.5°	7.04	7.08*	No taste; water-insoluble
Di-5-phenyl-2-pentenoyl	C ₂₆ H ₃₀ O ₂ N ₂	150-1°	6.97	6.73*	
Di-5-phenyl-3-pentenoyl	C ₂₆ H ₃₀ O ₂ N ₂	Oil	6.97	5.67*	Decompn on vac distn
Di-5-phenyl- <i>n</i> -valeroyl	C ₂₆ H ₃₄ O ₂ N ₂	64.5-65°	6.89	7.15*	
Piperazonium Salts					
Di- β -cinnamenyl acrylyl	C ₂₆ H ₃₀ O ₄ N ₂	196-7°	6.45	6.32; 6.35†	Pungent taste; water-soluble
Di-5-phenyl-2-pentenoyl	C ₂₆ H ₃₄ O ₄ N ₂	152-3°	6.39	6.31; 6.27†	
Di-5-phenyl-3-pentenoyl	C ₂₆ H ₃₄ O ₄ N ₂	126.7°	6.39	6.56; 6.64†	
Di-5-phenyl- <i>n</i> -valeroyl	C ₂₆ H ₃₈ O ₄ N ₂	119.5°	6.31	6.44*	

* Analyses by Samuel P. Sadtler & Son, Philadelphia, Pa.

† Analyses by Micro-Tech Laboratories, Skokie, Ill.

pounds were then purified by recrystallization from appropriate solvents.

Table 1 gives some of the properties of the compounds prepared. The melting points of the piperazonium salts are not reliable values for determining their purity, as the salts split off water on heating to form diacyl piperazines. None of the diacyl piperazines has the pungent taste of pepper, whereas all the corresponding

diacyl piperazonium salts have this characteristic flavor to a marked degree.

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A High-Pressure Cytolyzer

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In recent experiments at this laboratory concerned with the removal of cholinesterase from insect tissue, it was found that the usual instruments used for homogenizing tissue were unwieldy for large amounts of materials. The Potter-Elvehjem homogenizer and the Waring Blendor, for example, either did not break down the cellular structure so that the enzyme could be thoroughly extracted, or they inactivated the enzyme by production of heat. It was found that this could be avoided in the following manner: The tissue was subjected to a high pressure (1,800 psi) of nitrogen and was allowed to equilibrate with this pressure for 24 hr, after which time the pressure was released instantly with a "quick-release" valve. This had the effect of exploding the cells, and practically 100% cytolysis occurred.

The apparatus (Fig. 1) was constructed at very little cost from a small gas cylinder rated at 3,000 psi and therefore safe for this purpose. It was cut in the middle, and 1½" steel sleeves with threads were roll-welded to the tank. This gave access to the chamber for placement and removal of the sample. The quick-release valve was a steam safety valve. The remaining portions of the ap-

paratus were procured from surplus plumbing supplies, with the exception of a fitting for a 2,000 psi nitrogen cylinder.

This apparatus was tested on rat liver and brain, whole flies, and mold mycelium. It was successful in homogen-

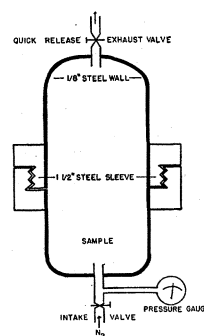


FIG. 1.

izing the rat liver and brain, and the whole flies; the mold mycelium did not seem to be affected by the pressures. This type of apparatus can be used to homogenize large amounts of tissue; and cytolysis, at the time of pressure release, is done in extreme cold rather than heat, because of the drop in temperature when the pressure is released. For any experiments involving reproducible preparation of tissue breis or the removal of a biologically active material without heat inactivation, this method is very effective.

¹The author is indebted to George Drumm and Robert Hallam for advice concerning the engineering details of this problem.